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Understanding the mangrove-associated avifauna and their conservation status in the Gorai Creek, Western Mumbai, Maharashtra, India: A Recent Study

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Abstract— *The research was conducted from June 2017 to June 2019 to better understand the diversity and current state of the avifauna in the Gorai Creek region. 96 species belonging to 39 families from 16 orders, including terrestrial and aquatic birds, were identified as surviving near the stream over the two-year research period, including residents, migratory, common, uncommon, and unusual species. 64 species were permanent birds, 28 were winter migrants, 4 were summer migrants, 23 were uncommon, 57 were common, and 16 were rare. Anatidae, Ardeidae, Cuculidae, Accipitridae, Sturnidae, Strigidae, Laridae, Charadridae, Scolopacidae, and Rallidae were the most regularly observed bird families. The extensive mangrove cover around the creek provided food for all the birds. The ferry system to Gorai village, as well as the Essel World Park, has been seen to mildly impair the birds' breeding and foraging. Seasonal changes have a significant impact on bird numbers. Except for the ferry system, anthropogenic disturbances are quite minimal in the area, therefore the creek has less pollution and dense mangrove foliage, which shelters the avifauna that thrives in the zone.*

Keywords— ***Aquatic birds, Avifauna, creek, Gorai, mangroves.***

I. INTRODUCTION

Mangrove systems are a perennial, salt-tolerant plant community that thrives in tropical and subtropical intertidal coastal zones across the world. Mangroves have been found to contain a larger diversity of terrestrial and aquatic birds than tidal flats, floodplains, and coastlines (Mac Arthur and Mac Arthur, 1961). Mangrove habitats are regarded to be among the world's most prolific ecosystems (Mann, 1982). Despite their importance, mangrove ecosystems have been destroyed or degraded to the tune of 50% in the last two decades (Zakaria and Rajpar, 2015). They are important habitats for many faunal species, offering refuge, food, and breeding opportunities (Mestre, Krul, and Moraes 2007). More than 40% of bird species and roughly 12% of other faunal species are found in wetlands across the world (Rajpar and Zakaria, 2010). The health of a mangrove ecosystem is determined through detailed investigations of various physical and chemical factors, as well as studies of indicator organisms, particularly avifaunal species. Mangrove trees have long been known to play a critical role in estuarine ecosystems, sustaining most of the other creatures that rely on the lush mangroves for survival. Birds are regarded as the most effective biodiversity indicators among a range of creatures, owing to their resonance and connection with humans and their lifestyles (Gregory and Strien, 2010). In a mangrove community, the presence of birds is the best sign of the system's health (Holguin et al. 2006). Although birds are the finest bioindicators and mangroves act among the most favored nesting and feeding sites for the avifauna, there is little research on the avifauna of the mangrove

environment. There is limited research on the Gorai mangroves and the birds that live in the habitat. Chatthan et al., 2008 published research on the avifauna found in the Gorai mangrove system. The survey identified 66 species from 24 families and 15 orders. There has been very little research in the region after this first record.

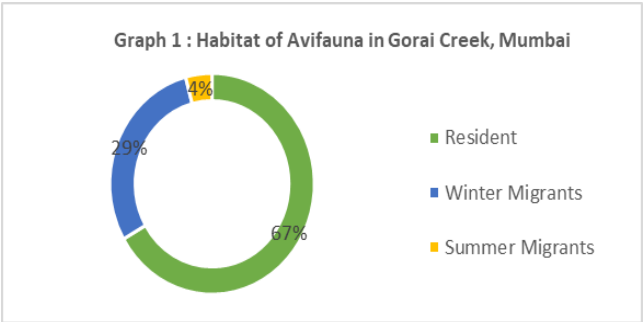
The purpose of this study is to update existing data and to investigate and describe the avifaunal species that survive in the Gorai Creek mangrove habitat. A preliminary investigation of the impact of human activity in the area has also been made.

II. MATERIALS AND METHOD

The Gorai Creek area, which is roughly 10 feet above sea level and located between 19°14' 12.69" N and 72°49'12.51" E, is the research location for the current investigation. The creek is a 12-kilometer length of mangrove mudflats and low-lying marsh that runs inland. The creek's southern section is Gorai-Charkop, while the northern region is Gorai village. Semi-diurnal tides, which flood the creek's lower portions, have a big impact on the area. Avifaunal observations were made at ten sites along the stream channel. From June 2017 to June 2019, the avifauna was documented in the early mornings from 5.00 AM IST to 7 AM IST and in the evenings from 5 PM IST to 7 PM IST over a period of two years on alternate days. