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Full Length Research Article

BIRDS OF WASAI RESERVOIR, MINJIBIR, KANO - NIGERIA

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ABSTRACT
Birds are invaluable indicator species owing to their sensitivity to environmental changes. This survey was conducted to provide baseline information on the avifaunal diversity of Wasai reservoir, Minjibir, Kano, Nigeria (N12^0 53', E 8^0 32'), an inland wetland habitat designated for irrigation, recreation, and other uses. We recorded 110 bird species belonging to 48 families, comprising of 87 resident species, three intra-African migrants, and 20 Palearctic migrants. The three most common families were Ardeidae, Accipitridae, and Ploceidae. Similarly, majority of these species belong to the insectivore and carnivore feeding guilds. Thus, Wasai reservoir is of significant ecological value as a home to many water-birds and terrestrial bird species, and also serves as a staging and wintering ground for a number of Palaerctic migrants. It is recommended that the Kano State Government should put in place necessary mechanisms towards the conservation and sustainable use of this important bird habitat.

Keywords: Wasai, dam, avifauna, checklist, wetland, habitat

INTRODUCTION

Avian species are good indicators of the conditions in ecological systems; they also serve as important biological indicators of how species respond to climate change (Pearce-Higgins *et al*., 2014). As indicators of habitat quality, birds have distinctive ecological requirements which allow easy assessment of how they respond to environmental changes ranging from landscape fragmentation, land use intensity, as well as climate change. Their body size, dispersal power, feeding guild, breeding strategy, and migratory activities are some of the features that are used to assess how they react to ecosystem disturbances (Vandewalle *et al*., 2010). Furthermore, among the vertebrates, birds render the most diverse ecosystem services ranging from soil formation to nutrient cycling (Sekercioglu, 2006). They also play a wide variety of ecological roles serving as pollinators, predators, scavengers, seed dispersers, seed predators, as well as ecosystem engineers (BirdLife International, 2013).

Wetlands are unique and among the most productive ecosystems in the world. They are ecologically significant in the sense that they harbor various species of birds (Ekhande *et al*., 2012). Wetlands are capable of supporting huge number of both resident and migratory bird species and play vast roles ranging from social, economic, scientific, and ecological (Omotoriogun *et al*., 2011). As prolific habitats, they serve as haven for diverse plants and animal species and play important functions including flood and erosion control in addition to nutrient absorption and recharging of aquifers. However, wetlands are experiencing great anthropogenic disturbances worldwide which likely affect the bird assemblages in these important habitats (Kumar and Gupta, 2009).

Kano State is one of the major cities in northern Nigeria. The drainage system in Kano comprises of two major rivers namely Kano and Challawa, with modifications using reservoirs built to serve multipurpose uses (Barau, 2007). Wasai reservoir, also known as Jakara reservoir is an important reservoir on Kano River that affords significant ecological value as habitat for many avian species. To date, there is no literature on its avifaunal diversity, and therefore, this study provide for the first time a checklist of bird species inhabiting the Wasai reservoir, Minjibir, Kano - Nigeria.

MATERIALS AND METHODS

Study Area

Wasai reservoir (N12^0 53', E 8^0 32') is located in Minjibir Local Government in the Northern part of Kano State, Nigeria (Figure 1). The reservoir was constructed in 1976 for the purpose of irrigation, recreation and wildlife conservation (Abubakar and Abdullahi, 2015). The catchment and surface areas of the reservoir are 559km^2 and 1,659ha respectively (Yakubu *et al*., 2016). River Jakara and River Getsi are the two major tributaries that drain into the reservoir, carrying municipal and industrial effluents (Imam, 2012). The people settling in the nearby villages primarily depend on the reservoir as a source of livelihood thereby over-exploiting its resources. They engage in fishing and farming activities most especially during the dry season when the volume of the water is considerably reduced and open land becomes available at the bank of the reservoir. Crops grown in this area include sweet potato (*Ipomoea batatas*), cassava (*Manihot esculenta*), maize (*Zea mays*), rice (*Oryza sativa*), okra (*Abelmoschus esculentus*), onion (*Allium cepa*), pumpkin (*Cucurbita maxima*), and roselle (*Hibiscus sabdariffa*). Nevertheless, the moist area surrounding the reservoir still serves as roosting and foraging sites for many resident and migratory bird species.

