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# Conservation Status, Threats and Diversity of Wetland Birds of Dyamannana Lake (Kere), Bhadravathi Taluk, Shivamogga District, Karnataka, India

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**Abstract** The study revealed a total of 52 wetland bird species belonging to 15 families and 8 orders. Among them the Family Ardeidae was found to be dominated the list by the representation of 10 species, followed by the Scolopacidae by 7 species; Rallidae by 6 species; Anatidae by 5 species and Motacillidae by 4; whereas the Family Podicipididae, Anhingidae, Rostratulidae and Recurviorostridae contributed very less by the one species each. The study also revealed that the lake is a vulnerable wetland harboring plenty of resident as well as few migratory birds. Occurrence of five species like Black-headed Ibis (*Threskiornis melanocephalus*), Painted Stork (*Mycteria leucocephala*), Darter (*Anhinga melanogaster*), Black-tailed Godwit (*Limosa limosa*) and River Tern (*Sterna aurantia*) were near threatened and protected under the schedule IV of Indian Wildlife Protection Act, 1972, indicating the importance of lake. However, this habitat is facing tremendous conservation challenges by the impact of anthropogenic activities in and around the lake. Hence, the proper and regular surveys related to water bird species diversity and awareness of the local people should be conducted for a detailed assessment of the wetland.

**Keywords** Conservation threats, Diversity of wetland birds, Dyamannana lake, Migratory birds, Threatened species.

## Introduction

The birds which inhabit and dependant on wetland directly or indirectly for feeding, breeding, nesting or roosting are commonly called as water birds or wetland birds [1—3]. Selection of wetland by aquatic birds is greatly influenced by its complex characteristics including water chemistry, aquatic vegetation, invertebrate fauna and physical features [3].

Out of 310 species of wetland birds found in In-

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**Table 1.** Systematic list of wetland birds with their conservation status in Dyamannana lake, Shivamogga District, Karnataka. [1]Common names after Manakadan et al., 1998, [2]Scientific names after Inskipp et al., 1996, S[3]-Status of the birds observed as Resident (R), Winter Migratory (WM), Local Migaratory (LM), and Resident Migratory (RM), CS[4]-Conservation status: GT–Globally threatened; LC–least concerned; NT–Near threatened; WPA, 1972–Wildlife Protection Act 1972; Schedule IV, **Birds with migratory population.

| Sl. No. | Common name[1] | Scientific name[2] | S[3] | CS[5] IUCN 2014.3 | CS[5] WPA, 1972 |
|---|---|---|---|---|---|
| | Order: Podicipediformes | Family: Podicipididae | | | |
| 1 | Little Grebe | *Tachybaptus ruficollis* | LM | LC | IV |
| | Order: Pelecaniformes | Family: Phalacrocoracidae | | | |
| 2 | Little Cormorant | *Phalacrocorax niger* | RM | LC | IV |
| 3 | Great Cormorant | *Phalacrocorax carbo* | RM | LC | IV |
| 4 | Indian Shag | *Phalacrocorax fuscicollis* | RM | LC | IV |
| | | Family: Anhingidae | | | |
| 5 | Darter | *Anhinga melanogaster* | LM | NT | IV |
| | Order: Ciconiiformes | Family: Ardeidae | | | |
| 6 | Little Egret | *Egretta garzetta* | R | LC | IV |
| 7 | Cattle Egret | *Bubulcus ibis* | R | LC | IV |
| 8 | Large Egret | *Casmerodius albus* | R | LC | IV |
| 9 | Median Egret | *Mesophoyx intermedia* | R | LC | IV |
| 10 | Grey Heron | *Ardea cinerea* | WM | LC | IV |
| 11 | Purple Heron | *Ardea purpurea* | LM | LC | IV |
| 12 | Indian Pond Heron | *Ardeola grayii* | R | LC | IV |
| 13 | Little Green Heron | *Butorides striatus* | LM | LC | IV |
| 14 | Black-crowned Night Heron | *Nycticorax nycticorax* | LM | LC | IV |
| 15 | Chestnut Bittern | *Ixobrychus cinnamomeus* | LM | LC | IV |
| | | Family: Ciconiidae | | | |
| 16 | White-necked Stork | *Ciconia episcopus* | LM | LC | IV |
| 17 | Asian Openbill Stork | *Anastomus oscitanus* | LM | LC | IV |
| 18 | Painted Stork | *Mycteria leucocephala* | R | NT | IV |
| | | Family: Threskiornithidae | | | |
| 19 | Black-headed Ibs | *Threskiornis melanocephalus* | R | NT | IV |
| 20 | Black Ibis | *Pseudibis papillosa* | R | LC | IV |
| | Order: Anseriformes | Family: Anatidae | | | |
| 21 | Lesser-whistling Duck | *Dendrocygna javanica* | LM | LC | IV |
| 22 | Spot Billed Duck | *Anas poecilorhyncha* | R | LC | IV |
| 23 | Cotton Teal | *Nettapus coromandelianus* | R | LC | IV |
| 24 | Common Teal | *Anas crecca* | WM | LC | Iv |
| 25 | Garganey** | *Anas querquedula* | WM | LC | IV |
| | Order: Gruiformes | Family: Rallidae | | | |
| 26 | White-breasted Waterhen | *Amaurornis phoenicurus* | R | LC | IV |
| 27 | Slaty-legged Crake | *Rallina eurizonoides* | LM | LC | IV |
| 28 | Staty-breasted Rail | *Gallirallus striatus* | R | LC | IV |
| 29 | Brown Crake | *Amaurornis akool* | R | LC | IV |
| 30 | Common Coot** | *Fulica atra* | WM | LC | IV |
| 31 | Common Moorhen | *Gallinula chloropus* | WM | LC | IV |
| | Order: Charadriiformes | Family: Rostratulidae | | | |
| 32 | Greater Painted Snipe | *Rostratula benghalensis* | R | LC | IV |
| | | Family: Charadriidae | | | |
| 33 | Little Ringed Plover** | *Charadrius dubius* | WM | LC | IV |
| 34 | Yellow-wattled Lapwing | *Vanellus malabaricus* | LM | LC | IV |
| 35 | Red-wattled Lapwing | *Vanellus indicus* | RM | LC | IV |

