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Research article

Seasonal variation of avian diversity in Jamunkhadi Wetland Area, Jhapa, Nepal

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Abstract

Wetlands are among the most productive ecosystems on the earth, supporting a variety of species and providing numerous ecological services to balance the ecosystem. This study analysed how seasonality affects bird species richness and diversity at the Jamunkhadi Wetland in Kankai Municipality, Jhapa District, eastern Nepal. Using point count and MacKinnon list methods, monthly surveys were conducted in winter from December 2023 to February 2024 and summer from March to May 2024. The study recorded 1060 birds, from 67 species, 32 families, and 15 orders. The most common order was Passeriformes, consisting of 31 species. The Shannon-Wiener diversity index was higher during winter (H = 3.20) than in summer (H = 3.19), while species evenness was higher in summer than in winter (J = 0.83 in summer, J = 0.80 in winter), but neither difference was statistically significant. Out of recorded species, 52 were resident and 15 were migratory: eight visited during winter, four visited during summer while three were partial migrants. Wetland-dependent species comprised an important component of the assemblage, with 13 species closely associated with wetland habitats. The great bittern (*Botaurus stellaris*) was a nationally endangered species along with four nationally near-threatened species- collared falconet (*Microhierax caerulescens*), the great cormorant (*Phalacrocorax carbo*), the blossom-headed parakeet (*Psittacula roseata*), and the Alexandrine parakeet (*Psittacula eupatria*). The wetland is an ecologically important station where migrants stop over on the Central Asian Flyway. Therefore, effective management and conservation are essential to minimize human impacts and protect habitats for both resident and migratory species.

Keywords: Bird diversity; Jamunkhadi; Migratory birds; Seasonality; Wetland

1 | Introduction

Wetlands refer to the world of wet habitats, which include bogs, swamps, and seasonally flooded areas (Tiner 2016). At the local level, wetlands provide food, fibre, pollutant filtration, sediment storage, flood control, wildlife habitat, recreation, aesthetics, and other functions (Millennium Ecosystem Assessment 2005). On a larger scale, wetlands help in regulating local climate and provide important habitat for migratory species (Marshall et al. 2004; Myers 1983; Webb et al. 2010). Of all ecosystem services, wetland ecosystem services are the most valuable per hectare, and their total value makes up 47% of the value of ecosystems worldwide (Costanza et al. 1997). Therefore, wetlands are one of the most important productive ecosystems in the world, which also serve as a key habitat for migratory and resident birds but is ecologically delicate, susceptible to deterioration and degeneration due to constant anthropogenic pressure (Gupta & Singh 2003). Birds are an important part of the ecosystem as they are crucial to the environment as pollinators, seed dispersers, predators, and are also sensitive indicators of ecosystem health. Nepal has 892 species of birds documented so far (DNPWC & BCN 2022), largely due to its incredibly diverse climatic and topographical variations, which have provided a variety of forest and ecosystem types. Over 5% of Nepal's landscape is made up of wetlands, offering a variety of ecosystem services to communities that depend on them (Pokharel 2024). Small and fragmented wetlands can function as important foraging and roosting sites for waterbirds and migrants (Gibbs 2000). Despite this, there are still a lot of fragmented wetlands in Nepal, particularly outside of protected areas in the lowland Terai that are overlooked.

Seasonal variation plays an important role in the abundance and distribution of birds in an area. During wet and dry seasons, the availability of food, the conditions of habitat, vegetation complexity, and breeding behaviour cause differences in the relative abundance of avian species across different seasons (Belay & Yihune 2017). The migration of bird species is also one of the main reasons for variations in avian community structure, differences in bird richness, and social and foraging behavior across different seasons (Amador et al. 2006). The arrival and departure of seasonal migrants is also one of the chief causes for the variation in the number of bird documentations (Werema & Howell 2016). Since one-third of all bird species recorded in Nepal are migratory, including both summer and winter migrants (Inskipp et al. 2016), understanding these seasonal dynamics is important for conservation of avian species, yet most avian studies in Nepal have focused on major wetland areas such as Ramsar sites, with little attention given to small and unprotected wetlands. Because many wetland-dependent

and migratory birds move along the Central Asian Flyway (Mundkur et al. 2023), lowland wetlands such as Jamunkhadi may serve as seasonal refuge during the winter. Several previous studies from Nepal have documented high winter concentrations of waterbirds in similar small wetlands (Bhusal et al. 2020; Pokharel 2015; Subedi 2019; Regmi et al. 2023). Despite this, the Jamunkhadi wetland in Kankai Municipality, Jhapa District, remains an overlooked wetland, even though it plays an importance ecological and recreational role.

Therefore, this study aims to assess the seasonal variation in bird species richness, diversity, and abundance in the Jamunkhadi wetland area. The following hypotheses were considered before the study: (i) the diversity of birds would be higher in winter than in summer, and (ii) species evenness would be higher in summer compared to winter. Through systematic survey conducted in summer and winter, this research provides the first comprehensive assessment of avian diversity of birds in the Jamunkhadi wetland area.

