

1ST SUNDARBAN BIRD FESTIVAL

CONSERVATION OF
AVIFAUNA
2023





This report is published by
The CCF and Field Director, Sundarban Tiger Reserve
Government of West Bengal, 2023

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SUNDARBAN BIRD FESTIVAL, 2023 : A DETAILED REPORT

EXECUTIVE SUMMARY:

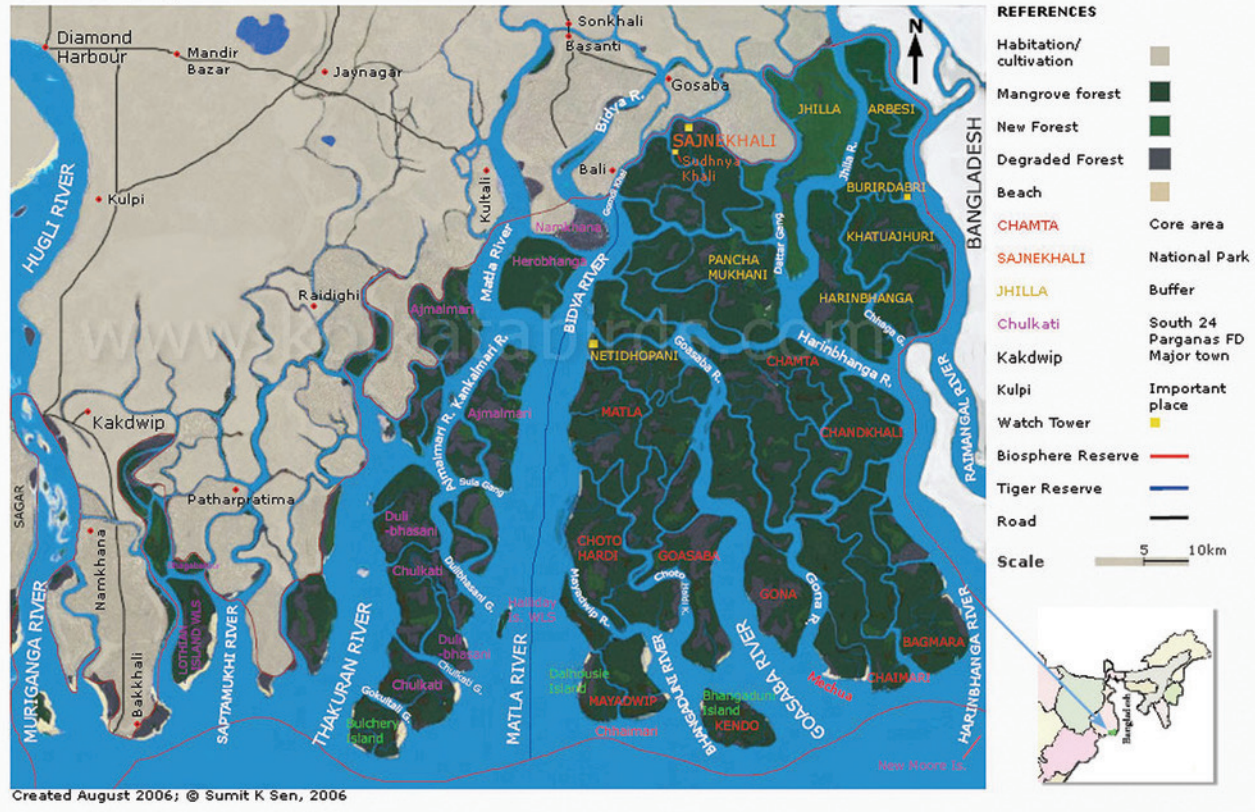
Sundarban, the only mangrove tiger habitat, is an abode for avian biodiversity. Two important flyways overlap in the Ramsar site of international importance, namely- the Central Asian flyway and the East Asia-Australasian flyway. This UNESCO World Heritage Site is inundated under tidal influx on a daily basis and thereby creating various localized ecosystems and niches like the aquatic, shores, mudflats, and the mangrove forests. A diversity of microhabitats with hyper-volume niche exists in the Mangals. The back mangrove possesses a variety of avian diversity; on the other hand the shoreline ecotone supports the specialists of that particular ecosystem.

This year, the first ever Sundarban Bird Festival (SBF 2023) was organized from 7th to 10th February, 2023 starting with the inauguration cum orientation session and a bird transect through 6 different routes, covering almost the whole forest and protected area (4000 sq KM) of the Indian Sundarban. Boat transects and point count methods were followed by the teams. Out of the total of approximately 5065 total sightings of birds, 145 different species (Annexure 1) were identified by the experts and the teams in 2 days. This amount to 33.7% of the total bird species recorded in Sundarbans (429) sighted in just 2 days by boat transects. Statistical tools were used for the better understanding of the habitat preferences of the birds. The bird species of major concern are the shorebirds, as per qualitative and quantitative data analysis. The management interventions that will be required to ensure that Sundarbans will remain as the haven for the Avian biodiversity is also a part of the report.

STR owes their deep gratitude to the officials of the South 24 Pgs forest division, the NGOs, the participants, the renowned wildlife photographers and the frontline staff for the holistic support and encouragement that made the first ever Sundarban Bird Festival a success. This comprehensive report of the first Sundarban Bird Festival, 2023 has been prepared by Research Assistant, senior officials of STR and the design team.



Sundarbans, India



Picture 1: Sundarban Landscape.