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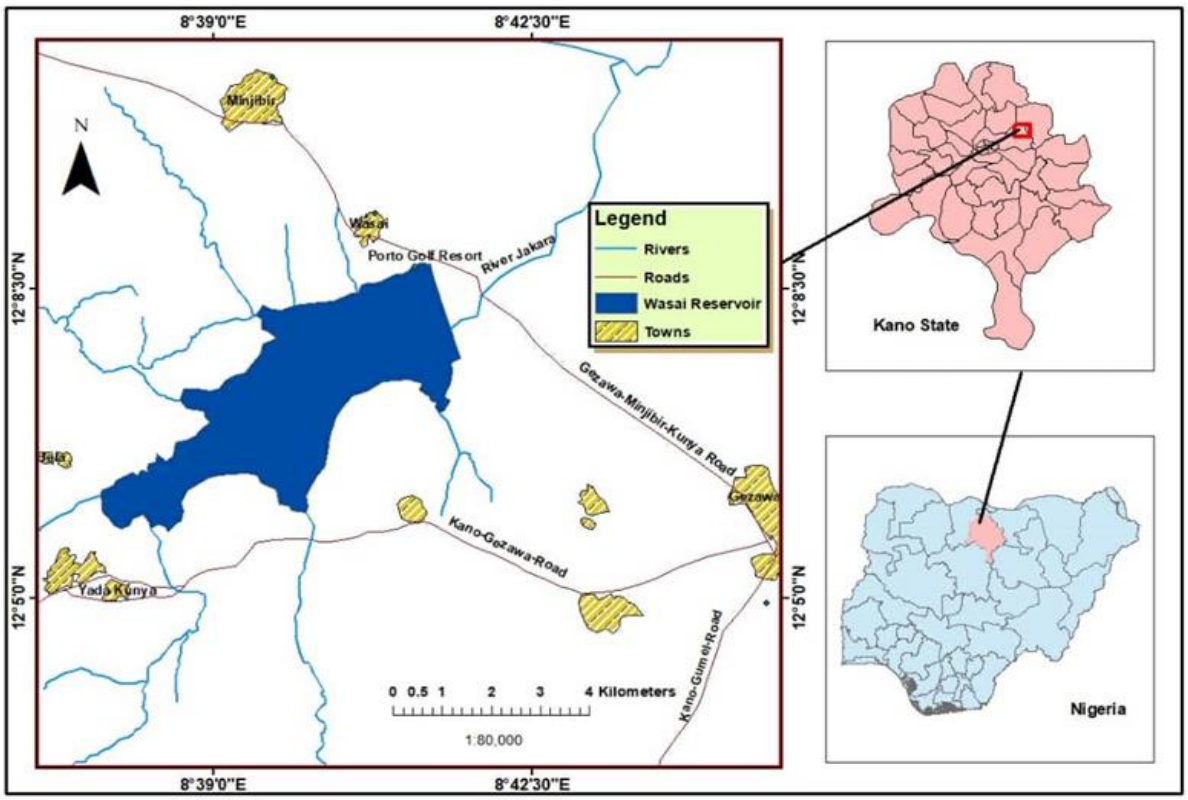

Figure 1: Map showing the location of Wasai reservoir, Kano State, Nigeria

Survey method

The area of the reservoir adjacent to Wasai village and its periphery was surveyed twelve times between February, 2018 and September, 2019. Observations were carried out along predetermined line transects covering a total length of 5.2 km. Surveys were carried out in the early morning hours when birds are most active between 0630 and 1100 hours (Muhammad *et al*., 2018). Species record included birds encountered both visually and aurally during the surveys. A pair of binoculars (Bushnell Legend M-series 10 x 42 mm) was used to observe birds and identification was aided by a field guide (Borrow and Demey, 2014).

Data analysis

Species family name, scientific name, and English names, as well as residence status were according to the field guide to the birds of Western Africa (Borrow and Demey, 2014). Feeding guild was determined using Birds of Western Africa field guide (Borrow and Demey, 2014) and Handbook for the Birds of the World Alive (HBW, 2019).

