

Birds Species Richness and Abundance Across Three Prominent Wetlands of Dutse, Northwestern Nigeria

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Abstract

Wetlands serve as crucial habitats for bird populations, playing a significant role in supporting diverse avian communities. Birds are bio indicators for assessing the quality and importance of wetlands. Understanding the breadth of species diversity and other ecological aspects of birds within these ecosystems is paramount for effective ecosystem management and conservation efforts. This study presents a comprehensive abundance and species richness of waterbirds species observed in three prominent wetlands situated in Dutse, a city located in Northwestern Nigeria. The point count method was implemented and refined over a period of six months during the study. Shannon-wiener diversity index was used to calculate bird diversity. A total of 13,862 individual of 84 species from 41 families of birds species were recorded. The White-faced whistling duck (*Dendrocygna viduata*) and Cattle egret (*Bubulcus ibis*) emerged as the most abundant species, with 5,690 and 600 individuals recorded, respectively. In contrast, the Osprey (*Pandion haliaetus*) and Black-headed heron (*Ardea melanocephala*) were the least abundant, with only one individual recorded throughout the duration of the study. 7,316 individuals of 42 bird species were recorded at Golf course wetland, 3,286 individuals of 70 species were recorded at Baranda wetland and 3260 individuals of 56 species were observed at Warwade wetland. These wetlands occupied abundance of both resident birds e.g. African jacana (*Actophilornis africana*), partially migratory species e.g. Yellow wagtail (*Motacilla flava*), intra-

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African migrant e.g. *Abdim's stork (Ciconia abdimii)* and resident *Pied Kingfisher (Corvus albus)*. The species diversity was higher in Baranda wetland ($H' = 3.479$) followed by Warwade wetland ($H' = 3.241$) and least was Golf Course ($H' = 1.195$). Long time monitoring of these water-related and water birds is recommended in these wetlands for effective management and conservation strategies.

Keywords: WaterBirds, Species Richness, Wetlands, Dutse

INTRODUCTION

Wetlands are among the most productive ecosystems globally, renowned for their rich biodiversity and ecological complexity. Functioning as transitional zones between aquatic and terrestrial environments, they harbor diverse flora and fauna and provide crucial ecosystem services, including water purification, flood control, and climate regulation. Wetlands occupy about 2.5 million square kilometers of the Earth's surface and have been globally recognized for their ecological significance through the designation of nearly 2,400 Ramsar sites (Ramsar, 2014). These ecosystems not only support life but also play an instrumental role in species evolution and survival, underscoring their critical importance for global ecological stability.

Birds are a vital component of wetland ecosystems and are widely recognized as bio-indicators due to their sensitivity to environmental changes and anthropogenic activities (Ashraf *et al.*, 2018; Khan *et al.*, 2021). They contribute significantly to ecosystem functioning through pollination, seed dispersal, and pest control, while also serving as a key focus for conservation efforts. In northwestern Nigeria, Dutse is a region known for its diverse wetland complexes, which act as crucial habitats for both resident and migratory bird species. These wetlands provide essential ecosystem functions and support local livelihoods, offering refuge to a rich array of bird species, while also enhancing biodiversity at the landscape level.

Several studies have highlighted the significance of wetlands in avian conservation. For instance, Ringim and Muhammad (2017) documented the role of wetlands in sustaining waterbird populations in Hadejia-Nguru Wetland, while Jadoon *et al.* (2019) emphasized the importance of birds as ecological sentinels. Mughal *et al.* (2020) explored the contributions of avian species to human well-being, and Khan *et al.* (2021) evaluated the effects of environmental change on bird diversity. Although these studies provide insights into wetland ecosystems and their avian inhabitants, there remains a gap in understanding regional variations in bird species richness and abundance, particularly in the context of African wetlands, which are understudied compared to their counterparts in other regions.

In Nigeria, research on avian diversity across wetlands has largely been fragmented, with limited or no comprehensive studies on the dynamics of bird species richness and abundance in Dutse's prominent wetland complexes. Existing studies primarily focus on general biodiversity or single species, leaving critical gaps in understanding the ecological interplay within these habitats. Furthermore, rapid environmental changes, habitat degradation, and anthropogenic pressures pose increasing threats to these ecosystems, making timely and focused research essential.