GENERAL OVERVIEW:

The Sundarban – the only mangrove tiger-land, is composed of innumerable islands interspersed in a maze of rivers, rivulets, and creeks. The Dampier-Hodges line separates the Sundarbans from the rest of West Bengal. On the eastern boundary, neighbouring country Bangladesh is separated by the rivers like-Kalindi, Raimangal and Harinbhanga. On the western boundary lies the territorial division of 24-Parganas (South) and towards the south lies the Bay of Bengal. As we know this pristine forest has several diamonds on its crown, being designated as the Biosphere Reserve, UNESCO World Heritage Site, the Ramsar Site of international importance and the CATS accredited land of Mangals: our Sundarbans.

Daily inundation of the landscape by high tides and low tides and silt deposition makes the mangrove delta a haven for natural coastal barrier- the 'Mysterious Mangrove'. Some of the areas are inaccessible throughout the year, due to natural constraints. Tiger reserves are not only the land of tigers, it also possesses a lot of co-predators, avian biodiversity, invertebrates, insects and some unknown natural wonders. It is our duty to create awareness among the people about the biodiversity of the region and its importance in the fight against the Environmental Challenges facing humanity.



The primeval forest supports a good number of resident and migratory faunal communities, especially birds. 429 species of resident and migratory birds are reported from Sundarbans till now, but there may be some species hidden in the lap of Mother Nature which is yet to show itself to the human quest.. In pursuance of the same, Sundarban Tiger Reserve along with the 24 Parganas (South) Division organised the first ever Sundarban Bird Festival (SBF) in the month of February, 2023.



Registration:

Registration through online was widely publicised by Sundarban Tiger Reserve and Wildlife Wing under Directorate of Forests in their respective websites and through media channels from January 2023. Several enthusiastic birders responded through the online portal.

Inaugural Ceremony:

The first ever bird festival was held from 7th February to 10th February, 2023. The inaugural programme was held at Sajnekhali SIC hall on 7th February, 2023.

Orientation Programme:

A short Orientation programme along with an interactive session on bird count, bird identification and bird migration in presence of senior IFS officers, scientists and researchers.

6 BIRDING TEAMS

With Field Guide Books, Necessary Gears for birding (binoculars, cameras etc.), By means of Waterways only.

6 ROUTES

National Park East, National Park West, Basirhat, Sajnekhali, Kalas Matla

TEAM COMPOSITION

Leader- Resource Person (1) Eco-tourist Guide (1), Experienced armed Forest Guard (1), Participants (3 nos.)





ROUTE MAPS : The route maps of the first Sundarban Bird Festival 2023 are attached in Annexure 2.



SUBMISSION OF DATA : On 10th February, 2023 the teams submitted the data to the Research Assistant of Sundarban Tiger Reserve for further compilation of the report.



SUNDARBAN BIRD FESTIVAL

at a Glance



145

Bird Species
Sighted



2

Days Bird
Trial

5065

Total Number of
Birds Sighted



7

Number of
Species
of Kingfisher
Sighted



Habitat

Number of Species

• Waders / Mudflat Birds / Shore Birds

42

• Raptors

12

• Forest birds

78

• Water Fowl

6

• Others

7



DETAILED RESULTS AND ANALYSIS

During the two days of bird count, approximately 5065 birds were sighted. Total number of species was counted at 145 (Vide: Annexure 1). The species of birds were sub-divided into broad categories like waders/ shore birds (42); raptors (12); forest birds (78); waterfowl (6) and others (7).

Composition of birds found in the 1st SBF, 2023

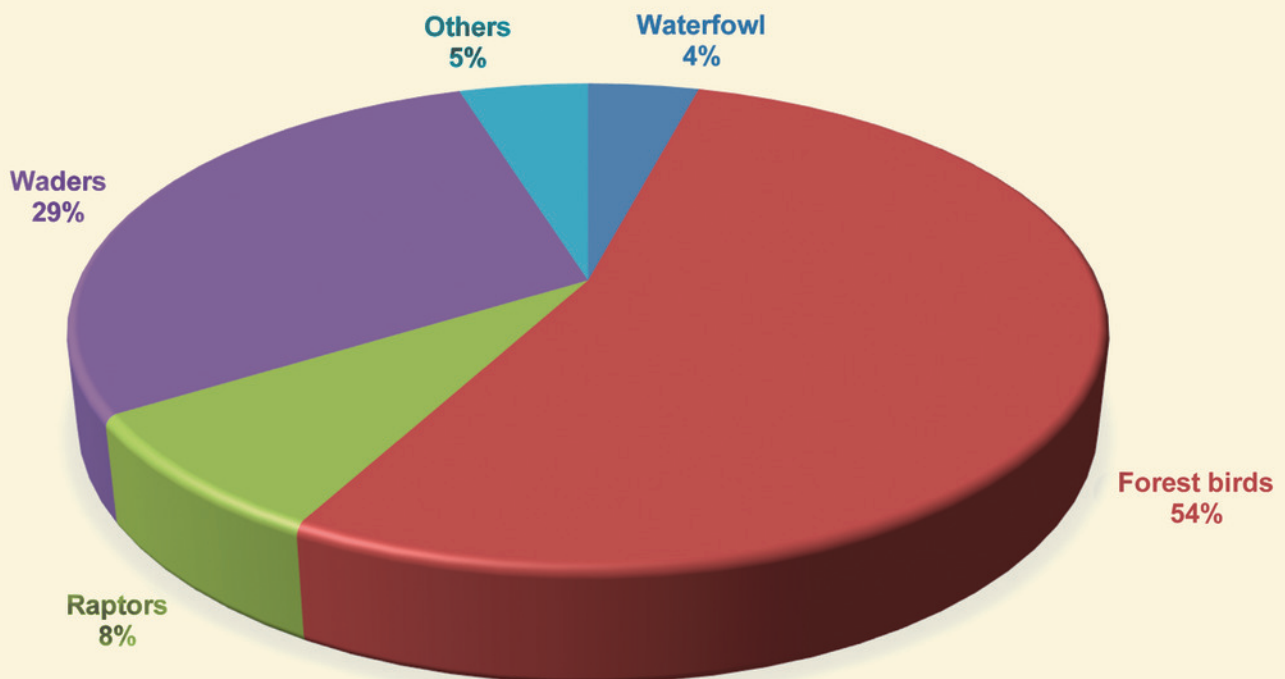


Fig 1: Composition of avian fauna after birding in February, 2023

Protection status	Number of Avian Species Recorded
Core	86
Buffer	128
Outside Protected areas	71

