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ORIGINAL ARTICLE



Species Richness, Population, & Habitat Utilization by Waterbirds of Balachhadi Coast, Jamnagar, Gujarat.

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ABSTRACT

Wetlands plays a crucial part in the maintenance of numerous natural cycles as well as the support of a diverse spectrum of wildlife. Wetlands are the most essential habitat for most waterfowl and migratory species on the planet. Wetlands are used by ducks around the world for food and breeding. Wetlands are used by migrating birds all over their range. Wetlands can stretch from pole to pole. Migratory birds rely on continental and intercontinental feeding, nesting, and resting habitats, which necessitate coordinated wetland conservation efforts across several countries. Coastal and inland wetland ecosystem services have a larger monetary value than other ecosystem types. Based on field studies, an endeavor has been made to compile the avian fauna of Balachhadi's coastal/tidal wetlands. Keywords: Balachhadi, Coastal Wetlands, Foraging, Waterbirds, Avifauna.

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INTRODUCTION

Wetlands are located between land and water ecosystems and share the characteristics of both. Wetlands is a general term used to define the universe of wetland habitats, including wetlands, swamps, and similar areas. There, excess water repeatedly has a regulatory effect on all biota (plants, animals, microbes). They are one of the most important ecosystems on the planet [2]. According to the wordings of Ramsar Convention's Article 1.1, wetlands are stated as: "Areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters." Including, the Ramsar Convention's Article 2.1, it acknowledges that wetlands:"May incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands." According to the definition by Ramsar Convention, 1971, a wide variety of natural and man-made aquatic areas including rivers, streams, lakes, ponds/tanks, irrigation reservoirs, dams/barrages, salt pans, intertidal flats, mangroves, and coral reefs are wetlands. However, deep water bodies are not treated as wetlands. Wetlands vary greatly in their formation, location, water and chemical balance, dominant flora, and soil or sediment properties. Wetlands are characterized by wetland hydrology (permanent or regular flooding), moist soils, and distinctive aquatic plants. Wetlands range broadly because of nearby and neighborhood adjustments in soils, terrain, climate, hydrology, water chemistry, flora, and different elements inclusive of human disturbance. Wetlands are discovered on each continent except Antarctica, from the tundra to the tropics. Wetlands are divided into types: coastal/tidal wetlands and inland/non-tidal wetlands.

Coastal Wetlands are found near the land-sea interface, in a habitat that can be the most topographically and sediment logically complicated on the planet. The coast can be substantially erosional or depositional

in the initial instance. Coasts can recede rapidly if erosional and prone to wave, tide, and wind agencies, resulting in a range of coastal shapes based on rock types, physical and chemical coastal processes, biota, and climate. Waves, storms, wind, groundwater, hydrochemistry, evaporation, and rainfall interact with land and sea to produce a variety of landforms and other physical, chemical, and biological products, which are often zoned physically, chemically, and biologically over the shore [2]. With the formation of estuaries and deltas, as well as associated lower scale physical, chemical, and biological perturbations, rivers discharging into the sea produce local complex nodal points. As a result, the beach is one of the most challenging wetlands settings to define. Coastal wetlands, like open sea habitats, offer habitat for a big style of marine and coastal species. Along the coasts, Coastal Birds/Shorebirds/Waterbirds may be visible in big numbers. Coastal wetlands are a completely unique type of wetland that is tormented by shifting water ranges and gives habitat for an in-depth variety of organisms, together with some endangered species. These essential features are water purifiers, fish breeding grounds, foraging grounds, and herbal global habitats. During their annual cycles, certain birds rely almost absolutely on wetlands for breeding, nesting, foraging, and haven. Throughout their lives, wetland-based birds require a wetland or wetland products. Migratory birds that use the coastal wetlands encompass ducks, shorebirds, gulls, terns, and flamingos. Many birds that live in intertidal regions are migrants who fly through the Central Asian-Indian Flyway, which stretches from Siberia to the Indian subcontinent through the Himalayas, each year. During top annual migration seasons, lots of birds journeying over the Central Asian-Indian Flyway descend on India's coastal wetlands searching out have and food [3]

MATERIAL AND METHODS

Study Area

Balachhadi is a small village in Jodiya Taluka of the Jamnagar district of Gujarat. It is 25 kilometres east of Jamnagar and is part of the Kachchh Gulf. Balachhadi is located between 22° 36' 0" Northern Latitude and 70° 13' 0" Eastern Longitude. The overall topographical cover of the village is 1182.75 hectares. The region lies inside the Gujarat-Rajwada biotic province of the semi-arid biogeographical sector in step with the category evolved with the aid of using Rodgers and Panwar (1988). Balachhadi is also considered a coastal wetland situated near the Gulf of Kutch. It is a resting and feeding place for various waterfowl, which are generally migratory or resident. Due to the temporal and spatial conditions in and around Balachhadi, this place is suitable for the colonization of waterbirds. These birds are generally found in coastal regions. In most parts of India. The main migratory birds using the Balachhadi coastal wetlands are Phoenicopterus (flamingos), waterfowl (ducks), waders (shore), Larus (gulls) and Sternidae (terns). Materials

The study was carried out for three months from November 2021 to February 2022. There was a total of eight sites for bird observations and these eight sites represented two types of habitats, i.e., marshy habitat and seashore habitat.