2 | Materials and methods

2.1 | Study area

Jamunkhadi wetland (26°39' N and 87°54' E), located in Kankai Municipality, Jhapa District, Koshi Province, eastern Nepal (Fig. 1), has a total wetland area of 0.22 km² and lies between elevations of 135 m to 145 m. It has subtropical climatic conditions with annual rainfall of 245 mm and temperatures between 1 to 39.5°C (Department of Hydrology and Meteorology 2021). The wetland is surrounded by mixed forest to the north and agricultural land to the south and supports diverse fauna, including spotted deer (*Axis axis*), barking deer (*Muntiacus vaginalis*), and rhesus macaques (*Macaca mulatta*).

2.2 | Data Collection Methods

2.2.1 Point count method

The point count method (Sutherland 2006) was used to estimate abundance and relative abundance. During the summer (March to May) and winter (December to February), five GPS-defined points with inter-point distance greater than 200 m were surveyed, each located using a handheld GPS device (Garmin eTrex 10, Garmin Ltd., Olathe, Kansas, USA). Surveys were conducted in the early morning (7:00 AM to 11:00 AM). Each point was scanned with Nikon Monarch 8x42 binoculars (Nikon Corporation, Tokyo, Japan) for 30 minutes and photographed using a Canon EOS 700D with 55-250 mm lens (Canon Inc., Tokyo, Japan). At each station, we used a fixed detection radius of 100 m, only birds detected within the radius were counted in a clockwise sweep starting from North. Only incoming birds entering the detection radius were counted, and individuals moving out of the radius were not counted. For birds moving through the area, individuals were assigned to the station where they were first detected. When the same individual could not be reliably assigned to a single station, we recorded it as a non-duplicate observation only if the location allowed unique assignment. The "Birds of Nepal" field guidebook was used to identify the species (Grimmett et al. 2016).

2.2.2 MacKinnon's listing method

Bird species were recorded using the Mackinnon list method (MacKinnon and Phillipps 1993). It was concurrently used as species discovery method. With each encounter, whether seen or heard, the species encountered was recorded in a list (number 1) until the species list reached 20 different species. A new list (number 2) was then created, and 20 more species were recorded. Each list contains 20 different species, but there was also an opportunity to include species from previous lists. Species encountered opportunistically while moving between two-point count stations were also included

