

Assessment of Bird Diversity and Population Count in Samaspur Bird

Sanctuary, Raebareli, Uttar Pradesh, India

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Abstract

Wetland bird communities are widely used in ecological assessment because changes in bird occurrence and abundance often reflect changes in habitat condition, food availability, and disturbance regimes. Samaspur Bird Sanctuary (Raebareli district, Uttar Pradesh) is a perennial wetland complex recognised for supporting high avian diversity and large seasonal waterbird congregations, and it was designated a Ramsar site on 3 October 2019 (reported area \approx 799 ha). This paper analyses resident/local birds and migratory birds, which records “present estimated” population counts by species. Across both datasets, 162 species were recorded with a total estimated abundance of 16,245 individuals. Resident/local species comprised 95 species (N = 9,495 individuals; 58.45%), while migratory species comprised 67 species (N = 6,750 individuals; 41.55%). Diversity metrics were calculated using standard ecological indices: Shannon diversity (H'), Simpson diversity ($1 - D$), and Pielou evenness (J), with interpretation in the context of “effective numbers of species” (Hill numbers). Overall diversity was high (Shannon $H' = 4.600$; Simpson $1 - D = 0.981$; $J = 0.905$), reflecting a comparatively even abundance distribution across many species rather than extreme dominance by a small subset. The most abundant species in the full dataset included House Sparrow (1,320), Little Stint (805), Lesser Whistling Teal (800), and Eurasian Coot (590), indicating that both human-associated terrestrial habitats and wetland habitats contribute substantially to the observed assemblage. These results show that Samaspur is an important wetland area with different habitats. It is important to monitor it regularly to protect birds and follow Ramsar guidelines and India’s wetland rules.

Keywords: Wetland birds, Point counts, Ramsar Site, Shannon index, Simpson index, Hill numbers, Indo-Gangetic wetlands, Conservation monitoring

1. Introduction

Birds are frequently used as ecological indicators because they occupy diverse trophic positions, respond measurably to environmental change, and can be surveyed repeatedly at

relatively low cost using established field protocols. [1] Indicator-based monitoring is especially valuable where it is not feasible to measure all taxa or all ecosystem processes directly, and bird indicators therefore form a major component of many biodiversity assessment frameworks. [2]

Wetlands are among the most valuable ecosystems for biodiversity and human well-being, supporting water regulation, water purification, carbon storage, livelihoods, and habitat for wetland-dependent species (including waterbirds) [3] At the same time, global assessments highlight continuing wetland loss and degradation and emphasise the need for conservation, management planning, and monitoring to maintain wetlands' "ecological character" and associated ecosystem services [4]. In India, this policy direction is reflected both in international commitments (e.g., the Ramsar Convention) and in domestic regulatory instruments and implementation guidance that structure wetland identification, notification, and integrated management planning [5]

Samaspur Bird Sanctuary is a key wetland habitat in the Indo-Gangetic Plains that is recognised for high bird richness and large seasonal influxes of migratory waterfowl. [6] This paper contributes a quantitative baseline from the uploaded dataset by (i) summarising species richness and total abundance for resident/local and migratory species, (ii) identifying dominant and characteristic species in each assemblage, and (iii) calculating diversity and evenness metrics that can support future comparisons across seasons and years using consistent survey protocols [7]

2. Study area

Samaspur Bird Sanctuary lies near Salon [8] in the Raebareli district and was declared a bird sanctuary in 1987; the Wildlife Institute of India [9] reports an area of 7.80 km² (\approx 780 ha) for the sanctuary declaration and describes the landscape as a perennial wetland system experiencing strong seasonal temperature variation (\approx 46°C in summer to \approx 4°C in winter) with average annual rainfall around 900 mm. [10] In India's national Ramsar listing, the Ramsar designation for Samaspur Bird Sanctuary is recorded as 3 October 2019 with an area of approximately 799 ha. [11]

The sanctuary comprises a complex of connected lakes/wetlands (commonly described as six lakes, with additional nearby waterbodies included in some delineations), producing a habitat

mosaic that includes open water, marsh vegetation, and surrounding agricultural and plantation areas. The Key Biodiversity Areas (KBA) factsheet notes that the wetland receives water from rainfall and irrigation canals, and that only a portion of the declared sanctuary area is open water at a given time, with additional land uses (including plantations, crop fields, orchards, and other dryland habitats) contributing to overall habitat heterogeneity and bird diversity [12]