Avian Species Recorded as per Protection Measure

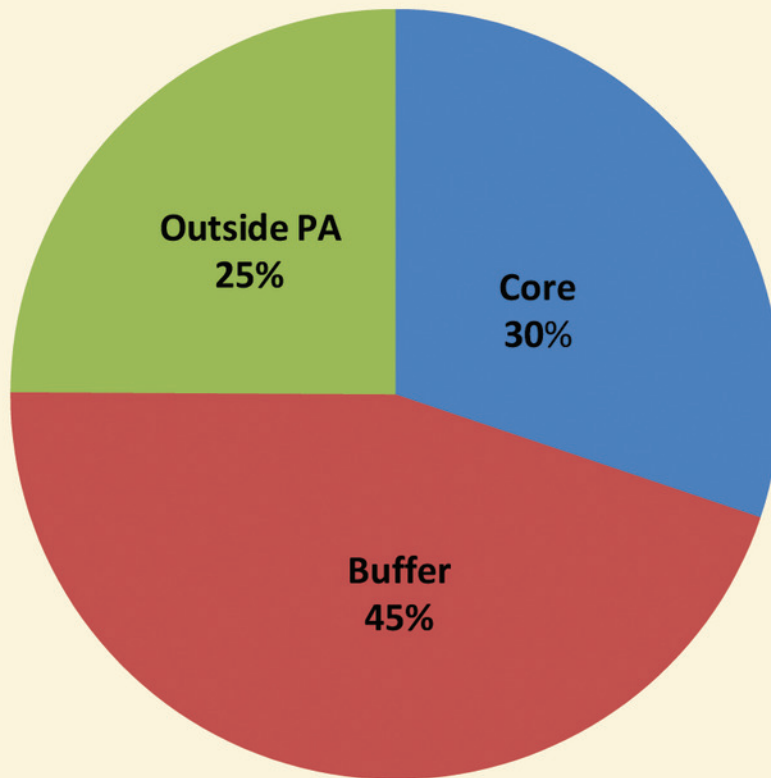
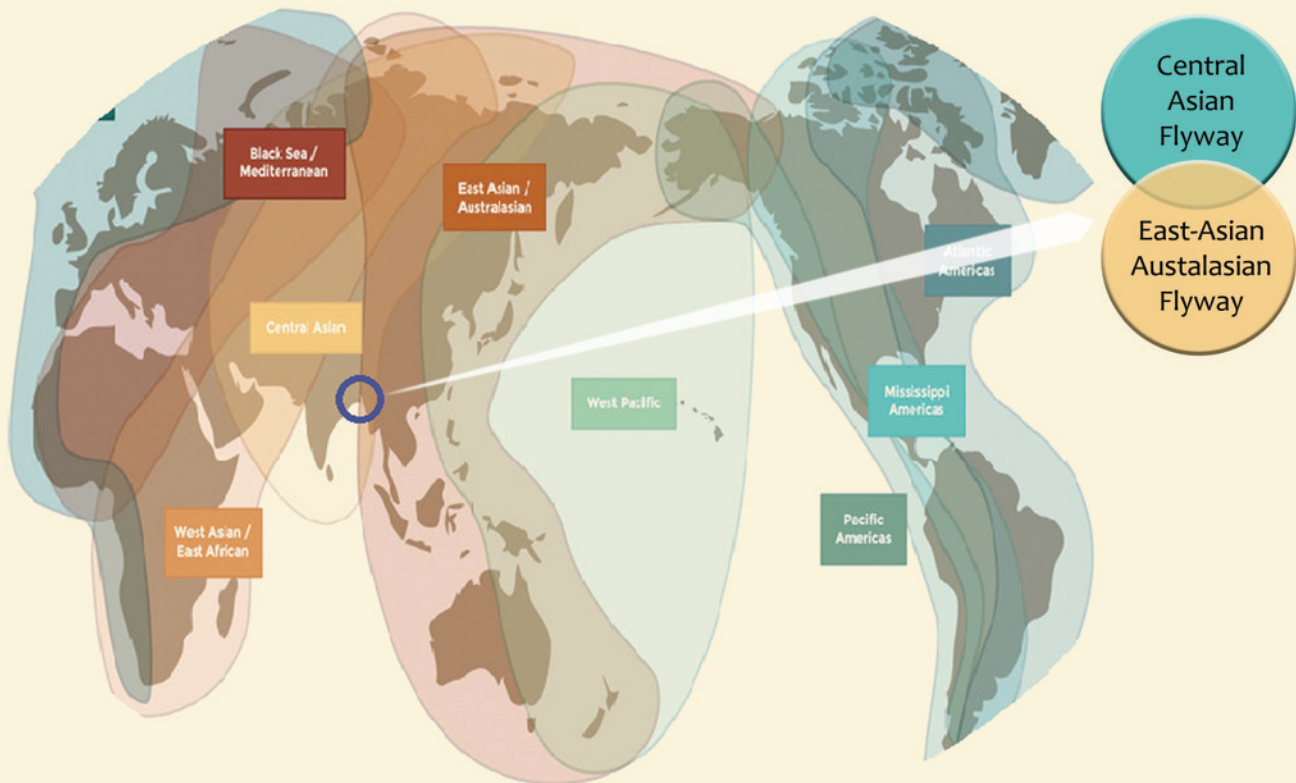


Figure 2: Percentage of avian species recorded as per protection by the forest department.