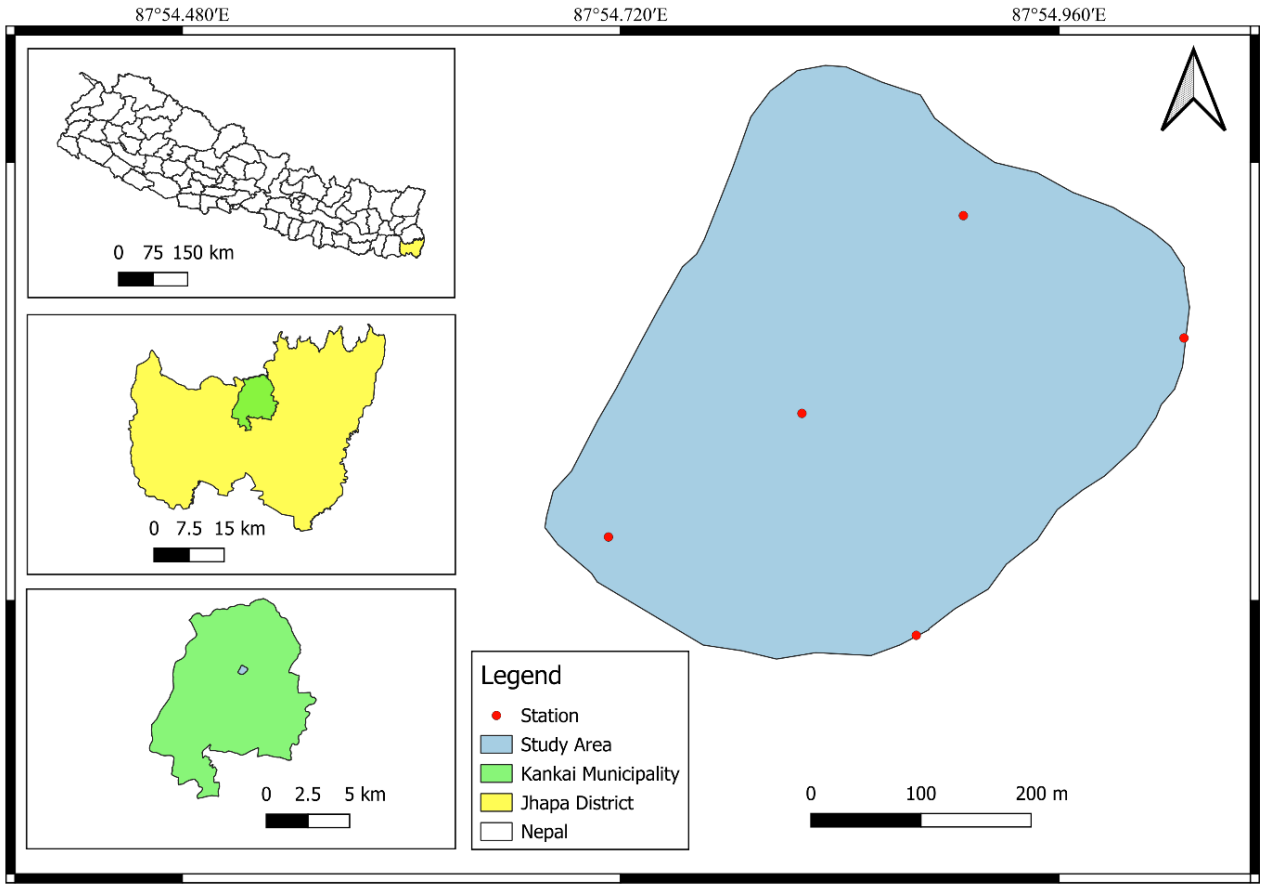

Figure 1. Map of the study area showing bird count stations in Jamunkhadi Wetland Area, eastern Nepal

in the MacKinnon list. The cumulative number of species was determined by counting the newly added species in each successive list. This process was repeated for all surveys conducted during the summer and winter seasons.

2.3 Data analysis

The collected data were then organised into MS Excel for further analysis. The nomenclature of the bird species documented was determined using an official checklist provided by DNPWC and BCN (2022). The residential and migratory status was determined using the "Birds of Nepal" field guide (Grimmett et al. 2016). The conservation status of birds globally was assessed using the IUCN Red List (IUCN 2024) and nationally using the official checklist provided by (DNPWC and BCN 2022). Bar diagrams were used for visual representation. Species Discovery curve for the species was created using Mackinnon's List by plotting the cumulative sum of species found against the number of lists.

The Shannon-Wiener diversity index (H) was used to analyse the avian diversity for each season. This index was also computed using Microsoft Excel. To compare bird diversity in various areas, Mann Whitney U test was used.

i) Shannon- Wiener diversity Index (Shannon and Weaver 1949)

$$H = -\sum_{i=1}^{s}(p_i \, lnp_i)$$

where,

$p_i = n_i / N$

n_i = number of individuals of species i

N = total number of individuals of all species

S= Total Number of Species

ii) Pielou's Evenness Index (Pielou 1966)

$$E = \frac{H}{\ln(s)}$$

where,

H= Shannon Wiener index

S = Total number of species.

ln(s) = Natural logarithm of the total number of species.

Percent relative abundance was calculated using the formula

$$R.A. = (n / N) \times 100\%$$

where,

n = the number of individuals of a particular species recorded

N = the total number of individuals of the species

3 | Results

3.1 | Species composition of birds in Jamunkhadi Wetland Area

Throughout the study period, 1060 individuals from 67 different species, representing 15 orders and 32 families, were recorded as shown in Figures 2 and 3. The most prominent order, Passeriformes, contained 31 species, followed by the order Piciformes, which contained 7 species. The order Columbiformes, Cuculiformes, Pelecaniformes, and Psittaciformes had 4 different species of birds each whereas the order Ciconiiformes, Falconiformes, Galliformes, Gruiformes, Strigiformes, and Anseriformes, were represented by a single species. As illustrated in Figure 3, the Sturnidae family had the greatest number of species at the family level, with five species each followed by Ardeidae, Columbidae, Cuculidae, Muscicapidae, Picidae and Psittacidae with four species. Out of the 67 species, a total of 13 wetland-dependent bird species were recorded. These species form the core ecological assemblage of the wetland, reflecting its capacity to support marsh and wetland foraging species.

Table 1. Diversity index of study area during different seasons

Season	No. of species	No. of individuals	Shannon diversity index	Pielou's evenness
Winter	54	634	3.20006	0.80224
Summer	48	426	3.19427	0.825137