RESULTS

A total of 110 bird species belonging to 48 families were recorded in this study, comprising of 87 resident species, three intra-African migrants, and 20 Palearctic migrants as shown in Table 1. As a wetland habitat, the Ardeidae family is the largest with nine species, then Accipitridae and Ploceidae with six species each. This is followed by Cisticolidae, Falconidae, and Rallidae having five species each.

Wasai reservoir was found to be a wintering site for a number of Palearctic migrant species such as the Ruff (*Calidris pugnax*), Gull-billed tern (*Gelochelidon nilotica*), White-winged tern (*Chlidonias leucopterus*), Yellow wagtail (*Motacilla flava*), White wagtail (*Motacilla alba*), Kittlitz's plover (*Charadrius pecuarius*), and Little ringed plover (*Charadrius dubius*). Others include Common sandpiper (*Actitis hypoleucos*), Green sandpiper (*Tringa ochropus*), Wood sandpiper (*Tringa glareola*), European reed warbler (*Acrocephalus scirpaceus*), Sedge warbler (*Acrocephalus schoenobaenus*), Melodious warbler (*Hippolais polyglotta*), and Black kite (*Milvus migrans*). In addition to this, most of the carnivorous species are raptors (birds of prey) among them include Shikra (*Accipiter badius*), Black-shouldered Kite (*Elanus caeruleus*), Dark Chanting Goshawk (*Melierax metabates*), Yellow-billed Kite (*Milvus aegyptius parasitus*), Western Marsh Harrier (*Circus aeruginosus*), Common Kestrel (*Falco tinnunculus*), and Red-necked Falcon (*Falco chicquera*).

The classification of bird species based on their feeding guild is shown in Figure 2. Insectivorous and carnivorous species were the highest in number while the least in number were nectarivorous and frugivorous species.

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Table 1: Checklist of birds of Wasai reservoir, Minjibir, Kano – Nigeria

S/N	Family	Scientific Name	English Name	Residence Status	Guild
1	Accipitridae	*Accipiter badius*	Shikra	Resident	Carnivore
2	Accipitridae	*Circus aeruginosus*	Western Marsh Harrier	Palearctic migrant	Carnivore
3	Accipitridae	*Elanus caeruleus*	Black-shouldered Kite	Resident	Carnivore
4	Accipitridae	*Melierax metabates*	Dark Chanting Goshawk	Resident	Carnivore
5	Accipitridae	*Milvus migrans*	Black Kite	Palearctic migrant	Carnivore
6	Accipitridae	*Milvus aegyptius parasitus*	Yellow-billed Kite	Resident	Omnivore
7	Acrocephalidae	*Acrocephalus scirpaceus*	European Reed Warbler	Palearctic migrant	Insectivore
8	Acrocephalidae	*Hippolais polyglotta*	Melodious Warbler	Palearctic migrant	Insectivore
9	Alaudidae	*Galerida cristata*	Crested Lark	Resident	Omnivore
10	Alcedinidae	*Ceryle rudis*	Pied Kingfisher	Resident	Carnivore
11	Alcedinidae	*Halcyon leucocephala*	Grey-headed Kingfisher	Intra-African migrant	Carnivore
12	Anatidae	*Dendrocygna viduata*	White-faced Whistling Duck	Resident	Omnivore
13	Anatidae	*Plectropterus gambensis*	Spur-winged Goose	Resident	Omnivore
14	Anatidae	*Sarkidiornis melanotos*	Knob-billed Duck	Resident	Omnivore
15	Apodidae	*Apus affinis*	Little Swift	Resident	Insectivore
16	Apodidae	*Cypsiurus parvus*	African Palm Swift	Resident	Insectivore
17	Ardeidae	*Ardea cinerea*	Grey Heron	Resident	Carnivore
18	Ardeidae	*Ardea intermedia*	Intermediate Egret	Resident	Carnivore
19	Ardeidae	*Ardea melanocephala*	Black-headed Heron	Resident	Carnivore
20	Ardeidae	*Ardea purpurea*	Purple Heron	Palearctic migrant	Carnivore
21	Ardeidae	*Ardeola ralloides*	Squacco Heron	Resident	Carnivore
22	Ardeidae	*Bubulcus ibis*	Cattle Egret	Resident	Insectivore
23	Ardeidae	*Butorides striata*	Green-backed Heron	Resident	Carnivore
24	Ardeidae	*Egretta ardesiaca*	Black Heron	Resident	Carnivore
25	Ardeidae	*Egretta garzetta*	Little Egret	Palearctic migrant	Carnivore
26	Bucerotidae	*Tockus erythrorhynchus*	Northern Red-billed Hornbill	Resident	Frugivore
27	Bucerotidae	*Tockus nasutus*	African Grey Hornbill	Resident	Frugivore
28	Buphagidae	*Buphagus africanus*	Yellow-billed Oxpecker	Resident	Insectivore
29	Charadriidae	*Charadrius dubius*	Little-ringed Plover	Palearctic migrant	Insectivore
30	Charadriidae	*Charadrius pecuarius*	Kittlitz's Plover	Resident	Insectivore
31	Charadriidae	*Vanellus spinosus*	Spur-winged Lapwing	Resident	Insectivore
32	Charadriidae	*Vanellus tectus*	Black-headed Lapwing	Resident	Insectivore
33	Cisticolidae	*Camaroptera brachyura*	Grey-backed Camaroptera	Resident	Insectivore
34	Cisticolidae	*Cisticola cantans*	Singing Cisticola	Resident	Insectivore
35	Cisticolidae	*Cisticola galactotes*	Winding Cisticola	Resident	Insectivore
36	Cisticolidae	*Cisticola juncidis*	Zitting Cisticola	Resident	Insectivore
37	Cisticolidae	*Prinia subflava*	Tawny-flanked Prinia	Resident	Insectivore
38	Columbidae	*Columba guinea*	Speckled Pigeon	Resident	Granivore
39	Columbidae	*Streptopelia senegalensis*	Laughing Dove	Resident	Granivore