Routes	Number of Species
NPW	70
Kalas	98
NPE	50
Sajnekhali	54
Matla	71
Basirhat	64

Table 1: Route specific species count.

The Tiger Reserve area and the surrounding areas are categorized into Buffer, Core and Outside Protected Area (PA) respectively. A good quantity of birds was counted (Figure 2) from the outside Protected Areas. This indicates the overall good habitat for the avian diversity even outside the protected areas of Sundarbans,



The Sundarbans is a very dynamic ecosystem, which has various types of avian habitats. After the data compilation, an important question that arises was that which habitats are most important in connection with the Central Asian Flyway and East Asian- Australasian Flyway, as Sundarban is the overlapping zone of these two important avian flyways and what is the status, trend of those habitats. To test this, statistical works were carried out for holistic scientific understanding.

Important Habitat Specifications:

- **Shoreline Ecotone**
 Mudflat ecotone and Sandy beaches
 e.g. Whimbrel, Eurasian Curlew etc. are found.
- **Canopy**
 Mostly Raptors are observed,
 e.g. White breasted Sea Eagle, Brahminy Kite etc. are found.

- **Typical Mangrove Forest Floor**
 Highest mixing of organic matters, leaf litter with nutrients,
 e.g. Red Jungle Fowl, Ruddy-breasted Crake etc. are found.

- **Mangrove Branches and hollow deadwoods**
 Birds do nesting in seasons,
 Various Owls and Parakeets are found into this habitat.

STATISTICAL ANALYSIS OF THE DATA

The recorded birds from different habitat indicate the importance of the dynamic ecotone. To test the hypothesis a few statistical tests were performed. The tests were performed through SPSS statistical software version 25, IBM. Five codes are used for habitat specific species count- Bird 1 – Shorebirds, Bird 2- Raptors, Bird 3- Forest Floor birds, Bird 4- Water fowl and Bird 5- Others.

To test, if the birding data is in normal distribution or not, Non-parametric test (Kolmogorov-Smirnov Test) was performed. As per the data size, the research wing decided to run the statistical works under Kruskal-Wallis H test. df indicates as Degree of freedom. Number of items were 5 (N), hence, $df = (N-1) = 4$.



Ho (Null Hypothesis)

There is no statistically significant level of difference exist between the different bird groups in different habitats of Sundarban.



H1 (Alternative Hypothesis)

There is obviously a statistically significant level of difference exist between the different bird groups in different habitats of Sundarban.

Test Statistics 1

Distribution of Dataset - Kolmogorov-Smirnov Test

Test Statistics 2

Kruskal -Wallis H test





Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The categories of Birds occur with equal probabilities.	One-sample Chi-Square Test	1.000	Retain the null hypothesis.
2	The distribution of Numbers is normal with mean 28 and standard deviation 27.912	One-sample Kolmogorov-Smirnov Test	.000 ¹	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

¹ Lilliefors Corrected

Test Statistics ^{a,b}	
	Numbers
Kruskal-Wallis H	22.493
df	4
Asymp. Sig.	0.000
a. Kruskal Wallis Test	
b. Grouping Variable: Birds	
P value < 0.05, hence H ₀ rejected. Inference: There is obviously a statistically significant level of difference exist between the different bird groups in different habitats of Sundarbans.	



INFERENCES THAT CAN BE DERIVED FROM THE ABOVE ANALYSIS :

- In the Indian subcontinent, Passerine birds are found large in numbers, and Sundarbans is no exception to it.
- Buffer region is the area of interference for most of the birds.
- Mudflats along the Western reaches especially along the habited islands forms a good habitat for the Migratory birds and Passerine birds.
- Apart from this, mudflats in forests and forest floor are two different types of habitat which are

Importance of the Mudflat Ecotone in the Conservation of the Flyways:

As we know mudflats or the shoreline is the most significant zone of natural nutrient cycling in Sundarbans and is the zone of mixing of the brackish waters and the mudflats or the sandy beaches. Here, the statistical analysis indicates that the most important birds found in this habitat are the shorebirds which are predominantly migratory, often visiting these lands in the winter months in Sundarbans.

This clearly shows us that the mudflats and shorelines are the most important habitats for birds, especially the birds under watch according to the Central Asian Flyway list. These mudflats are distributed among both the forest areas and inhabited islands. A large portion of such habitats interestingly falls in the Human inhabited islands due to the recent geological changes. This brings the focus of Conservation not only to the protected areas of the Sundarbans but also the Non protected bird habitats which need to be conserved.



Picture 2: Erosion at Kendo Island from 2013 to 2023 indicates the habitat loss.



Picture 3: New land formation at Haldibari indicates the active delta formation.



THREATS



Plantation activities :

Various plantation activities by different NGOs and the Forest Department in the mudflat zones, open shores and new chor lands results in habitat destruction of the prime and critical habitat for foraging, nesting and breeding activities of both the migratory and residential species of the Sundarbans.