Table 2. Statistical test for the seasonal difference in birds

Season	Months	Median	U	p
Winter	Dec-Feb	2.95	6	0.7039
Summer	Mar-May	2.89		

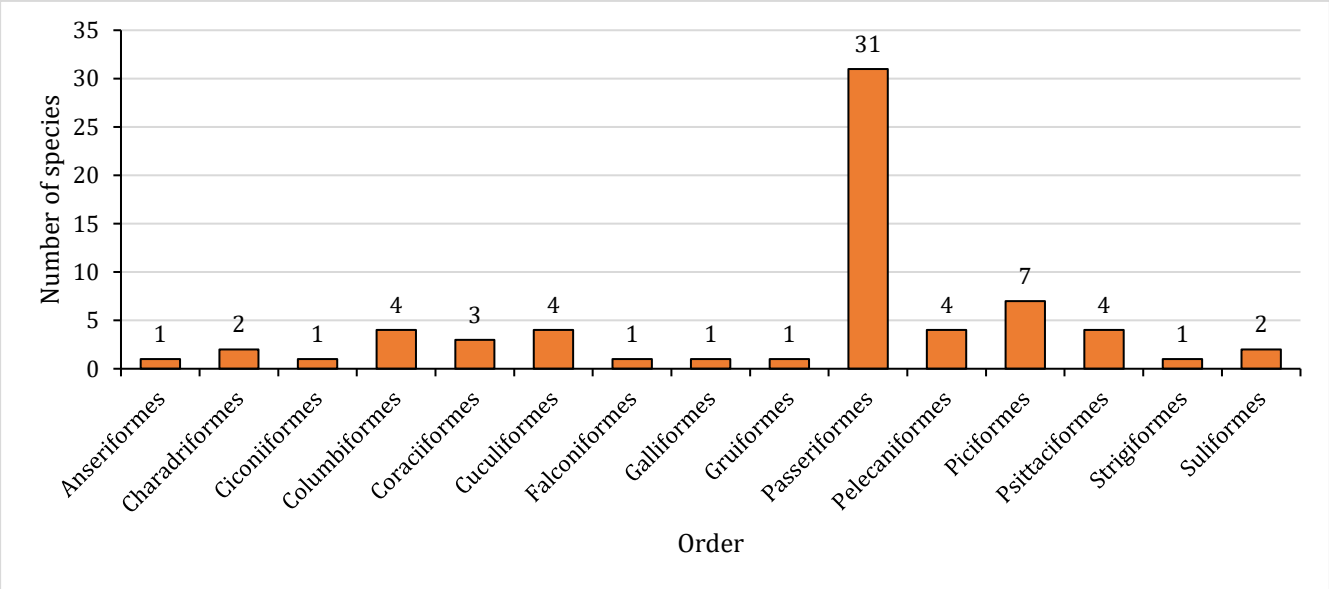

Figure 2. Number of bird species belonging to different orders

Table 3. Top five ranking of abundant species among summer and winter season across the study area based on percentage relative abundance.

S.N.	Species name	Across the study area		Winter		Summer	
		R.A (%)	Rank	R.A (%)	Rank	R.A (%)	Rank
1	Common myna	13.01	1	16.4	1	7.98	4
2	Little cormorant	8.11	2	7.09	3	9.62	2
3	Jungle babbler	7.64	3	7.09	3	8.45	3
4	Lesser whistling duck	6.88	4	3.78	-	11.5	1
5	Great cormorant	6.32	5	9.77	2	1.17	-
6	Asian pied starling	5.094	-	6.62	4	2.81	-
7	House crow	3.96	-	5.67	5	1.4	-
8	Plum headed parakeet	5.094	-	2.52	-	8.92	-
9	Red vented bulbul	4.15	-	2.36	-	6.8	5

3.2 | Seasonal variation of birds in Jamunkhadi Wetland Area

Out of the 67 birds that were identified during the study period, a total of nine MacKinnon's List in winter and eight MacKinnon's List in summer season were produced. A total of 54 species from the 12 orders and 27 families were recorded during the winter season, while 48 species from the 15 orders and 28 families that were recorded during the summer season. Out of the 67 recorded species, 35 species were recorded during both summer and winter seasons. 13 species were only documented in the summer, whereas 19 species were only recorded in the winter season.

The winter season had the greater bird diversity (H = 3.20006) when compared to the summer season (H = 3.19427) as shown in Table 1. There was seasonal variation in species evenness, indicating that birds were more widely distributed during the summer (J = 0.825137) than during the winter season (J = 0.80224). However, there was no statistically significant variation in seasonal diversity of birds during the summer season and winter season ($p > 0.05$) as shown in Table 2.

The cumulative species curve (Fig. 4) illustrates the progressive increase in the number of species recorded across sampling lists during winter and summer. The curve for winter rises more steeply and remains higher than that of summer throughout, indicating greater species richness in the winter season. Both curves gradually level off toward the end, suggesting that the sampling effort was sufficient, as few or no new species were added with additional lists, as shown in Figure 4.

3.3 | Relative abundance, migratory and threatened status of birds of Jamunkhadi Wetland

The most common bird species in the study area, according to the percent relative abundance composition was found to be common myna (*Acridotheres tristis*) with 13.01 percent across the study area. It was also found to be most prevalent during the winter season, with 16.4 percent of relative abundance, while it ranked fourth on relative abundance with 7.98 percent in the summer season. The second most prevalent species across the study area was found to be little cormorant (*Phalacrocorax niger*) with 8.11 percent relative abundance, while being ranked third (7.09 percent) and second (9.62 percent) on percent relative abundance in winter and summer season respectively. The great cormorant (*Phalacrocorax carbo*) was the second most prevalent species found during the winter season