This study aimed at investigating bird species richness and abundance across three prominent wetlands in Dutse, northwestern Nigeria. By providing a detailed checklist of bird species and assessing their distribution patterns, this research contributes to a better understanding of wetland dynamics in the region. The Study will serve as a foundation for effective

conservation strategies and policy interventions, ensuring the sustainable management of these vital ecosystems.

MATERIALS AND METHOD

Study area

The study was conducted at Dutse Northwestern Nigeria (11°42'8.46"N and 9°20'2.46"E). Three different sites, namely: Warwade, Baranda, and Dutse Royal golf course garden in Kachi town were selected for data collection. Warwade dam is about 15km south away from Dutse the capital city of Jigawa State. The wetland is located between latitude 11043' 30"N - 11046'30"N and longitude 9011'30"E - 90 16'30"E The water table of the area is from 25m to 50m (Dogara *et al.*, 2020). Baranda wetland is about 15km away from the city and the Dutse royal Golf Course garden is part of the Royal Farm (Fig. 1). Fishing, hunting and grazing are some of the human activities taking place in these wetlands.

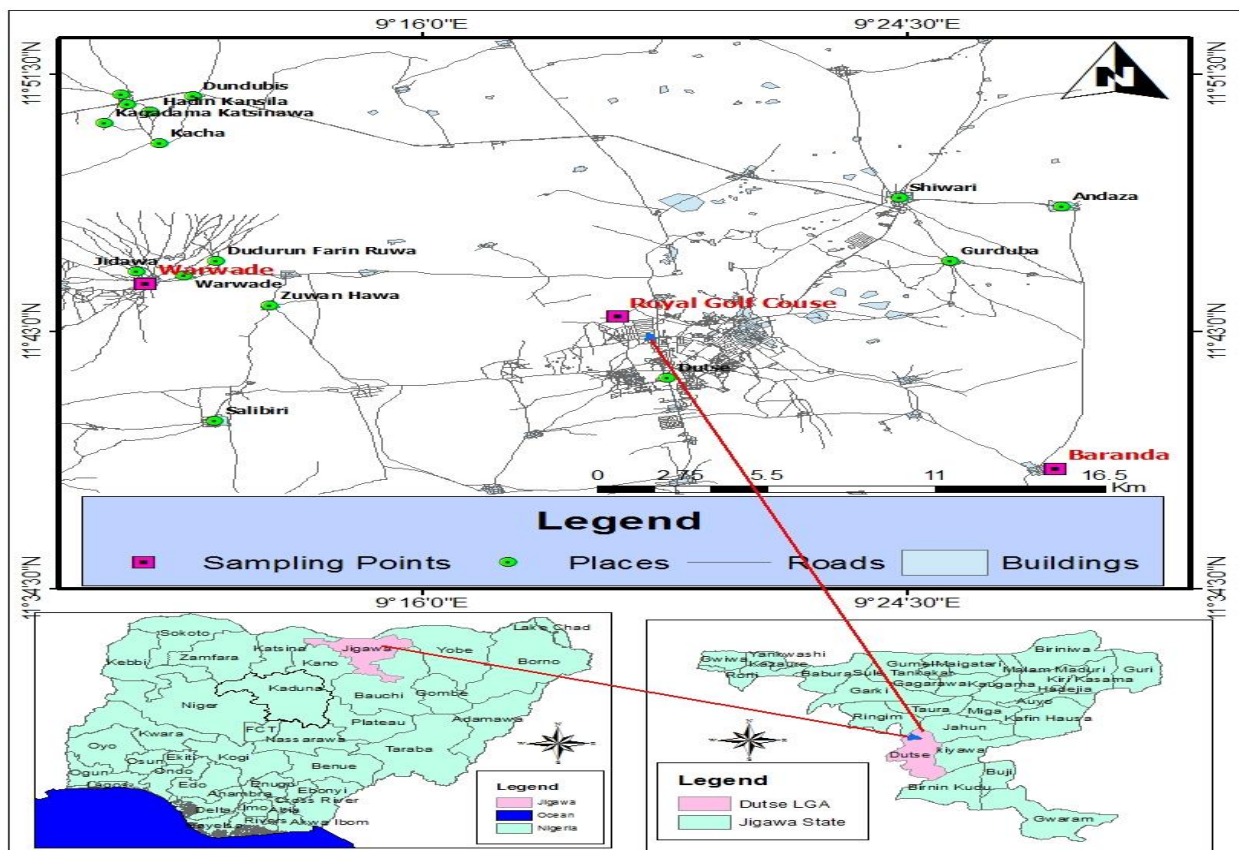


Figure 1: Map of Jigawa State showing the study sites

BIRD SURVEY

Bird's count was carried out using point count methods described by Bibby *et al.*, (2000) and adopted by Muhammad *et al.* (2018) where a period of five minutes interval was observed at arrival to each point to allow birds activities to settle. Counting of birds within each point was done for ten minutes, 100m interval distance apart from each point station was established to avoid double counting of same birds at different stations. Bird count was conducted from 06:00h to 09:00h in the morning when birds are more active (Manu *et al.*, 2010). Birds were surveyed once on weekly basis for a period of six months spanning both the dry seasons (January, February and March) and wet seasons (May, June and July) for each study sites.

Borrow and Demey, 2014 field guide to Birds of Western Africa was used in order to identify sighted birds and to categorize bird species residence status into residents, migrants, main range and intra-African migrant. 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 assessed species population trends along with the conservation status. The vernacular (Hausa) names of some bird species are provided with the help of field assistants.

DATA ANALYSES