Illegal destructive activities in Chorlands :

In the Chor lands and Mudflats of Sundarbans, use of Char pata, Khal pata and other destructive fishing nets is a major threat to the habitat of residential birds along with the mudflat and coastal biodiversity in general.

Poaching :

Poaching of eggs and some migratory species along non- forest areas which disturbs the foraging and breeding habits of the birds.

Dynamic geology of the landscape :

Decreasing land area along the coastal belt, due to decrease in sedimentation inflow from upstream rivers and increase in the sea level rise due to climate change has resulted in loss of habitat for shore birds.

Climate change and related effects :

Increase in the frequency and intensity of the cyclones in the Sundarbans (Cyclone Capital of the world), increasing temperature and erratic weather patterns, ocean acidification and increasing salinity has been degrading the quality of foraging habitats of the migratory birds.

INTERVENTIONS TO ENSURE CONSERVATION OF AVIFAUNA IN SUNDARBANS:

Sundarbans is one of the large wintering sites' for a whole host of trans-boundary migrant birds and is critical to the future of many globally threatened species as it is an

important resting and roosting ground for most of the winter migrant birds. The following interventions are proposed for the conservation of birds in Sundarbans

Habitat Study :

Demarcating Critical Habitats :

- Comprehensive study of species diversity of different islands of Sundarbans and thereby a source-migratory population can be identified in near future;
- Mudflat birds are the bio-indicator for the shoreline ecotone. The edge effect sustains a lot of micro-fauna which are utilised by the birds. Some anthropogenic activities may hamper the mudflat habitat (viz. illegal earth works, usage of chor pata net etc.),
- Mapping of the existing critical habitats and potential habitats (New chor lands) so that they can be recorded and special attention and protection can be provided to the areas by devising a plan.
- Finding the nesting habitats of migratory species

Poaching

- Creating Beats/Seasonal Camps in the critical area for Close monitoring of the locations and protection by the concerned divisions.
- Network of information by creating local volunteers and informers.
- Maintain liaison with the other civil departments, police and BSF/ Coast guard in international border.

No Plastic Zone

- Entire Sundarban Area should be declared as a No Plastic Zone.

No illicit Felling

- No illicit felling of trees in the protected areas and also in islands with habitation where the non Mangrove trees have different micro habitats.

Non Forest Area Protection

- Creating Small Protected areas in Non Forest areas at Critical location for Bird breeding and Migration – foraging which will be maintained as No disturbance zone and may be declared as Conservation reserve/ Community Reserve.
- Protection of Known Winter Resting and breeding habitats of birds in Sundarbans;
- Increasing Protection along Non-Forest area for birds by intensive measure to sensitize the local population.
- Concept of PakhiMitra can be introduced in the mapped location who will act as a extension of the forest department in critical areas.
- Benefit sharing mechanism from Tourism, Bird watching for the local population to ensure sustainable protection of the habitats and the birds.



WAY FORWARD FOR SUNDARBAN BIRD FESTIVAL

Yearly Survey and Regular Update :

- Yearly surveys should be carried out for habitat conservation; thereby a master plan can be prepared in which the Bird festival can play an important role.
- Regular update in an e-based platform (e.g. e-bird handle of Sundarban).

Ethological Study :

- Recording of daily tidal fluctuation with respect to the birds behaviour with their specific habitat by training staff.

Monitoring :

- GPS- based rings can be introduced for bird monitoring throughout the year.
- An intensive monitoring and conservation effort should be given to two species, namely, Goliath heron and Buffy Fish Owl.

Method of Survey :

- To be done during the neap tide phase of the moon from next year.
- If possible forest bird survey can be included in the next phase.
- Each team to be provided with a Spotting scope for bird identification.
- 2 Days is too short for the exercise can be extended by one more day.

Conservation of the Bird Habitats in Sundarbans would not just benefit the Transboundary Migrants and the Resident Birds but also the Protozoans, Crustaceans, Invertebrates, and molluscs which thrive in similar habitats and their Ecologies are interconnected.



ANNEXURE 1

CHECKLIST OF THE BIRDS FROM SBF, 2023:



Sl.No.	Order	Family	Common Name	Scientific Name
1	Galliformes	Phasianidae	Red Junglefowl	<i>Gallus gallus</i>
2	Anseriformes	Anatidae	Lesser Whistling-duck	<i>Dendrocygna javanica</i>
3			Common Shelduck	<i>Tadorna tadorna</i>
4			Gadwall	<i>Anas strepera</i>
5			Eurasian Wigeon	<i>Anas penelope</i>
6			Northern Pintail	<i>Anas acuta</i>
7			Northern Shoveler	<i>Anas clypeata</i>
8	Piciformes	Picidae	Fulvous-breasted Woodpecker	<i>Dendrocopos macei</i>
9			Lesser Yellownape	<i>Picus chlorolophus</i>
10			Streak-throated Woodpecker	<i>Picus xanthopygaeus</i>
11			Grey-headed Woodpecker	<i>Picus canus</i>