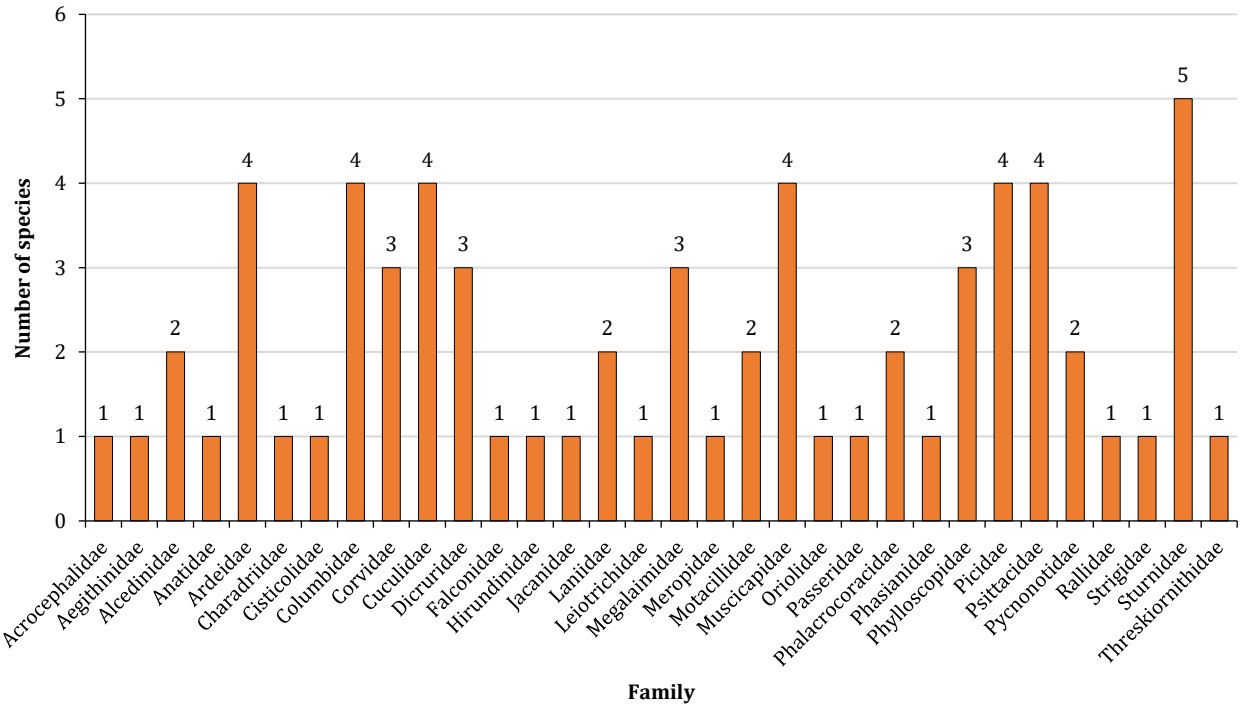

Figure 3. Number of bird species belonging to different families recorded in the study area.

Table 4. Relative abundance of waterbird species compared to the entire bird community and to the waterbird assemblage only.

S.N.	Name	RA (%) in winter		RA (%) in summer	
		All birds	Waterbirds	All birds	Waterbirds
1	Bronze-winged jacana	1.1	3.76	0.84	1.51
2	Common kingfisher	0.63	2.15	0.75	3.03
3	Great cormorant	9.77	33.33	6.32	3.78
4	Indian pond heron	2.52	8.6	2.64	9.09
5	Lesser whistling duck	3.78	12.9	6.88	37.12
6	Little cormorant	7.09	24.19	8.11	31.06
7	Little egret	0.94	3.22	0.56	0
8	Red-wattled lapwing	0.788	2.688	0.75	2.27
9	White-breasted waterhen	1.41	4.83	1.32	3.78
10	White-throated kingfisher	1.2	4.3	1.41	5.3
11	Intermediate egret	0	0	0.09	0.75
12	Red-naped ibis	0	0	0.188	1.51
13	Great bittern	0	0	0.09	0.75

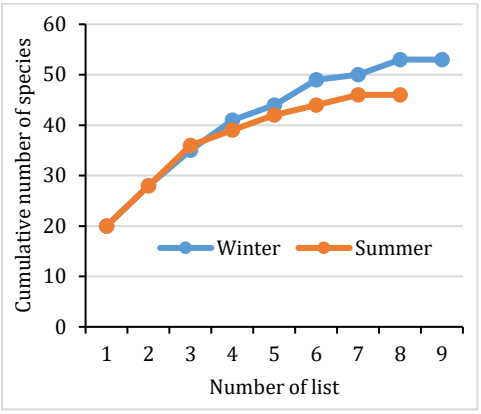

Figure 4. Species discovery curve showing total number of species seen during winter and summer season.

(9.77 percent), while being ranked fifth across the study area with 6.32 percent but it only occupied 1.17 percent of relative abundance during the summer season as shown in Table 3.

Out of 67 species of birds that were documented throughout the study period, 52 were found to be residential birds, 8 to be winter visitors, 4 to be summer visitors and 3 to be partial migrants (Fig. 5). A total of 13 wetland-dependent bird species were recorded in the study area. Their relative abundance varied seasonally. During winter season, the great cormorant (33.33% of total water birds), little cormorant (24.19% of total water birds) and lesser whistling duck (12.9 % of total water birds) were the most abundant species, making large part of the waterbird community while during summer lesser whistling duck (37.12% of total water birds) and little cormorant (31.06% of total water birds) were the most dominant species among water birds (Table 4). Species such as intermediate egret (0.75% of total water birds), Red-naped Ibis (1.51% of total water birds) and great bittern (0.75% of total water birds) were only recorded during the summer season with very low relative abundance.