The data collected from the observation was recorded and their frequency of visit was analyzed using Microsoft Excel (2013). All descriptive statistics were conducted using pivot table function in Microsoft Excel.

RESULTS AND DISCUSSION

A total of 13,862 individual of 84 different Bird species from 41 different families were recorded. The family Anatidae had the highest bird’s species with 5,764 individuals; Ploceidae had 1,590 individual then Ardeidae had 1,524 individuals respectively. White-faced whistling duck (*Dendrocygna viduata*) and Cattle egret (*Bubulcus ibis*) emerged as the most abundant species, with 5,690 and 600 individuals recorded, respectively. In contrast, the Osprey (*Pandion haliaetus*) and Black-headed heron (*Ardea melanocephala*) were the least abundant, with only one individual of each species recorded throughout the duration of the study (Table 1).

Table 1: Bird Species Composition across study sites

Family	Scientific Name	English Name	Local name	Abundance
Accipitridae	<i>Elanus caeruleus</i>	Black-Shouldered Kite		2
Accipitridae	<i>Kaupifalco monogrammicus</i>	Lizard Buzzard	Ci kadangaru	1
Acrocephalidae	<i>Acrocephalu schoenobaenus</i>	Sedge Warbler		1
Alaudidae	<i>Galerida cristata</i>	Crested Lark	Màitukku	13
Alcedinidae	<i>Alcedo cristata</i>	Malachite Kingfisher	Marokin-ruwa	13
Alcedinidae	<i>Corous albus</i>	Pied Kingfisher	Dan kwalam	282
Alcedininae	<i>Halcyon leucocephala</i>	Grey-Headed Kingfisher	Makokofa	18
Alcedininae	<i>Ispidina picta</i>	African Pygmy Kingfisher	Cinuwuya	7
Anatidae	<i>Plectropterus gambensis</i>	Spur-Winged Goose	Dínyáá	74
Anatidae	<i>Dendrocygna viduata</i>	White-Faced Whistling Duck	Kírínjyàà	5690
Animalia	<i>Poicephalus senegalus</i>	Senegal Parrot	Tsíryáá	4
Ardeidae	<i>Ardea melanocephala</i>	Black-Headed Heron	bákínzalbe	1
Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret	Bàlbéélààà	600
Ardeidae	<i>Ardea cinerea</i>	Green-Backed Heron	Dan dolodolo	48
Ardeidae	<i>Ardea cinerea</i>	Grey Heron	Zalbe	303
Ardeidae	<i>Egretta intermedia</i>	Intermediate Egret	Tashifari	11
Ardeidae	<i>Ixobrychus minutes</i>	Little Bittern		11
Ardeidae	<i>Egretta garzetta</i>	Little Egret		20
Ardeidae	<i>Ardeola ralloides</i>	Squacco Heron	Makwabo	530
Bucerotidae	<i>Tockus erythrorhynchus</i>	Northern Red-Billed Hornbill	Cilikowamaijan-baki	68
Burhinidae	<i>Burhinus senegalensis</i>	Senegal Thick-Knee	Sarafagè	3
Charadriidae	<i>Vanellus tectus</i>	Black-Headed Lapwing	Zakarankekuwa	4
Charadriidae	<i>Vanellus spinosus</i>	Spur-Winged Lapwing	Zakarandawaki	303