Sl.No.	Order	Family	Common Name	Scientific Name
12			Black-rumped Flameback	<i>Dinopium benghalense</i>
13			Greater Flameback	<i>Chrysocolaptes guttacristatus</i>
14		Megalaimidae	Coppersmith Barbet	<i>Megalaima haemacephala</i>
15	Bucerotiformes	Upupidae	Common Hoopoe	<i>Upupa epops</i>
16	Coraciiformes	Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>
17		Halcyonidae	Brown-winged Kingfisher	<i>Halcyon amauroptera</i>
18			Stork-billed Kingfisher	<i>Halcyon capensis</i>
19			White-throated Kingfisher	<i>Halcyon smyrnensis</i>
20			Black-capped Kingfisher	<i>Halcyon pileata</i>
21			Collared Kingfisher	<i>Todiramphus chloris</i>
22		Cerylidae	Pied Kingfisher	<i>Ceryle rudis</i>
23		Meropidae	Asian Green Bee-eater	<i>Merops orientalis</i>
24			Blue-tailed Bee-eater	<i>Merops philippinus</i>
25	Cuculiformes	Cuculidae	Common Hawk Cuckoo	<i>Hierococcyx varius</i>
26			Asian Koel	<i>Eudynamis scolopacea</i>
27			Green-billed Malkoha	<i>Phaenicophaeus tristis</i>
28			Greater Coucal	<i>Centropus sinensis</i>
29			Lesser Coucal	<i>Centropus bengalensis</i>
30	Psittaciformes	Psittaculidae	Rose-ringed Parakeet	<i>Psittacula krameri</i>
31	Apodiformes	Apodidae	Asian Palm Swift	<i>Cypsiurus balasiensis</i>
32	Strigiformes	Tytonidae	Barn Owl	<i>Tyto alba</i>
33		Strigidae	Oriental Scops Owl	<i>Otus sunia</i>
34			Buffy Fish Owl	<i>Ketupa ketupu</i>
35			Brown bobook/Brown hawk owl	<i>Ninox scutulata</i>
36			Spotted Owlet	<i>Athene brama</i>
37	Caprimulgiformes	Caprimulgidae	Large-tailed Nightjar	<i>Caprimulgus macrurus</i>
38	Columbiformes	Columbidae	Rock Pigeon	<i>Columba livia</i>
39			Spotted Dove	<i>Streptopelia chinensis</i>
40			Eurasian Collared Dove	<i>Streptopelia decaocto</i>
41			Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>
42	Gruiformes	Rallidae	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>
43			Ruddy-breasted Crake	<i>Porzana fusca</i>





Sl.No.	Order	Family	Common Name	Scientific Name
44			Common Moorhen	<i>Gallinula chloropus</i>
45			Common Coot	<i>Fulica atra</i>
46	Charadriiformes	Scolopacidae	Eurasian Whimbrel	<i>Numenius phaeopus</i>
47			Eurasian Curlew	<i>Numenius arquata</i>
48			Spotted Redshank	<i>Tringa erythropus</i>
49			Common Redshank	<i>Tringa tetanus</i>
50			Common Greenshank	<i>Tringa nebularia</i>
51			Terek Sandpiper	<i>Xenus cinereus</i>
52			Common Sandpiper	<i>Actitis hypoleucos</i>
53		Burhinidae	Great Thick-knee	<i>Esacus recurvirostris</i>
54		Charadriidae	Pacific Golden Plover	<i>Pluvialis fulva</i>
55			Grey Plover	<i>Pluvialis squatarola</i>
56			Little Ringed Plover	<i>Charadrius dubius</i>
57			Kentish Plover	<i>Charadrius alexandrinus</i>
58			Lesser Sand Plover	<i>Charadrius mongolus</i>
59			Greater Sand Plover	<i>Charadrius leschenaultii</i>
60			Grey-headed Lapwing	<i>Vanellus cinereus</i>
61			Red-wattled Lapwing	<i>Vanellus indicus</i>
62		Laridae	Heuglin's Gull	<i>Larus heuglini</i>
63			Pallas's Gull	<i>Larus ichthyæetus</i>
64			Brown-headed Gull	<i>Larus brunnicephalus</i>
65			Black-headed Gull	<i>Larus ridibundus</i>
66			Caspian Tern	<i>Sterna caspia</i>
67			River Tern	<i>Sterna aurantia</i>
68			Common Tern	<i>Sterna hirundo</i>
69			Little Tern	<i>Sterna albifrons</i>
70			Whiskered Tern	<i>Chlidonia shybridus</i>
71	Accipitriformes	Pandionidae	Osprey	<i>Pandion haliaetus</i>
72		Accipitridae	Brahminy Kite	<i>Haliaeetus turindus</i>
73			White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>
74			Crested Serpent Eagle	<i>Spilornis cheela</i>
75			Shikra	<i>Accipiter badius</i>
76			Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i>
77			Changeable Hawk Eagle	<i>Spizaetus cirrhatus</i>
78			Peregrine Falcon	<i>Falco peregrinus</i>
79	Suliformes	Anhingidae	Oriental Darter	<i>Anhinga melanogaster</i>
80		Phalacrocoracidae	Little Cormorant	<i>Phalacrocorax niger</i>
81			Indian Cormorant	<i>Phalacrocorax fuscicollis</i>
82	Pelecaniformes	Ardeidae	Little Egret	<i>Egretta garzetta</i>
83			Great Egret	<i>Casmerodius albus</i>



Sl.No.	Order	Family	Common Name	Scientific Name
84			Intermediate Egret	<i>Mesophoyx intermedia</i>
85			Cattle Egret	<i>Bubulcus ibis</i>
86			Indian Pond Heron	<i>Ardeola grayii</i>
87			Grey Heron	<i>Ardea cinerea</i>
88			Purple Heron	<i>Ardea purpurea</i>
89			Little Heron	<i>Butorides striatus</i>
90			Black-crowned Night Heron	<i>Nycticorax nycticorax</i>
91	Pelecaniformes	Threskiornithidae	Black-headed Ibis	<i>Threskiornis melanocephalus</i>
92	Ciconiiformes	Ciconiidae	Asian Openbill	<i>Anastomus oscitans</i>
93			Lesser Adjutant	<i>Leptoptilos javanicus</i>
94	Passeriformes	Pittidae	Mangrove Pitta	<i>Pitta megarhyncha</i>
95		Laniidae	Brown Shrike	<i>Lanius cristatus</i>
96		Pachycephalidae	Mangrove Whistler	<i>Pachycephala cinerea</i>
97		Corvidae	Rufous Treepie	<i>Dendrocitta vagabunda</i>
98			House Crow	<i>Corvus splendens</i>
99			Large-billed Crow	<i>Corvus macrorhynchos</i>
100		Artamidae	Ashy Woodswallow	<i>Artamus fuscus</i>
101		Oriolidae	Black-hooded Oriole	<i>Oriolus xanthornus</i>
102		Coracidae	Large Cuckooshrike	<i>Coracina macei</i>
103			Black-winged Cuckooshrike	<i>Coracina melaschistos</i>
104		Campephagidae	Small Minivet	<i>Pericrocotus cinnamomeus</i>
105		Rhipiduridae	White-throated Fantail	<i>Rhipidura albicollis</i>
106		Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>
107			Bronzed Drongo	<i>Dicrurus aeneus</i>
108		Aegithinidae	Common Iora	<i>Aegithina tiphia</i>
109		Turdidae	Tickell's Thrush	<i>Turdus unicolor</i>
110		Muscicapidae	Red-breasted Flycatcher	<i>Ficedula parva</i>
111			Verditer Flycatcher	<i>Eumyias thalassina</i>
112			Blue-throated Flycatcher	<i>Cyornis rubeculoides</i>
113			Oriental Magpie Robin	<i>Copsychus saularis</i>
114			Black Redstart	<i>Phoenicurus ochruros</i>
115		Sturnidae	Common Starling	<i>Sturnus vulgaris</i>
116			Asian Pied Starling	<i>Sturnus contra</i>
117			Common Myna	<i>Acridotheres tristis</i>



Sl.No.	Order	Family	Common Name	Scientific Name
118			Jungle Myna	<i>Acridotheres fuscus</i>
119		Sittidae	Chestnut-bellied Nuthatch	<i>Sittacus tanea</i>
120		Parusidae	Great Tit	<i>Parus major</i>
121		Hirundinidae	Barn Swallow	<i>Hirundo rustica</i>
122		Pycnonotidae	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>
123			Red-vented Bulbul	<i>Pycnonotus cafer</i>
124		Zosteropidae	Oriental White-eye	<i>Zosterops palpebrosus</i>
125		Acrocephalidae	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>
126		Cisticolidae	Common Tailorbird	<i>Orthotomus sutorius</i>
127		Phylloscopidae	Dusky Warbler	<i>Phylloscopus fuscatus</i>
128			Hume's Warbler	<i>Phylloscopus humei</i>
129			Greenish Warbler	<i>Phylloscopus trochiloides</i>
130			Large-billed Leaf Warbler	<i>Phylloscopus magnirostris</i>
131		Pellorneidae	Puff-throated Babbler	<i>Pellorneum ruficeps</i>
132		Timaliidae	White-browed Scimitar Babbler	<i>Pomatorhinus schisticeps</i>
133			Striped Tit-Babbler	<i>Macronous gularis</i>
134		Dicaeidae	Thick-billed Flowerpecker	<i>Dicaeum agile</i>
135			Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchus</i>
136			Scarlet-backed Flowerpecker	<i>Dicaeum cruentatum</i>
137		Nectariniidae	Purple-rumped Sunbird	<i>Leptocoma zeylonica</i>
138			Purple Sunbird	<i>Cinnyris asiaticus</i>
139			Loten's Sunbird	<i>Cinnyris lotenius</i>
140		Passeidae	House Sparrow	<i>Passer domesticus</i>
141		Motacidae	Forest Wagtail	<i>Dendronanthus indicus</i>
142			White Wagtail	<i>Motacilla alba</i>
143			Citrine Wagtail	<i>Motacilla citreola</i>
144		Fringillidae	Common Rosefinch	<i>Carpodacus erythrinus</i>
145		Muscicapidae	Taiga Flycatcher	<i>Ficedula albicilla</i>