S/N	Family	Scientific Name	English Name	Residence Status	Guild
40	Columbidae	*Streptopelia vinacea*	Vinaceous Dove	Resident	Granivore
41	Columbidae	*Turtur abyssinicus*	Black-billed Wood Dove	Resident	Granivore
42	Coraciidae	*Coracias abyssinicus*	Abyssinian Roller	Resident	Insectivore
43	Coraciidae	*Coracias naevius*	Rufous-crowned Roller	Resident	Insectivore
44	Corvidae	*Corvus albus*	Pied Crow	Resident	Omnivore
45	Corvidae	*Ptilostomus afer*	Piapiac	Resident	Omnivore
46	Cuculidae	*Centropus senegalensis*	Senegal Coucal	Resident	Carnivore
47	Cuculidae	*Cuculus gularis*	African Cuckoo	Intra-African migrant	Insectivore
48	Dicruridae	*Dicrurus adsimilis*	Fork-tailed Drongo	Resident	Insectivore
49	Emberizidae	*Emberiza tahapisi*	Cinnamon-breasted Rock Bunting	Resident	Granivore
50	Estrildidae	*Estrilda troglodytes*	Black-rumped Waxbill	Resident	Granivore
51	Estrildidae	*Euodice cantans*	African Silverbill	Resident	Granivore
52	Estrildidae	*Lagonosticta senegala*	Red-billed Firefinch	Resident	Granivore
53	Estrildidae	*Uraeginthus bengalus*	Red-cheeked Cordon-bleu	Resident	Granivore
54	Falconidae	*Falco ardosiaceus*	Grey Kestrel	Resident	Carnivore
55	Falconidae	*Falco biarmicus*	Lanner Falcon	Resident	Carnivore
56	Falconidae	*Falco chicquera*	Red-necked Falcon	Resident	Carnivore
57	Falconidae	*Falco naumanni*	Lesser Kestrel	Palearctic migrant	Insectivore
58	Falconidae	*Falco tinnunculus*	Common Kestrel	Palearctic migrant	Carnivore
59	Fringillidae	*Crithagra leucopygia*	White-rumped Seedeater	Resident	Granivore
60	Hirundinidae	*Hirundo aethiopica*	Ethiopian Swallow	Resident	Insectivore
61	Jacanidae	*Actophilornis africanus*	African Jacana	Resident	Carnivore
62	Jacanidae	*Microparra capensis*	Lesser Jacana	Resident	Carnivore
63	Laniidae	*Corvinella corvina*	Yellow-billed Shrike	Resident	Insectivore
64	Laridae	*Chlidonias leucopterus*	White-winged Tern	Palearctic migrant	Insectivore
65	Laridae	*Gelochelidon nilotica*	Gull-billed Tern	Palearctic migrant	Insectivore
66	Locustellidae	*Acrocephalus schoenobaenus*	Sedge Warbler	Palearctic migrant	Omnivore
67	Malaconotidae	*Laniarius barbarus*	Yellow-crowned Gonolek	Resident	Insectivore
68	Motacillidae	*Motacilla alba*	White Wagtail	Palearctic migrant	Insectivore
69	Motacillidae	*Motacilla flava*	Yellow Wagtail	Palearctic migrant	Omnivore
70	Muscicapidae	*Bradornis pallidus*	Pale Flycatcher	Resident	Insectivore
71	Muscicapidae	*Myrmecocichla aethiops*	Northern Anteater Chat	Resident	Insectivore
72	Musophagidae	*Crinifer piscator*	Western Grey Plantain-eater	Resident	Frugivore
73	Nectariniidae	*Anthodiaeta platura*	Pygmy Sunbird	Resident	Nectarivore
74	Nectariniidae	*Chalcomitra senegalensis*	Scarlet-chested Sunbird	Resident	Nectarivore
75	Nectariniidae	*Cinnyris cupreus*	Copper Sunbird	Resident	Nectarivore
76	Nectariniidae	*Cinnyris pulchellus*	Beautiful Sunbird	Resident	Nectarivore
77	Passeridae	*Passer griseus*	Northern Grey-headed Sparrow	Resident	Granivore
78	Phalacrocoracidae	*Microcarbo africanus*	Long-tailed Cormorant	Resident	Carnivore