Samaspur is widely reported to support high avifaunal richness (>250 species recorded historically) and large winter waterbird visitation; the Wildlife Institute of India [9] estimates approximately 50,000 waterbirds visit annually between November and March and lists typical wintering waterfowl (e.g., greylag geese, pintail, teal, shoveler). Independent conservation-oriented summaries similarly emphasise high bird species richness and the role of the sanctuary as a seasonal habitat for migratory waterfowl [13]

Threats documented for the sanctuary include agricultural intensification in surrounding floodplains, water pollution from contaminated runoff and waste dumping, siltation, spread of invasive aquatic weeds (notably water hyacinth), and pressures linked to fishing and hunting/poaching. These drivers align with broader wetland risk pathways highlighted in national and global wetland assessments and reinforce the need for a monitoring-to-management pipeline that links bird data to habitat and disturbance metrics [14]

3. Materials and methods

The present analysis is based on the uploaded Excel datasets containing species lists and “present estimated” counts for (i) resident/local birds and (ii) migratory birds recorded from Samaspur Bird Sanctuary. The dataset structure includes species common names, Hindi names (in many cases), and a single abundance estimate per species in each list. Because the spreadsheets do not include survey dates, season labels, number of sampling points, count duration, or detection-distance rules, the analysis treats the data as a single-timepoint assemblage summary suitable for baseline description rather than formal inference on trends.

Field sampling is described by the user as based on point counts. Point-count and related census methods are widely used in bird monitoring and can be standardised to support comparison across time and space when protocols (count duration, point placement, repeats, observer effects, and detection considerations) are specified and consistently applied [15]. The need for

standardisation in point-count practice is also a recurring theme in methodological guidance compiled to reduce bias and improve comparability across studies and monitoring programmes. [15].

Analytical processing focused on descriptive community ecology:

- Species richness (S) was calculated as the number of species listed in each dataset and in the combined dataset.
- Total abundance (N) was calculated as the sum of “present estimated” individuals.
- Relative abundance was calculated as the proportion of N contributed by each species.
- Diversity indices were computed using standard formulations: Shannon diversity $H' = -\sum p_i \ln p_i$, Simpson concentration $D = \sum p_i^2$ and Simpson diversity $1-D$, and Pielou evenness $J = H'/\ln(S)$. [15]
- Effective numbers of species (Hill numbers) were derived to support interpretable comparison across indices (e.g., $e^{H'}$ for Shannon-based diversity, $1/D$ for Simpson-based diversity) [16]

For contextual interpretation of migratory waterbird importance, this paper also references frameworks used in regional and flyway-scale monitoring, including the use of population estimates and 1% thresholds for waterbird populations [16].

4. Results

The uploaded dataset contains 162 species and 16,245 estimated individuals in total, partitioned into 95 resident/local species (N = 9,495) and 67 migratory species (N = 6,750). On a proportional basis, resident/local birds account for 58.45% of individuals and migratory birds account for 41.55%. Interpreting these proportions requires caution: the dataset does not specify seasonality, but the sanctuary’s documented peak waterbird visitation period (November–March) indicates that migratory abundance can be strongly seasonal at Samaspur.

Table 1. List of local species

Sl. No	Name of Bird	Hindi Name	Present Estimated
1	Black Francolin	काला सीतर	50
2	Grey Francolin	सफेद सीतर	70

3	Indian Peafowl	मोर	115
4	Lesser Whistling Teal	सिलही	800
6	Indian Spot-billed Duck	गुगरी बतख	75
7	Little Grebe	डबडबी	74
8	Painted Stork	रंगीन जोगिल	38
9	Asian Openbill	घोंघिल	40
10	Black-necked Stork	लोहा सारंग	2
11	Woolly-necked Stork	सफेद लकलक	35
12	Black-headed Ibis	सफेद बुज्जा	154
13	Yellow Bittern	पीला बगुला	44
14	Black-crowned Night Heron	रात बगुला	52
15	Indian Pond Heron	अन्धा बगुला	258
16	Purple Heron	लाल अजन	58
17	Cattle Egret	गाय बगुला	65
18	Intermediate Egret	करछिया बगुला	105
19	Little Egret	छोटा करछिया बगुला	398
20	Darter (Snake Bird)	पनदा	32
21	Little Cormorant	छोटा पनकौवा	255
22	Indian Cormorant (Indian Shag)	देसी पनकौवा	60
23	Black-winged Kite	कपासी चील	12
24	Black Kite	सामान्य चील	44
25	Black-eared Kite	चील	50
26	Brahminy Kite	सफेद सिर चील	40
27	Pallas's Fish Eagle		32
28	Egyptian Vulture	सफेद गिद्ध	54
29	Tawny Eagle		44
30	Bonelli's Eagle		28
31	Shikra	शिकरा	72
32	White-breasted Waterhen	डवक	314
33	Grey-headed Swamphen (Purple Moorhen)	धोमा जटायुनी	175
34	Common Moorhen	जटायुनी	218
35	Sarus Crane	सारस	74
36	Bronze-winged Jacana	जलायुनी	38
37	River Lapwing	जल टिटारी	44
38	Yellow-wattled Lapwing	जल टिटारी	48
39	Red-wattled Lapwing	काज लालकी टिटारी	245
40	Greater Painted-snipe	सान्यडा	99
41	Common Pigeon (Blue Rock Pigeon)	काकुर	270

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42	Eurasian Collared Dove	नीर जाज्जा	38
43	Red Collared Dove	सामान्य पुठरी	44
44	Spotted Dove	किसाको काकुला	120
45	Laughing Dove	टोटी फाटका	267
46	Yellow-footed Green Pigeon	हरिजन	10
47	Rose-ringed Parakeet	कडा चोता	62
48	Plum-headed Parakeet	कुटरा चोता	50
49	Common Hawk-Cuckoo	सामान्य पागोन	52
50	Asian Koel	कोयल	174
51	Greater Coucal	कडा महोद	44
52	Indian Scops Owl	साल पट्टी चुराट	30
53	Jungle Owlet	जंगलो चुराट	97
54	Spotted Owlet	सामान्य चुराट	76
55	Common Hoopoe	सुकड	64
56	Indian Roller	रोलाको	54
57	Stork-billed Kingfisher	दुब्योमा किलाकिला	24
58	White-throated Kingfisher	सुकड पाठी किलाकिला	152
59	Common Kingfisher	जोटा किलाकिला	25
60	Pied Kingfisher	ओडियाला	85
61	Green Bee-eater	पागोन	66
62	Indian Grey Hornbill	संगटी काय	50
63	Brown-headed Barbet	रडा बरिया	45
64	Brown-capped Pygmy Woodpecker	रडा गिर कठकाडिया	42
65	Black Drongo	सामान्य भुजगा	52
66	Indian Golden Oriole	पीलक	59
67	Rufous Treepie	महलत	72
68	Indian Jungle Crow	जंगली कौवा	58
69	House Crow	देसी कौवा	120
70	Great Tit	बड़ा रामगगरा	98
71	Red-whiskered Bulbul	पहाड़ी बुलबुल	55
72	Red-vented Bulbul	गुलदुम बुलबुल	65
73	Ashy Prinia	काली फुदकी	65
74	Jungle Prinia	जंगली फुदकी	60
75	Striated Grassbird	बड़ी धारीदार फुदकी	69
76	Common Tailorbird	दर्जिन	67
77	Jungle Babbler	सतदाई	72
78	Large Grey Babbler	पड़ी गौगई	32
79	Indian Nuthatch	खेरा पेट सिरी	41

80	Jungle Myna	जंगली मैना	37
81	Common Myna	देसी मैना	59
82	Brahminy Starling	ब्राह्मनी मैना	29
83	Oriental Magpie Robin	धयल	70
84	Indian Robin	कलपुरी	48
85	Pied Bushchat	चितकबश झासी पिददा	29
86	Brown Rock Chat	श्योमा	55
87	Purple Sunbird	कालापिडा	63
88	House Sparrow	गौरया	1320
89	Chestnut-shouldered Petronia	जंगली गौरया	179
90	Black-breasted Weaver	चदवा बया	19
91	Baya Weaver	देसी बया	24
92	Indian Silverbill	सफेद मुनिया	70
93	Red Avadavat	लाल मुनिया	50
94	Scaly-breasted Munia	सैलिया मुनिया	49
95	White Browed Wngtail		35
96	Paddy Field Pipit		22
Total			9495

Table 3. List of Migratory Birds

Sl. No	Name of Bird	Hindi Name	Present Estimated
1	Common Quail	बड़ा बटेर	140
2	Grey Lag Goose	बड़ा सवन	61
3	Bar-Headed Goose	सिर पट्टी सगन	76
4	Ruddy Shelduck	सुरखाब	45
5	Gadwall	भूरा बतख	228
6	Eurasian Wigeon	छोटा साल सिर बतख	90
8	Northern Shoveler	तिदारी बतख	65
9	Northern Pintail	सीकर	95
10	Garganey Teal	पीला बतख	55
11	Common Teal	छोटी मुर्गाबी	244

12	Red-Crested Pochard	लालसिर	162
13	Common Pochard	छोटा लाल सिर गोतख	98
14	Ferruginous Duck	करछिया बतख	49
15	Tufted Duck	अबलका	102
16	Great Crested Grebe	शिवहंस	52
17	Black Stork	सुरमल लगलग	50
18	White Stork	उजला लगलग	40
21	Eurasian Spoonbill	चमचा	145
23	Grey Heron	स्लेटी अंजन	92
24	Great White Pelican	सफेद हवासील	45
25	Spot-Billed Pelican	चित्ती चोंच हवासील	85
26	Great Cormorant	बड़ा पनथीया	161
27	Common Kestrel	सामान्य नरजी	55
29	Red-Necked Falcon	लालसिर तुरुमुति	54
30	Osprey	मछलीमार	32
33	Griffon Vulture	यूरेशियाई गिद्ध	32
39	Eurasian Coot	ठेकारी	590
41	Black-Winged Stilt	गजपाँव	120
44	Ruff	रफ	65
46	Pintailed Snipe	लंबी पूँछ वाली चकवा / स्नीप	70
47	Common Snipe	साधारण चकवा	120
48	Black Tailed Godwit	काली पूँछ वाला गोडवित	71
49	Common Redshank	लाल टांग टिटहरी	64
50	Common Greenshank	हरी टांग टिटहरी	92
51	Little Stint	छोटी टिटहरी	805
53	Green Sandpiper	हरा जलपक्षी	48

54	Wood Sandpiper	वन जलपक्षी	60
55	Common Sandpiper	सामान्य जलपक्षी	70
56	Little Ringed Plover	छोटी घेरा टिटिहरी	30
57	Kentish Plover	केंटिश टिटिहरी	40
58	Oriental Turtle Dove	फाख्ता	112
59	Jacobin Cuckoo	पपीहा	22
60	Grey Billed Cuckoo	धूसर चोंच कोयल	32
61	Asian Paradise Flycatcher	दूधराज	70
62	Barn Swallow	अबाबील	118
63	Blue Tailed Bee Eater	नीली पूंछ वाला मधुमक्खीभक्षी	106
65	Brown Shrike	भूरा लटकन	99
66	Isabelline Shrike	हल्का भूरा लटकन	125
67	Common Chiffchaff	छोटी चहचहाने वाली चिड़िया	108
68	Lesser Whitethroat	छोटी सफेद गला चिड़िया	80
69	Common Starling	मैना जैसी चिड़िया (स्टार्लिंग)	55
70	Rosy Starling	गुलाबी मैना	98
71	Black Throated Thrush	काला गला थ्रश	94
72	Blue Throat	नीला गला	114
73	Black Redstart	काला सुर्ख पूंछ	102
74	Common Stonechat	पत्थरचिड़ी	85
75	Grey Bushchat	धूसर झाड़ी चिड़ी	108
76	Red Breasted Flycatcher	लाल सीना मक्खीमार	65
77	Asian Brown Flycatcher	भूरा मक्खीमार	55
78	Taiga Flycatcher	टैगा मक्खीमार	32
80	Verditer Flycatcher	नीला मक्खीमार	76
81	Yellow Wagtail	पीली खंजन	72

82	Citrine Wagtail	पीली खंजन (चमकीली)	15
83	White Wagtail	सफेद खंजन	64
84	Grey Wagtail	धूसर खंजन	75
85	Tree Pipit	पेड़ चिड़ी (पिपिट)	90
86	Olive Backed Pipit	जैतूनी पीठ पिपिट	80
Total			6750

Table 3. Diversity and evenness metrics computed from the uploaded dataset (natural log base).