**Table 1.** Continued.

| Sl. No. | Common name[1] | Scientific name[2] | S[3] | CS[5] IUCN 2014.3 | CS[5] WPA, 1972 |
|---|---|---|---|---|---|
| | | Family: Scolopacidae | | | |
| 36 | Black-tailed Godwit | *Limosa limosa* | WM | NT | IV |
| 37 | Common Redshank** | *Tringa totanus* | WM | LC | IV |
| 38 | Marsh Sandpiper** | *Tringa stagnatilis* | WM | LC | IV |
| 39 | Common Greenshank** | *Tringa nebularia* | WM | LC | IV |
| 40 | Common Sandpiper** | *Tringa hypoleucos* | WM | LC | IV |
| 41 | Little Stint** | *Calidris minuta* | WM | LC | IV |
| 42 | Common Snipe | *Gallingo gallingo* | WM | LC | IV |
| | | Family: Recurvirostridae | | | |
| 43 | Black-winged Stilt | *Himantopus himantopus* | LM | LC | IV |
| | | Family: Laridae | | | |
| 44 | River Tern | *Sterna aurantia* | LM | NT | IV |
| 45 | Common tern | *Sterna hirundo* | R | LC | IV |
| | Order: Coraciiformes | Family: Alcedinidae | | | |
| 46 | Small Blue Kingfisher | *Alcedo atthis* | R | LC | IV |
| 47 | Lesser Pied Kingfisher | *Ceryle rudis* | R | LC | IV |
| 48 | White-breasted Kingfisher | *Halcyon smyrnensis* | R | LC | IV |
| | Order: Passeriformes | Family: Motacillidae | | | |
| 49 | Yellow Wagtail** | *Motacilla flava* | WM | LC | IV |
| 50 | Grey Wagtail | *Motacilla cinerea* | RM | LC | IV |
| 51 | Large Pied Wagtail | *Motacilla maderaspatensis* | R | LC | IV |
| 52 | White Wagtail | *Motacilla alba* | WM | LC | IV |

dia [1, 4, 5] almost half of these are migratory which visit India from cold areas of different part of China, Russia, Central Asia, Tibet and from across the entire range of the Himalaya. In the last century, over 50% of wetlands in the world have been lost and the remaining wetlands have been degraded to different degrees because of the adverse anthropogenic activities [6, 7]. Monitoring to assessment of the abundance and diversity of bird species in any ecosystem provides valuable information on status and health of wetlands and can be a vital tool the developing awareness regarding the conservation value of the wetlands [2, 3, 8].