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Ciconiidae	<i>Ciconia abdimii</i>	Abdim's Stork	Shààmúwáá	7
Columbidae	<i>Streptopelia senegalensis</i>	Laughing Dove	kúrcíyáágámjì	289
Columbidae	<i>Oena capensis</i>	Namaqua Dove	Bardon s'uuga	12
Columbidae	<i>Columba guinea</i>	Speckled Pigeon	Hásbíyáá	76
Columbidae	<i>Streptopelia vinacea</i>	Vinaceous Dove	Wálakuršiiia	280
Coraciidae	<i>Coracias abyssinicus</i>	Abyssinian Roller	Tsànwáákàà	36
Corvidae	<i>Ptilostomus afer</i>	Piapiac	Carkingiwa	121
Corvidae	<i>Corvus albus</i>	Pied Crow	Hànkáákàà	1
Cuculidae	<i>Clamator glandarius</i>	Great Spotted Cuckoo	Dum'bus	1
Cuculidae	<i>Centropus senegalensis</i>	Senegal Coucal	rágónmázáá	71
Estrildidae	<i>Euodice cantans</i>	African Silverbill	Ciriri	45
Estrildidae	<i>Estrilda troglodytes</i>	Black-Rumped Waxbill		32
Estrildidae	<i>Lagonoticta senegala</i>	Red-Billed Firefinch	báá'ú	359
Estrildidae	<i>Uraeginthus bengalus</i>	Red-Cheeked Cordon-Bleu	Asisi	37
Fringillidae	<i>Serinus mozambicus</i>	Yellow-Fronted Canary	Kunan-dorowa	93
Indicatoridae	<i>Indicator indicator</i>	Greater Honeyguide	Maganiya	2
Jacaniidae	<i>Actophilornis africana</i>	African Jacana		112
Leiotherichidae	<i>Turdoides plebejus</i>	Brown Babbler	Cakwaikwaiwa	41
Malaconotidae	<i>Tchagra senegalus</i>	Black-Crowned Tchagra	Sùudaa	2
Malaconotidae	<i>Laniarius barbarous</i>	Yellow-Crowned Gonolek	Càrkiiya	224
Meropidae	<i>Merops pusillus</i>	Little Bee-Eater	Raina baka	17
Meropidae	<i>Merops nubicus</i>	Northern Carmine Bee-Eater	Tsuntsunkayaki	12
Meropidae	<i>Merops bulocki</i>	Red-Throated Bee-Eater		1
Meropidae	<i>Merops albicollis</i>	White-Throated Bee-Eater	Jiriri	7
Monarchidae	<i>Terpsiphone viridis</i>	African Paradise Flycatcher	Dokintsuntsaye	7
Motacillidae	<i>Motacilla flava</i>	Yellow Wagtail	Hana noma	73
Muscicapidae	<i>Melaenornis edolioides</i>	Northern Black Flycatcher		11
Muscicapidae	<i>Melaenornis pallidus</i>	Pale Flycatcher		6
Musophagidae	<i>Crinifer piscator</i>	Western Grey Plantain-Eater	Kulkulu	2
Nectariniidae	<i>Cinnyris superbus</i>	Beautiful Sunbird	Shàakauci	6
Pandionidae	<i>Pandion haliaetus</i>	Osprey		1
Passeridae	<i>Passer griseus</i>	Northern Grey-Headed Sparrow		118
Phalacrocoracidae	<i>Phalacrocorax africanus</i>	Long-Tailed Cormorant	Caaga	303
Phasianidae	<i>Francolinus bicalcaratus</i>	Double-Spurred Francolin	Fàkàráá	3
Phoeniculidae	<i>Phoeniculus purpureus</i>	Green Wood-Hoopoe	Jaabakkoogoo	3
Ploceidae	<i>Plocepasser superciliosus</i>	Chestnut-Crowned Sparrow Weaver	Eggatantumi	22
Ploceidae	<i>Ploceus heuglini</i>	Heuglin's Masked Weaver		25
Ploceidae	<i>Ploceus luteolus</i>	Little Weaver	Kaabaree	46
Ploceidae	<i>Euplectes franciscanus</i>	Northern Red Bishop	Dòògàrì	167
Ploceidae	<i>Quelea quelea</i>	Red-Billed Quelea	Jan buwa	435
Ploceidae	<i>Ploceus cucullatus</i>	Village Weaver	Káábàréé	645
Ploceidae	<i>Bubalornis albirostris</i>	White-Billed Buffalo Weaver	càkwáikwáiwàà	250
Psittaculidae	<i>Psittacula krameri</i>	Rose-Ringed Parakeet	Kààlóó	48
Pycnonotidae	<i>Pycnonotus barbatus</i>	Common Bulbul	Magora	148