In each habitat (i.e.,marshy habitat and seashore habitat), bird enumerations (including species identification and abundance determination) were carried out using a pair of 10 x 50 binoculars. The birds were observed while standing at a pre-fixed observation point representing each site. Photographs of difficult-to-identify birds a high-end digital bridge camera (24x Zoom with 26 mm Wide-Angle to 624 mm Super-Telephoto Lens). Initially, a recognized bird guide was used to identify bird species. Birds sighted during the study period were classified according to their status as resident (R), migratory (M), & resident migrant (RM).

Methodology

The waterbird species were identified and counted through the direct sighting method. Several individuals were counted through the "Head Count" or "Block estimation" based on the magnitude of the population of observed species. If the population of a species was visibly low or if individuals were reasonably scattered, direct headcount was carried out. On the other hand, if the population of a species was visibly high or if individuals were densely packed, the block estimation strategy was adopted. The counted/estimated waterbird species were then recorded manually in the prescribed datasheet. The prescribed datasheet had a provision to record the information/data like name of the observed species, number/estimate of individuals of each species, site and habitat of occurrence, activity/behaviour at the time of observation, and time slot of observation (morning or evening).

RESULTS AND DISCUSSION

Balachhadi is a shallow coastal wetland that is known to support resident, resident- migratory and migratory waterbirds of the Indian Subcontinent. Fifty-seven species of waterbirds have been recorded. They belonged to 17 families. Of these, 14 (24%) species were Resident, 30 (53%) were Migratory and 13 (23%) species were Resident-Migrant (as shown in Chart 1). Scolopacidae (Whimbrel, Eurasian Curlew

etc.) has the highest number of species followed by Anatidae (Northern Pintail, Greylag Goose etc.), while Podicipedidae (Great Crested Grebe), Phalacrocoracidae (Little Cormorant), Ahingidae (Darter), Gruidae (Common Crane), Rallidae(Watercock), Haematopodidae (Eurasian Ovstercatcher), &Dromadidae (Crab Plover). (As shown in Graph 1). The (Table 2) indicates that out of 57 waterbird species recorded, 51 species (i.e., 89.5% species) were of Least Concern (Lc) status as per IUCN Red List. Moreover, 6 species (i.e., 10.5% species) belonged to the Near Threatened (Nt) status of the IUCN Red List. Thus, it's miles thrilling to show that no waterbird species belonging to Critically Endangered (Ce), Endangered (En) or Vulnerable (Vu) had been recorded withinside the Balachhadi coastal wetland area. The table also revealed that except for three species (viz. Common Crane, Red-wattled Lapwing and Yellow-wattled Lapwing), all the 54 species recorded were obligatorily aquatic (denoted as "A" in the table). It may be noted that Common Crane and Red-wattled Lapwing are known to have primarily aquatic and secondarily terrestrial niches, whereas Yellow-wattled Lapwing is known to have a primarily terrestrial and secondarily aquatic niche. Based on Graph 2, we conclude that, Highest average population (for 3 months study period) was recorded for Kentish Plover (n=320). The maximum population (n=584) was also the highest for the same species. Some other wetland bird species with relatively good average and maximum population were Greater Flamingo (n=228, 272), Lesser Sand Plover (n=147, 270), Gadwall (n=127, 158), Gull-billed Tern (n=109, 109), Crab Plover (n-172, 370). For some birds like Ruff, Little Ringed Plover, Painted Stork and Common Greenshank, the only maximum population was appreciably high. Lowest average population for the 3 months study period was recorded for Dalmatian Pelican (n=1), Yellowwattled Lapwing (n=1), Spot-billed Duck (n=1) and Black-necked Stork (n=1). The highest maximum population (n=1) was also recorded for the same species. Some other wetland bird species with relatively poor average and maximum population were Pallas's Gull (n=2, 5), Ruddy Turnstone (n=3, 5), Eurasian Oystercatcher (n=3, 6), Watercock (n-2,4).Some waterbirds like Lesser Flamingo, Little Ringed Plover, Great White Pelican, and Great Egret occurred in moderate average number.