S/N	Family	Scientific Name	English Name	Residence Status	Guild
79	Phoeniculidae	*Phoeniculus purpureus*	Green Wood-hoopoe	Resident	Insectivore
80	Ploceidae	*Bubalornis albirostris*	White-billed Buffalo Weaver	Resident	Granivore
81	Ploceidae	*Euplectes franciscanus*	Northern Red Bishop	Resident	Granivore
82	Ploceidae	*Ploceus cucullatus*	Village Weaver	Resident	Granivore
83	Ploceidae	*Ploceus luteolus*	Little Weaver	Resident	Granivore
84	Ploceidae	*Ploceus vitellinus*	Vitelline Masked Weaver	Resident	Granivore
85	Ploceidae	*Quelea*	Red-billed Quelea	Resident	Granivore
86	Psittacidae	*Poicephalus senegalus*	Senegal Parrot	Resident	Frugivore
87	Psittaculidae	*Psittacula krameri*	Rose-ringed Parakeet	Resident	Frugivore
88	Pycnonotidae	*Pycnonotus barbatus*	Common Bulbul	Resident	Omnivore
89	Rallidae	*Crex egregia*	African Crake	Resident	Carnivore
90	Rallidae	*Gallinula angulata*	Lesser Moorhen	Intra-African migrant	Omnivore
91	Rallidae	*Gallinula chloropus*	Common Moorhen	Resident	Omnivore
92	Rallidae	*Porphyrio alleni*	Allen's Gallinule	Resident	Omnivore
93	Rallidae	*Zapornia flavirostra*	Black Crake	Resident	Carnivore
94	Recurvirostridae	*Himantopus*	Black-winged Stilt	Resident	Carnivore
95	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	Palearctic migrant	Carnivore
96	Scolopacidae	*Calidris pugnax*	Ruff	Palearctic migrant	Insectivore
97	Scolopacidae	*Tringa glareola*	Wood Sandpiper	Palearctic migrant	Carnivore
98	Scolopacidae	*Tringa ochropus*	Green Sandpiper	Palearctic migrant	Insectivore
99	Scopidae	*Scopus umbretta*	Hamerkop	Resident	Carnivore
100	Sturnidae	*Lamprotornis caudatus*	Long-tailed Glossy Starling	Resident	Omnivore
101	Sturnidae	*Lamprotornis chalybaeus*	Greater Blue-eared Starling	Resident	Omnivore
102	Sturnidae	*Lamprotornis pulcher*	Chesnut-bellied Starling	Resident	Omnivore
103	Sturnidae	*Lamprotornis purpureus*	Purple Glossy Starling	Resident	Omnivore
104	Sylviidae	*Sylvia Communis*	Common Whitethroat	Palearctic migrant	Insectivore
105	Threskiornithidae	*Bostrychia hagedash*	Hadada Ibis	Resident	Insectivore
106	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	Palearctic migrant	Insectivore
107	Timaliidae	*Turdoides plebejus*	Brown Babbler	Resident	Insectivore
108	Turdidae	*Turdus pelios*	African Thrush	Resident	Omnivore
109	Viduidae	*Vidua chalybeata*	Village Indigobird	Resident	Granivore
110	Viduidae	*Vidua macroura*	Pin-tailed Whydah	Resident	Granivore