Rallidae	<i>Crex egregia</i>	Black Crake	kàazarruwaa	12
Rallidae	<i>Gallinula angulata</i>	Lesser Moorhen	kààzárrúwáá	5
Recurvirostridae	<i>Himantopus himantopus</i>	Black-Winged Stilt	Tàakaròkarò	396
Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank		27
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper		194
Scolopacidae	<i>Gallinago gallinago</i>	Common Snipe	Takabadomaizane	1
Scolopacidae	<i>Tringa ochropus</i>	Green Sandpiper		34
Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Kwàraakwàraa	39
Scolopacidae	<i>Tringa erythropus</i>	Spotted Redshank	Kwàraakwàraa	30
Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper		173
Scopidae	<i>Scopus umbretta</i>	Hamerkop	Shaida	2
Sturnidae	<i>Lamprotornis chalcurus</i>	Bronze-Tailed Glossy Starling	Shaya	33
Sturnidae	<i>Lamprotornis pulcher</i>	Chestnut-Bellied Starling	Caaraa	290
Sturnidae	<i>Sturnidae</i>	Greater Blue-Eared Starling	Kyàari-Kyàari	1
Sturnidae	<i>Lamprotornis caudatus</i>	Long-Tailed Glossy Starling	kila-kilai	361
Sturnidae	<i>Lamprotornis purpureus</i>	Purple Glossy Starling	Wurwuya	9
Viduidae	<i>Vidua chalybeate</i>	Village Indigobird	Dánbákíí	51

Abundance and richness of Birds Species across the study sites

Golf course wetland recorded highest number of individuals with White-faced Whistling duck (*Dendrocygna viduata*) as the most abundant species, followed by Baranda wetland 3,286 individuals which has the higher number of individuals (richness) with 70 species recorded. Yellow-crowned Gonolek (*Serinus mozambicus*) is the most abundant species (Figure 1).

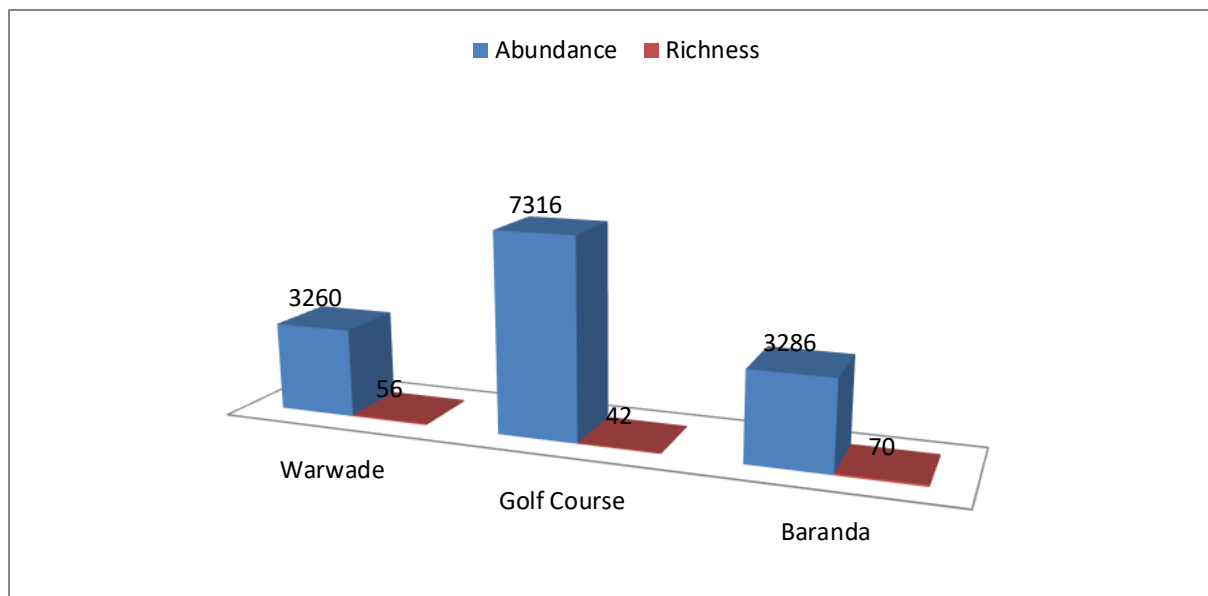


Figure 2: Birds Abundance and Species richness across study sites

Residence Status of the Birds Species Recorded across the Study Sites

From the results, a total of 55 bird species (66%) were found to be resident birds, 9 (10.7%) were non-breeding visitors (Main range), 17 species were resident but (partially migratory), 2 species were non-breeding visitors (sparse occurrence) and 1 species is found to be intra-African migrant (breeding visitor) Figure 3.

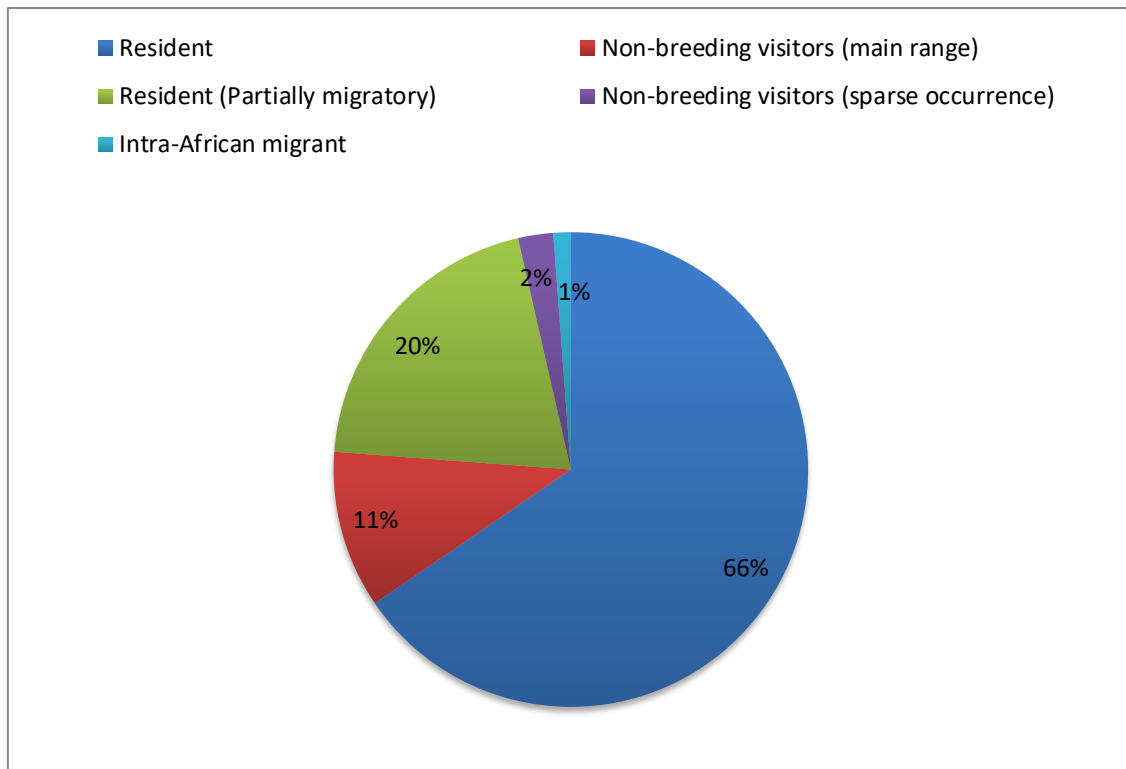


Figure 3: Birds Abundance by Residence status across study site

The species diversity was higher in Baranda wetland and least in Golf Course (Table 2).