Chart 2 indicates that the waterbirds utilize the coastal wetlands of Balachhadi majorly for Foraging 33 (58%), Foraging & resting 8 (14%), Locomotion 9 (16%), & Resting 7 (12%) out of total population of 57 recorded species at both Habitats (i.e., Open Water-cum-marshy habitat & shoreland area).

Level 1	Level 2	Level 3		
Inland/Non-Tidal Wetlands				
	Natural			
		Lakes		
		Ox-Bow Lakes/ Cut-Off Meanders		
		High altitude Wetlands		
		Riverine Wetlands		
		Waterlogged		
		River/stream		
	Anthropogenic			
		Reservoirs/ Barrages/Dams		
		Tanks Ponds		
		Waterlogged		
		Salt pans/farms		
Coastal/Tidal Wetlands				
	Natural			
		Lagoons		
		Creeks		
		Beaches		
		Intertidal mudflats		
		Salt Marsh		
		Mangroves		
		Coral Reefs		
	Anthropogenic			
		Salt pans/farms		
		Aquaculture ponds		

Table 1: Types of wetlands found in India at different levels of categorization.

Source: National Wetland Inventory and Assessment [6]

Table 2: Checklist of waterbirds recorded at Balachhadi with important additional information.

S N	Name of the Species	Scientific Name	Family	IUCN Status	Residential status	Ecologic al Niche
1	Great Crested Grebe	Podiceps cristatus.	Podicipedidae	Least Concerned	Migratory	Aquatic
2	Great White Pelican	Pelecanusonocrotalus.		Least Concerned	Resident- Migratory	Aquatic
3	Dalmatian Pelican	Pelecanidae Pelecanus crispus.		Near Threatened	Migratory	Aquatic
4	Little Cormorant	Phalacrocorax niger.	Phalacrocoracidae	Least Concerned	Resident	Aquatic
5	Oriental Darter	Anhinga melanogaster.	Anhingidae	Near Threatened	Resident	Aquatic
6	Western Reef Heron	Egrettagularis.		Least Concerned	Resident- Migratory	Aquatic
7	Grey Heron	Ardea cinerea.		Least Concerned	Resident- Migratory	Aquatic
8	Indian Pond Heron	Ardeolagrayii.	Ardeidae	Least Concerned	Resident	Aquatic
9	Great Egret	Casmerodius albus.		Least Concerned	Resident- Migratory	Aquatic
10	Intermediate Egret	Mesophoyx intermedia.		Least Concerned	Resident- Migratory	Aquatic
11	Painted Stork	Mycteria leucocephala.		Near	Resident	Aquatic
12	Black-necked Stork	Ephippiorhyncus asiaticus	Ciconiidae	Near	Resident	Aquatic
13	Black-headed Ibis	Pseudibispapillosa.		Least	Resident	Aquatic
14	Eurasian Spoonbill	Platalealeucorodia.	Threskiornithidae	Least	Resident	Aquatic
15	Greater Flamingo	Phoenicopterus ruber.	Phoenicopteridae	Least	Resident	Aquatic
16	Lesser Flamingo	Phoenicopterus minor.		Near Threatened	Resident	Aquatic
17	Greylag Goose	Anseranser.		Least Concerned	Resident	Aquatic
18	Mallard	Anas platyrhynchos.	Anas platyrhynchos. Anas strepera. Anas querquedula. Anatidae	Least Concerned	Resident- Migratory	Aquatic
19	Gadwall	Anas strepera.		Least Concerned	Migratory	Aquatic
20	Garganey	Anas querquedula.		Least Concerned	Migratory	Aquatic
21	Northern Shoveler	Anas clypeata.		Least Concerned	Migratory	Aquatic
22	Northern Pintail	Anas acuta.		Least Concerned	Migratory	Aquatic
23	Spot-billed Duck	Anas poecilorhyncha.		Least Concerned	Resident	Aquatic
24	Common Teal	Anas crecca.		Least Concerned	Migratory	Aquatic
25	Common Crane	Grus.	Gruidae	Least Concerned	Migratory	Aquatic- Terrestri al
26	Watercock	Gallicrex cinerea.	Rallidae	Least Concerned	Resident- Migratory	Aquatic
27	Eurasian Oystercatcher	Haematopusostralegus.	Haematopodidae	Least Concerned	Migratory	Aquatic
28	Pacific Golden Plover	Pluvialis fulva.		Least Concerned	Migratory	Aquatic
29	Lesser Sand Plover	Charadrius mongolus.	Charadriidae	Least Concerned	Resident- Migratory	Aquatic
30	Greater Sand Plover	Charadrius leschenaultia.		Least Concerned	Migratory	Aquatic
31	Little Ringed Plover	Charadrius dubius.		Least Concerned	Resident- Migratory	Aquatic
32	Kentish Plover	Charadrius alexandrines.		Least Concerned	Resident- Migratory	Aquatic