ANNEXURE 2



**ROUTE MAP : BASHIRHAT RANGE
SUNDARBAN TIGER RESERVE**



**Route Map: National Park West Range
Sundarban Tiger Reserve**



**Route Map: National Park East Range
Sundarban Tiger Reserve**



**Route Map: Sajnekhali Wildlife Sanctuary Range
Sundarban Tiger Reserve**

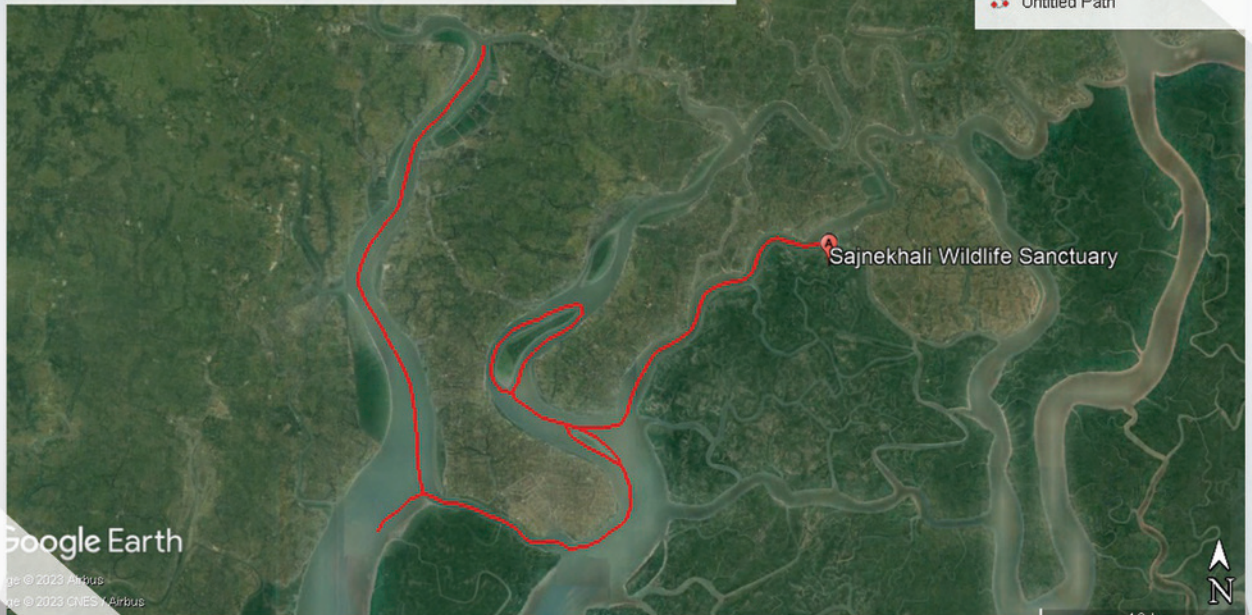


Route Map: Matla Range 24-Parganas (South) Division

Write a description for your map.

Legend

- Sajnekhali Wildlife Sanctuary
- Untitled Path



Route Map: Raidighi & Ramganga Range 24-Parganas (South) Division

Write a description for your map.

Legend

- Sajnekhali Wildlife Sanctuary
- Untitled Path





ANNEXURE 3

RECOMMENDATIONS AS PER UNDP:

- Large-scale plantation of trees in villages, especially tall trees suitable for nest building for large birds like birds of prey, storks, etc. should be taken up. The tree species considered to be planted should preferably be indigenous and should be resistant to high wind speed and storm surges so much prevalent in the area and which regularly uproots emergent trees. *Casuarina equisetifolia*, though an exotic species has been found to be preferred by some large birds as nesting and roosting trees.
- Whatever vegetation remains in the village mosaic, it is highly disturbed. Not only from the presence of a highly dense population but also from lopping and logging pressure, intensive use of insecticide in the orchards and conversion to other uses. It is recommended that to preserve the avifauna of the area in particular and the biodiversity in general certain small area of well vegetated village mosaic area with orchard, garden and small wetlands should be left aside as sanctuaries in each block to preserve the local avifauna and biodiversity for future generation.
- Prawn seedling collection, apart from affecting the whole aquatic ecosystem as a whole is also changing the microhabitat of the shore birds. Every effort should be expended to stop this highly destructive practice by providing alternative livelihood to the collectors.
- Wherever tourists visit areas of open beaches where birds also congregate like Sagar Island, Bakkhali, Kalash or Jambu Island there should be sign posts to make people aware about the importance of the beach for birds and informing tourists that the area should not be polluted and the birds should not be disturbed. Important areas which are small yet with significant bird population like the Halliday Wildlife Sanctuary should be closed to the general tourists and picnickers as apart from disturbing the birds, these groups often carry poultry products, potential carriers of Avian Flu.
- New tree plantations on open mudflats and open muddy or sandy beaches should always be done while keeping in mind the potential habitat of shorebirds. Prime shorebird habitats had vanished due to plantation programmes on such habitats.

- Though vast areas of the non-forest areas of the district are fishponds these are in most cases devoid of any significant waterfowl population. The water body is usually devoid of any floating or emergent vegetation, which is conducive to waterfowl and other birds that might have used it for roosting, feeding and nesting. The depths of water maintained in these ponds are very little and there is very little slope from the banks, which are steep-sided. This is not suitable for most wading waterfowls. Trapping and killing of waterfowl is also happening in many localities. Fishermen resent the presence of fish eating birds like the cormorants and actively drive them away or kill them. These wetlands would be ideal for waterfowl if properly managed. Some portions of these wetlands should be exclusively managed for waterfowl. These could be small wildlife sanctuaries or community reserves in some of the blocks. Fishing in these wetlands should be restricted. Wetland vegetation should be allowed to grow. There should be different gradients and slopes with varying depth of water to suit different species of waterfowl. Water level should be regulated to create suitable mudflats. Plantation of suitable trees in mounds within the wetlands will help to form roosting and breeding grounds for wetland birds. Plantation of trees along embankments should also be encouraged. At present our survey did not pinpoint any specific locality for this purpose where this can be built up because almost all the areas are now exploited severely at the cost of local biodiversity. But it is hoped that with proper planning many of the wetlands can bring back some of the former diversity of avian life.

- Destruction of habitat, indiscriminate use of insecticide, hunting and trapping still remains the few of the most important reasons for the vanishing avian life of Sunderban Biosphere Reserve. To slow down this process of decline in bird populations, creating awareness about birds among the general public is of prime importance. This should be done through regular awareness programmes in schools, colleges, clubs, societies and NGO's in the area about the importance of bird conservation. Posters and leaflets depicting the plight of the birds of Sunderban and telling the general public why they should conserve birds should be distributed. Effort should be aimed to create a sense of pride among the people of Sunderban about the wonderful bird resource that the area possess.

- As a future important ecotourism centre of the world, the wonderful birdlife of Sunderban mangrove forest should be brought to the notice of the millions of birdwatchers throughout the world through eye-catching websites, pamphlets, and booklets for a sustainable use of this resource.









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