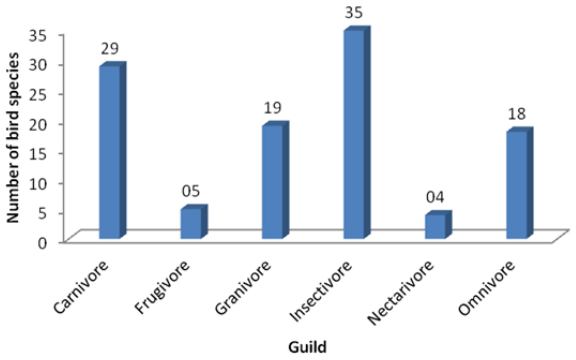

Figure 2: Categories of bird species according to feeding guild

DISCUSSION

The record of 110 avian species in the Wasai reservoir has indicated its importance as a good habitat for many bird species. A study of wild birds in Dagona-Waterfowl Sanctuary Yobe State, Nigeria, a protected area, records 135 species in 40 families (Lameed, 2011). In a study by Adang *et al*. (2015), they reported 60 species from 27 families at the Dadin Kowa Dam of Gombe State, Nigeria. . Similarly, Sabo (2010) recorded 164 species from 50 families at the Hadejia-Nguru Wetlands (HNWs), Nigeria; likewise, Ringim and Muhammad (2017) reported 191 bird species belonging to 54 families from the same wetlands. The differences in the avian species richness among these habitats could largely be due to discrepancies in duration of the studies or sampling methods (Bibby *et al*., 2000). Moreover, differences in the habitats covered by each study could also influence species richness. For instance, HNWs is a complex wetland comprising diverse habitat types, including swamps, marshes, ponds and rivers, compared to Wasai, which is a reservoir. Seasons of the year and food availability have also been reported to influence species richness, and this could be a good explanation accounting for the differences in the species record among the studies.

Majority of the species recorded belong to the insectivore and carnivore feeding guilds. Insectivorous species were also found to be the most dominant species in other wetland habitats as reported by Zakaria *et al.* (2009) in Peninsular (Malaysia), Odewumi *et al.* (2017) in Ondo State (Nigeria), as well as Sunday and Olumide (2018) in Oyo State (Nigeria). Furthermore, the prevalence of insectivore guild is probably due to the availability of aquatic insects and other suspended macroinvertebrates that serve as the diet of many bird species.

Birds are valuable bioindicators of habitat health because the occurrence of diverse avian fauna in a given habitat is an indication that such habitat is also rich in biodiversity (BirdLife International, 2013). Undoubtedly, Wasai reservoir and its environ provide a refuge for birds and other biodiversity taking into cognizance its bird species richness. Thus, protecting this habitat is of paramount importance with the view that conservation of avian species involves protecting them alongside their habitats, which favors other biodiversity as well (Ijeomah *et al*., 2013).

Conclusion

It is evident from the findings of this study that Wasai reservoir is home to many aquatic and terrestrial bird species. It also serves as a staging and wintering ground for a number of Palaerctic migrants. However, this important habitat is under human activities, notably exploitation of fish resources, agriculture, and livestock grazing which would likely further degrade the habitat and influence the amount of food available for the birds, most especially the migrant species.

Recommendations

The Kano state government should devise measures to ensure strict monitoring of the reservoir, and if possible to declare the area as bird sanctuary. They should also consider the present status of the dam which is in a state of gradual dilapidation, and therefore, requires proper maintenance.

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