Out of the 67 species recorded, 62 species of birds were listed as Least Concern nationally, while 65 species were listed as Least Concern globally. The great bittern (*Botaurus stellaris*), which was categorised as a Least Concern species globally, was the only Endangered species at the national level. Similarly, 4 species: the collared falconet (*Microhierax caerulescens*), the great cormorant (*Phalacrocorax carbo*), the blossom headed parakeet (*Psittacula roseata*), and the Alexandrine parakeet (*Psittacula eupatria*) were listed as Near Threatened on the National Level. There were only two near-threatened species on a global scale: The Alexandrine parakeet (*Psittacula eupatria*) and the blossom headed parakeet (*Psittacula roseata*).

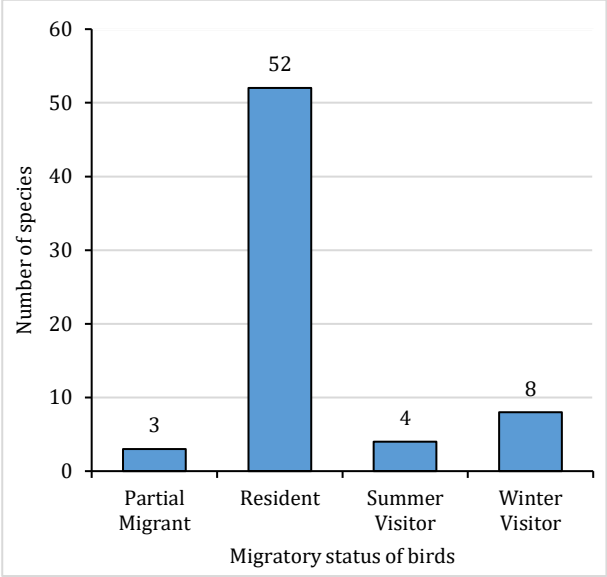

Figure 5. Migratory status of birds recorded during the study period.

4 | Discussion

The present study provides the first systematic assessment of seasonal variation in avian diversity of Jamunkhadi Wetland. The results show the ecological importance of the study area as it is home to both resident and migratory bird species. A total of 67 bird species belonging to 15 orders and 32 families were recorded, thus highlighting that community-managed wetland can also support substantial bird diversity.

The higher Shannon Wiener diversity index in winter (H=3.20) compared to summer (H=3.19) recorded in the study aligns with studies conducted by Basaula et al. (2021), Katuwal et al. (2018) and Tzortzakaki et al. (2018). Notably, many of the species contributing to the winter diversity were found to be wetland-dependent, which demonstrates that the condition of habitats in the wetland is particularly important during this season. The higher winter diversity at Jamunkhadi wetland can be attributed to favourable habitat, increased food availability and influx of migratory birds during the winter season. Conversely, the slightly higher species evenness in summer suggests a more uniform distribution of a smaller number of resident species, consistent with findings from Rani Lake (Pant et al. 2024). Similar studies conducted at the Betana wetland area, Belbari, Morang recorded greater Shannon Wiener diversity index and evenness index at the winter season (H=1.45, J=0.87) compared to the summer season (H=1.27, J=0.82) (Pokharel 2015). Another study conducted at Bees Hazari and associated lakes, Chitwan found the Shannon diversity index highest in winter season (H=1.8) and lowest in summer season (H=1.233) in Beesh Hazari Tal, while other associated lakes had Shannon diversity highest in summer season (H=1.92) and lowest in winter season (H=1.40) compared to autumn and spring season (Subedi 2019). The lack of a statistically significant difference between seasons indicates that Jamunkhadi provides year-round suitable habitat, though species composition fluctuates with the migration cycle.

Jamunkhadi wetland being a major recreational place in Kankai Municipality attracts more tourists during the winter seasons as picnicking is more common during this period. Similar observation was made by Regmi et al. (2023) where recreational activities were major threats to bird diversity at the wetland. The residue and waste from such recreational activities create major opportunities for species such as common myna, Asian pied starling and house crow to thrive, as these species are found to be dominant in such places (Sethi & Kumar 2018). These species ranked first, fourth and fifth on

percent relative abundance during the winter season occupying 16.4 percent, 6.62 percent and 5.67 percent respectively but only had percent relative abundance of 7.89 percent, 2.81 percent and 1.4 percent, respectively in the summer season. Similarly, the study area seems to have been undergoing construction in the months of April and May thus causing the disturbance in these months to be significantly higher, which may have contributed to the lower bird abundance in summer seasons.

The predominance of the order Passeriformes mirrors global and regional patterns, as this order typically dominates avian assemblages due to their ecological adaptability, which is further supported by multiple studies (Bhattarai et al. 2022; Chaudhari et al. 2009; Regmi et al. 2023). The presence of both water birds and forest edge dwellers demonstrates the habitat heterogeneity of Jamunkhadi wetland area.