There are no reports on avifauna from this habitat; hence the hitherto study was conducted to prepare a checklist and to focus on the ecological status, diversity and conservation threats of wetland migratory birds and also to identify the consequences of direct and indirect human interferences in the Dyamannana lake (Kere).

## Materials and Methods

### Study area

The Dyamannana lake (Kere) is a spectacular site located between located between 13°56´27´´N latitude and 75°48´3´´E longitude. The lake is about 141.08 acres, built before the independent of India, situated in Arakere Gram Panchayat, Bhadravathi Taluk, Shimoga District of Karnataka. This wetland provides water for drinking to wildlife from the surrounding Joladal Range Forest as well as to cattles from the nearby villages, irrigation to surrounding agricultural lands and for aquaculture practices. The lake is situated just adjacent to the Bhadravathi-Channagiri state road, which cover the half of the study area and rest of the area is surrounded by the Joladal Range Forest.

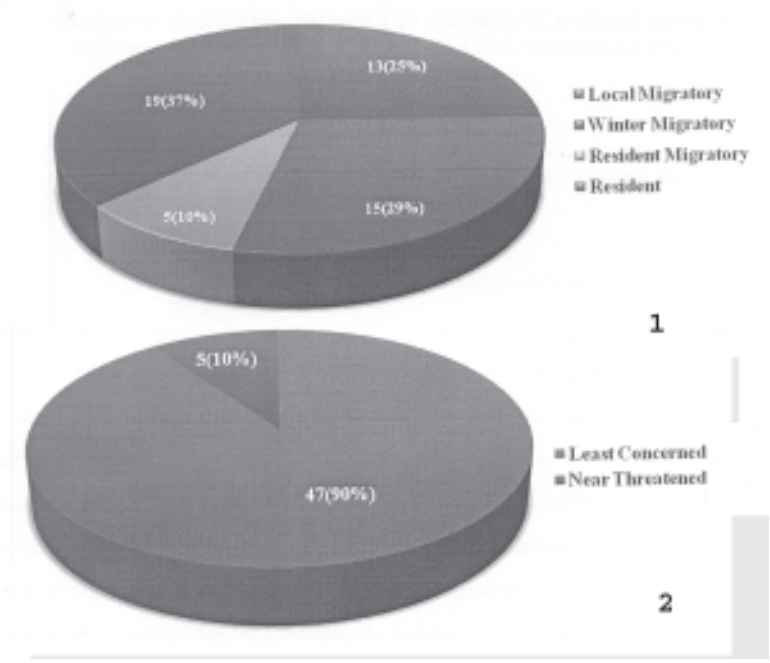


**Fig. 1.** Residential status of wetland birds of Dyamannana lake, Shivamogga District. **Fig. 2.** Conservation status of wetland birds of Dyamannana lake, Shivamogga District.

Methodology

The checklist is prepared based primarily on the field work conducted during November 2015 to October 2016 across Dyamannana lake by foot i.e., along road side count. In the heronry, total counts were carried out by direct and point counting methods for the birds [2, 3, 8, 9]. A total of 12 visits (1 visit per month) were spent in the field observing status and diversity of birds. Birds were observed from 6 A.M to 11 A.M and identified using Olympus binoculars (10 × 5) and field guides [10], also given standardized common and scientific name [11]. The status of birds was determined and categorized into three groups such as; LM-Local migratory, WM-Winter migratory and R-Resident on the basis of their movement and seasonality of occurrence (Table 1). The following formula was used for determining percentage of occurrence of Families [12]. Percentage Occurrence=No. of species of each Family/Total no. of different species seen × 100.

**Results and Discussion**

The present study revealed a total of 52 wetland bird species belonging to 15 families and 8 orders recorded from the study area. Details such as common, scientific names, frequency and conservation status of the wetland birds are presented in Table 1. During the study it was found that the order-Charadriiformes dominated the list (by 5 families with 14 species) followed by Ciconiiformes (by 3 families with 15 species), Gruiformes (by 1 family with 6 species), Anseriformes (by 1 family with 5 species), Pelecaniformes (by 2 families with 4 species), Passeriformes (by 1 family with 4 species) and Coraciiformes (by 1 family with 3 species) and least byodicipediformes, (1 family with 1 species) (Table 1 and Table 2).

Based on the family wise species distribution and percentage occurrence, the Family Ardeidae was found to be dominated the list by the representation

**Table 2.** Family wise species distribution and relative density of wetland birds in Dyamannana lake, Shivamogga District, Karnataka.

| Sl. No. | Family | No. of species | Percent occurrence |
|---|---|---|---|
| 1 | Podicipididae | 1 | 2% |
| 2 | Phalacrocoracidae | 3 | 6% |
| 3 | Anhingidae | 1 | 2% |
| 4 | Ardeidae | 10 | 19% |
| 5 | Ciconiidae | 3 | 6% |
| 6 | Threskiornithidae | 2 | 4% |
| 7 | Anatidae | 5 | 10% |
| 8 | Rallidae | 6 | 12% |
| 9 | Rostratulidae | 1 | 2% |
| 10 | Charadriidae | 3 | 6% |
| 11 | Scolopacidae | 7 | 13% |
| 12 | Recurvirostridae | 1 | 2% |
| 13 | Laridae | 2 | 4% |
| 14 | Alcedinidae | 3 | 6% |
| 15 | Motacillidae | 4 | 8% |
| | | 52 | 100% |

of 10 species with 19%, followed by the Scolopacidae by 7 species with 13%; Rallidae by 6 species with 12%; Anatidae by 5 species with 10% and Motacillidae by 4 with 8%; whereas the family Phalacrocoracidae, Ciconiidae and Alcedinidae contributed more or less equally by 3 species with 6% each, this was followed by the family Threskiornithidae and Laridae by 2 species with 4% each respectively. However, the Family Podicipididae, Anhingidae, Rostratulidae and Recurvirostridae contributed very less by the one species with 2% each of total percentage occurrence of water birds recorded from the study area (Table 2).

Based on the residential status, resident birds (R) were found as the most of predominant by the representation of 19 species with 37%, followed by the Winter migratory (WM) by 15 species with 29%,Local migratory (LM) by 13 species with 25%, whereas, Resident migratory (RM) represented very less by 3 species with 6% contribution of the total wetland birds recorded from the study area (Fig. 1). The study also revealed that, of the total wetland birds recorded, 90% (n=47 species) were Last concerned (LC) and 10% (n=5) were Near threatened (NT) species (Fig. 2), which includes, Black-headed Ibis (*Threskiornis melanocephalus*), Painted Stork (*Mycteria leucocephala*), Darter (*Anhinga melanogaster*), Black-tailed Godwit (*Limosa limosa*) and River Tern (*Sterna aurantia*) have a protected status under the schedule IV of Indian Wildlife Protection Act, 1972 [13]. The spoting of these threatened bird species highlights the importance of Dyamannana lake as an important feeding, staging and wintering ground for wetland birds.

In the present study, most of the migratory species recorded were winter visitors; they exhibit a distinct species specific patern for arrival at and departure from the wetland. Every year the peak population of winter migratory birds was seen during winter months i.e. January and February and almost all of them leave the wetland by end of March or early April. The basic requirements of the migratory water birds at their wintering sites are adequate food supply and safety [15]. But during these months the lake is almost dried due to extensive utilization of water for domestic purposes and also lake bed is intensively excavated for clay and soil for making country bricks leads to habitat fragmentation, these activities severely affected assemblage leads local distribution and movement to neighbouring water bodies [8].

However, during the study it has been found that, the Dyamannana lake is under threat due to intensive anthropogenic activities, like, aquaculture practices, movement of heavy vehicles around the wetland (Bharavathi-Channagiri state road), habitat alterations such as widening of roads, encroachment of lake bed for agricultural activities, siltation and untilization of marshy vegetation for grazing of live stock, decrease in rainfall and water pollution due to agriculture run off and eutrophication [2, 3, 14, 16, 17] are some of the major threats to the biodiversity of this landscape, which not only affecting the distribution of wetland birds but also cause local extinctions.

Hence, being generally at or near the top of most wetland food chains they are highly susceptible to habitat disturbances and are therefore good indicators of the general condition of wetland habitats [2, 18]. Hence, the regular surveys related to water bird species diversity and awareness of the local people should be conducted for a detailed assessment of the wetland [1]. Conservation of such wetlands is essential to sustain migratory bird populations, as it is prob-

ably an abode during their migratory route, serving a vital role in the conservation of these species.

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