Table 2: The Shannon Diversity of all the Three Wetlands

INDICES	Warwade	Baranda	Golf course
Species	56	70	42
Abundance	3260	3286	7316
Shannon_H	3.241	3.479	1.195
Evenness_e ^{H/S}	0.4565	0.4633	0.07867

DISCUSSION

This study provides the first comprehensive checklist of waterbirds in Dutse, Northwestern Nigeria, documenting 9.7% of Nigeria's total bird species. When compared to Muhammad's (2018) checklist of 128 bird species accounting for 15% of Nigerian birds in Dutse, our findings offered additional perception into species distribution and habitat use. Similarly, the Hadejia-Nguru wetlands, located in the Hadejia, have recorded 191 bird species from 54 families (Ringim and Muhammad, 2017), indicating the ecological richness of the broader landscape. Notably, while these studies highlighted the significance of wetlands for avian diversity, the differences in species numbers may reflect variations in wetland size, habitat characteristics, and survey methodologies.

The Golf Course wetland exhibited the highest bird abundance, but species richness was greater in Baranda and Warwade wetlands, indicating variations in habitat conditions and human activity levels. Baranda and Warwade wetlands, which are unprotected, shared a closer similarity in species composition and higher species richness, aligning with Rayner *et al.* (2014), who reported that unprotected wetlands often support greater species richness. Conversely, the lower richness and diversity index at the Golf Course wetland suggested that

human activities or other factors might have created a habitat dominated by fewer species. This supported findings by Ringim *et al.* (2017), who observed that protection status significantly affects bird diversity.

Baranda wetland stands out with the highest Shannon diversity index and evenness, indicating a more balanced distribution of species compared to the Golf Course wetland, which showed lower diversity and evenness. This is consistent with studies such as Sulaiman *et al.* (2015), which linked bird diversity and abundance to wetland size and type. The variations in species composition between different wetlands, such as the higher dry-season species richness in Baranda compared to Warwade, suggested that differences in vegetation structure, water quality, and resource availability are key drivers of avian diversity.

Resident bird species were the most abundant across all wetlands, contributing to ecosystem stability due to their year-round adaptation to local conditions. Similar findings were reported in the Hadejia-Nguru wetlands, where resident species dominated (Ringim *et al.*, 2018). Migratory species were less represented but remain critical to biodiversity dynamics, as their presence often indicates ecological health and connectivity between regions. Differences in migratory behavior and breeding status further indicated the influence of habitat and environmental factors.

The population trends observed in this study revealed important conservation challenges and opportunities. While 55% of bird populations were stable, the 19% with declining trends raise concerns about habitat degradation, climate change, and other anthropogenic pressures. In contrast, the 18% of increasing populations may indicate effective local adaptations or beneficial changes in habitat conditions. These patterns align with global trends; for example, the EPA (2023) reported significant increases in 84 bird species but concerning declines in 126 species in the United States. Similarly, in Europe, 39% of bird species are in poor or bad conservation status (Bart, 2005). These comparisons highlighted the need for targeted conservation actions to address habitat loss and mitigate climate impacts in Dutse wetlands.

CONCLUSION

This study presents a comprehensive checklist of waterbirds and water-associated bird species across three prominent wetlands in Dutse, Northwestern Nigeria. The presence of both migratory and intra-African migratory bird species underscores the ecological significance of these wetlands for avian conservation. Despite the richness of bird species, encompassing both waterbirds and terrestrial species, the region's wetlands remain under-researched. This highlights the urgent need for more detailed and systematic studies to evaluate the population dynamics and conservation status of avian fauna in the area.

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