Fifteen migratory species were recorded, including eight winter visitors, four summer visitors and three partial migrants in the study area. Similar studies by Regmi et al. (2023) also recorded 16 winter migrants and one summer migrant out of 84 documented species at Gajedi Wetland, while Bhusal et al. (2020) documented 31 migratory species of birds at Jagadishpur Reservoir Ramsar Site, Kapilvastu. Another study at Phewa Wetland documented seventy species of winter migrants (Khatri et al. 2019). Similarly, Chhetry (2006) documented 41 winter visitors, four summer visitors and 14 occasional visitors around the Koshi Barrage Area, thus highlighting the role of the wetland as a seasonal station and feeding ground for migratory birds. The presence of wintering waterbirds during the winter season shows that Jamunkhadi wetland functions as an important wintering site within the Central Asian Flyway thus increasing its conservation relevance despite its small size.

This study recorded one Endangered species, the great bittern (*Botaurus stellaris*) and four Near Threatened species: the Alexandrine parakeet (*Psittacula eupatria*), the great cormorant (*Phalacrocorax carbo*), the blossom-headed parakeet (*Psittacula roseata*), and the collared falconet (*Microhierax caerulescens*) throughout the study period. These species are documented to be greatly dependent on the different habitats such as forestland, marsh, and farmlands that are found around the wetland area. The significance of the wetland is further increased by the adjacent rice-growing fields which provides accessible food sources, especially for parakeets and crow species. Comparable studies in other wetlands by (Bhattarai et al. 2022; Pant et al. 2024) have also reported the occurrence of threatened species, thus signifying the importance of wetlands for avian species.

Despite its small size, the Jamunkhadi wetland supports a diverse range of avian fauna, suggesting that even fragmented wetlands have high ecological value when surrounded by forest and agricultural landscapes. However, the wetlands habitat quality may be threatened by growing anthropogenic pressure including construction, tourism, and agricultural runoff. These disturbances may impact food availability and nesting opportunity for avian fauna, particularly for sensitive waterbirds, if they are not well planned for and managed.

We recommend a more in-depth study, which includes all four seasons to gain a more comprehensive understanding of seasonal variations. Similarly, further study considering the impact of human disturbances and climatic conditions on bird diversity and behaviour in the wetland is also recommended. To sustain ecological integrity, a core conservation zone with minimal anthropogenic activities should be established.

5 | Conclusions

The study demonstrated that Jamunkhadi wetland supports notable assemblage of wetland-dependent species. Out of the total 67 recorded species, 13 were strongly associated with wetland habitats and 15 species were migratory. The study recorded a greater diversity of birds in winter (H=3.20) than in summer (H=3.19), while species evenness was higher in the summer season (J=0.82) than in the winter season (J=0.80). The presence of nationally threatened taxa: the great bittern (Endangered) and four Near-Threatened species highlight the conservation importance of this small wetland area. Given its role for wetland-dependent and migratory birds, we recommend management that prioritises protection of wetland habitat, reduction of anthropogenic activities, especially during migratory periods and long-term monitoring of waterbird populations.

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Authors' contributions

Magar K.T. and Kunwar N. designed the research, collected the data and wrote the manuscript; Limbu S. and Rai T. contributed to research design, species identification and data collection; Rai S.C. and Tuladhar R. helped in data collection; Thapa V. supervised the research. All the researchers contributed to the draft and gave final approval for publication.

Conflicts of interest

The authors declare no conflict of interest.

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Appendix 1. Checklist of birds recorded at the study area with migratory status and CITES

S.N.	Common name	Scientific name	Migratory status	CITES
A.	**Order: Anseriformes**			
i.	**Family: Anatidae**			
1	Lesser whistling duck	*Dendrocygna javanica*	R	
B.	**Order: Charadriformes**			
ii.	**Family: Charadriidae**			
2	Red-wattled lapwing	*Vanellus indicus*	R	
iii.	**Family: Jacanidae**			
3	Bronze-winged jacana	*Metopidius indicus*	R	
C.	**Order: Ciconiiformes**			
iv.	**Family: Threskiornithidae**			