Group	Species richness (S)	Total individuals (N)	Shannon H' (ln)	Simpson (1-D)	Pielou evenness (J)	Effective spp. (exp H')	Effective spp. (1/D)
Resident/Local	95	9,495	3.966	0.962	0.872	52.773	26.204
Migratory	67	6,750	3.874	0.966	0.915	48.161	29.298
Overall	162	16,245	4.600	0.981	0.905	99.479	52.826

These metrics indicate high overall diversity (high H' and high $1 - D$) combined with relatively high evenness ($J \approx 0.91$). Interpretation follows established ecological usage of Shannon and Simpson measures as summaries of abundance distribution (richness and evenness components), and Hill-number transformations as “effective numbers of species” that allow direct comparison across indices.

5. Discussion

The combined assemblage documented in the uploaded dataset (162 species) represents a substantial fraction of the >250 species reported historically from Samaspur by institutional and conservation-oriented sources, suggesting that the site continues to support high bird richness even though any single survey period is unlikely to capture the full long-term species

pool. The high overall evenness ($J \approx 0.91$) indicates that, within this dataset, many species contribute non-trivially to total abundance rather than the community being overwhelmingly dominated by a few taxa; in wetland monitoring terms, this can be consistent with a heterogeneous habitat mosaic (open water, marsh vegetation, and surrounding terrestrial/agro-ecosystem habitats) [17].

Ecological interpretation should nonetheless be conditioned on survey design and detectability. Point counts, while widely used and scalable, can be sensitive to observer effects, habitat structure, temporal variation in bird activity, and detection probability (including distance and audibility/visibility) [9]. For a future publishable monitoring design, the dataset would be strengthened by explicit metadata: visit dates and times, number of point stations, point spacing, count duration, habitat stratification, repeat counts, and consistent rules for flyovers and double-count prevention. These elements are central in methodological guidance aimed at producing comparable population indices through time.

From a conservation-management perspective, the sanctuary's ecological value is inseparable from documented pressures. Site-level accounts identify eutrophication risks from agricultural runoff, waste dumping, siltation, intensive resource use (including fishing), and invasive aquatic vegetation (water hyacinth) as persistent challenges [16]. These threats are also consistent with broader global wetland narratives that stress that designation alone is insufficient without effective management planning and implementation [6]. In India's governance context, the Wetlands (Conservation and Management) Rules and the associated implementation guidelines provide a framework for wetland listing/notification, delineation of zones of influence, identification of prohibited and regulated activities, and development of integrated management plans—tools that can be operationalised at the site and landscape level to reduce ecological risk drivers.

Finally, the presence in the dataset of recognised conservation-priority waterbird taxa (e.g., Common Pochard; Pallas's Fish Eagle) underscores the importance of linking local monitoring to flyway-scale conservation priorities. India's National Action Plan for migratory birds along the Central Asian Flyway emphasises the strategic role of Indian wetlands as stopover and wintering habitats and explicitly connects national conservation actions with international monitoring programmes (including waterbird censuses and Important Bird Area programmes)

[17] Aligning Samaspur's monitoring outputs with such frameworks (e.g., consistent annual winter waterbird counts alongside broader year-round community monitoring) would improve the sanctuary's capacity to demonstrate ecological character maintenance and to prioritise management interventions.

6. Conclusion

The uploaded dataset provides a quantitative baseline for bird diversity and population estimates at Samaspur Bird Sanctuary, recording 162 species and 16,245 individuals across resident/local and migratory assemblages. Diversity metrics (Shannon $H' = 4.600$; Simpson $1 - D = 0.981$; evenness $J = 0.905$) indicate a high-diversity, relatively even community, consistent with the site's documented role as a heterogeneous wetland complex embedded within a mixed-use landscape.

For a publication-ready monitoring programme and stronger inference on population trends, future datasets should add survey metadata and incorporate repeated seasonal sampling so that trends can be assessed within and across years using standardised point-count protocols. Management relevance is high: multiple authoritative site accounts identify pollution, invasive aquatic vegetation (water hyacinth), siltation, and resource-use pressures, reinforcing the need for monitoring linked to targeted interventions and to India's wetland governance tools (notification, zoning, and integrated management planning).

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