S N	Name of the Species	Scientific Name	Family	IUCN Status	Residential status	Ecologic al Niche
33	Yellow-Wattled Lapwing	Vanellusmalabaricus.		Least Concerned	Resident	Aquatic- Terrestri al
34	Red-wattled lapwing	Vanellus indicus.		Least Concerned	Resident	Aquatic- Terrestri al
35	Bar-tailed Godwit	Limosalapponica.		Least Concerned	Migratory	Aquatic
36	Whimbrel	Numenius phaeopus.		Least Concerned	Migratory	Aquatic
37	Eurasian Curlew	Numenius arquata.		Near Threatened	Migratory	Aquatic
38	Common Redshank	Tringa tetanus.		Least Concerned	Resident- Migratory	Aquatic
39	Spotted Redshank	Tringaerythropus.		Least Concerned	Migratory	Aquatic
40	Common Greenshank	Tringanebularia. Tringastagnatilis.		Least Concerned	Migratory	Aquatic
41	Marsh Sandpiper			Least Concerned	Migratory	Aquatic
42	Terek Sandpiper	Xenus cinereus.	Scolopacidae	Least Concerned	Migratory	Aquatic
43	Ruddy Turnstone	Arenaria interpres.	ia interpres.		Migratory	Aquatic
44	Sanderling	Calidris alba.		Least Concerned	Migratory	Aquatic
45	Little Stint	Calidris minuta.		Least Concerned	Migratory	Aquatic
46	Temminck's Stint	Calidris temminckii.		Least Concerned	Migratory	Aquatic
47	Dunlin	Calidris alpina.		Least Concerned	Migratory	Aquatic
48	Curlew Sandpiper	Calidris ferruginea.		Least Concerned	Migratory	Aquatic
49	Ruff	Philomachus pugnax.		Least Concerned	Migratory	Aquatic
50	Black-winged Stilt	Himantopus.	D	Least Concerned	Resident- Migratory	Aquatic
51	Pied Avocet	Recurvirostraavosetta.	Recurvirostridae	Least Concerned	Migratory	Aquatic
52	Crab Plover	Dromasardeola.	Dromadidae	Least Concerned	Migratory	Aquatic
53	Caspian Gull	Larus cachinnans.		Least Concerned	Migratory	Aquatic
54	Lesser Black-backed Gull	Larus fuscus.		Least Concerned	Migratory	Aquatic
55	Palla's Gull	Larus ichthyaetus. Laridae		Least Concerned	Resident	Aquatic
56	Gull-billed Tern	Gelochelidonnilotica.		Least Concerned	Resident- Migratorv	Aquatic
57	Little Tern	Sterna albifrons.		Least Concerned	Migratory	Aquatic

Source: Personal Observations [4][5]



Figure 1: Balachhadi village (Jodiya Taluka, Jamnagar Districts) with location points of the study site for bird monitoring for the study period (November 2021 to February 2022).



Figure 2: Methodology flow chart for bird study at Balachhadi coastal wetland.



Chart 1: Proportion of Resident, Migratory and Resident-Migratory Wetland bird Species at Balachhadi coastal wetlands.



Graph 1: Number of species belonging to 17 families.









Graph 2: Maximum & Average population of recorded Waterbird species during the study period of 3 Months.



Chart 2: Activities carried out through utilization of 2 habitats by the recorded wetland bird species between November 2021 and February 2022.

CONCLUSION

The monitoring from November 2021 to February 2022 has shown that the wetland area has a high capability of supporting rich wetland bird diversity as in the short period of 3 months 57 species of wetland-dependent birds could be recorded. Moreover, it can also be concluded that Balachhadi coastal wetland is good for supporting migratory birds than the other two types, i.e., resident and resident-

migratory species. The study has indicated that several migratory species supported by this wetland in 3 months period were double the number of species of each of the other two categories of birds recorded at the wetland.

As maximum of the birds recorded at Balachhadi wetland had been having "Least Concern" popularity in context with the IUCN Red List of Threatened Species, there may be no damage in persevering with regulated tourism or exercise interest withinside the vicinity as this place is very close to the Marine National Park and Sanctuary.

RECOMMENDATIONS

- As the area is adjacent to the MNP & S, the authorities should give some attention to conserving it as an eco-tourism (and not commercial tourism) site.
- People visiting this area for recreation should be prevented from littering. For this purpose, signage boards giving warnings against littering should be established.
- Tourists and visitors should also be discouraged from strolling towards open water-cum-marshy areas as some shy species like Crab Plovers and ducks etc. use this habitat. Even around shoreland, trails for the movement of tourists/visitors should be permanently marked at a safe distance so that tourists' movements will not disturb the bird congregations.
- This wetland area can be used for nature education activities for the students of nearby "Sainik School Balachhadi".

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