4	Red-naped Ibis	*Pseudibis papillosa*	R	
D.	**Order: Columbiformes**			
v.	**Family: Columbidae**			
5	Eurasian collared dove	*Streptopelia decaocto*	R	
6	Hill pigeon	*Columba rupestris*	R	
7	Rock dove	*Columba livia*	R	
8	Spotted dove	*Stigmatopelia chinensis*	R	
E.	**Order: Coraciiformes**			
vi.	**Family: Alcedinidae**			
9	Common kingfisher	*Alcedo atthis*	R	
10	White-throated kingfisher	*Halcyon smyrnensis*	R	
vii.	**Family: Meropidae**			
11	Chestnut-headed bee-eater	*Merops leschenaulti*	SV	
F.	**Order: Coraciiformes**			
viii.	**Family: Cuculidae**			
12	Asian koel	*Eudynamys scolopaceus*	SV	
13	Common hawk cuckoo	*Hierococcyx varius*	R	
14	Eurasian cuckoo	*Cuculus canorus*	SV	
15	Indian cuckoo	*Cuculus micropterus*	SV	
G.	**Order: Falconiformes**			
ix.	**Family: Falconidae**			
16	Collared falconet	*Microhierax caerulescens*	R	II
H.	**Order: Galliformes**			
x.	**Family: Phasianidae**			
17	Red junglefowl	*Gallus gallus*	R	
I.	**Order: Gruiformes**			
xi.	**Family: Rallidae**			
18	White-breasted waterhen	*Amaurornis phoenicurus*	R	
J.	**Order: Passeriformes**			
xii.	**Family: Acrocephalidae**			
19	Booted warbler	*Hippolais caligata*	WV	
xiii.	**Family: Aegithinidae**			
20	Common iora	*Aegithina tiphia*	R	
xiv.	**Family: Cisticolidae**			
21	Common tailorbird	*Orthotomus sutorius*	R	
xv.	**Family: Corvidae**			
22	House crow	*Corvus splendens*	R	
23	Large-billed crow	*Corvus macrorhynchos*	R	
24	Rufous treepie	*Dendrocitta vagabunda*	R	
xvi.	**Family: Dicruridae**			
25	Ashy drongo	*Dicrurus leucophaeus*	WV	
26	Black drongo	*Dicrurus macrocercus*	R	
27	Spangled drongo	*Dicrurus hottentottus*	R	
xvii.	**Family: Hirundinidae**			
28	Barn swallow	*Hirundo rustica*	R	
xviii.	**Family: Laniidae**			
29	Grey-backed shrike	*Lanius tephronotus*	WV	
30	Long-tailed shrike	*Lanius schach*	R	
xix.	**Family: Leiotrichidae**			
31	Jungle babbler	*Turdoides striata*	R	
xx.	**Family: Motacillidae**			
32	Olive-backed pipit	*Anthus hodgsoni*	WV	
33	Paddyfield pipit	*Anthus rufulus*	R	
xxi.	**Family: Muscicapidae**			
34	Asian brown flycatcher	*Muscicapa dauurica*	PM	
35	Oriental magpie-robin	*Copsychus saularis*	R	
36	Red-breasted flycatcher	*Ficedula parva*	R	
37	Taiga flycatcher	*Ficedula albicilla*	WV	
xxii.	**Family: Oriolidae**			
38	Black-hooded oriole	*Oriolus xanthornus*	R	
xxiii.	**Family: Passeridae**			
39	House sparrow	*Passer domesticus*	R	
xxiv.	**Family: Phylloscopidae**			
40	Dusky warbler	*Phylloscopus fuscatus*	WV	
41	Green-crowned warbler	*Seicercus burkii*	PM	
42	Grey-hooded warbler	*Phylloscopus xanthoschistos*	R	
xxv.	**Family: Pycnonotidae**			
43	Red-vented bulbul	*Pycnonotus cafer*	R	
44	Red-whiskered bulbul	*Pycnonotus jocosus*	R	
xxvi.	**Family: Sturnidae**			
45	Asian pied starling	*Sturnus contra*	R	
46	Chestnut-tailed starling	*Sturnus malabarica*	R	

47	Common hill myna	*Gracula religiosa*	R	II
48	Common myna	*Acridotheres tristis*	R	
49	Jungle myna	*Acridotheres fuscus*	R	
K.	**Order: Pelecaniformes**			
xxvii.	**Family: Ardeidae**			
50	Great bittern	*Botaurus stellaris*	PM	
51	Indian pond heron	*Ardeola grayii*	R	
52	Intermediate egret	*Ardea intermedia*	R	
53	Little egret	*Egretta garzetta*	R	
L.	**Order: Piciformes**			
xxviii.	**Family: Megalaimidae**			
54	Blue-throated barbet	*Megalaima asiatica*	R	
55	Coppersmith barbet	*Megalaima haemacephala*	R	
56	Lineated barbet	*Megalaima lineata*	R	
xxix.	**Family: Picidae**			
57	Black-rumped flameback	*Dinopium benghalense*	R	
58	Fulvous-breasted woodpecker	*Dendrocopos macei*	R	
59	Greater flameback	*Chrysocolaptes lucidus*	R	
60	Himalayan flameback woodpecker	*Dinopium shorii*	R	
M.	**Order: Psittaciformes**			
xxx.	**Family: Psittacidae**			
61	Alexandrine parakeet	*Psittacula eupatria*	R	II
62	Blossom-headed parakeet	*Psittacula roseata*	R	II
63	Plum-headed parakeet	*Psittacula cyanocephala*	R	II
64	Rose-ringed parakeet	*Psittacula krameri*	R	
N.	**Order: Strigiformes**			
xxxi.	**Family: Strigidae**			
65	Spotted owlet	*Athene brama*	R	II
O.	**Order: Suliformes**			
xxxii.	**Family: Phalacrocoracidae**			
66	Little cormorant	*Phalacrocorax niger*	R	
67	Great cormorant	*Phalacrocorax carbo*	WV	

R = Resident, SV = Summer Visitor, WV = Winter Visitor, PM = Partial Migrant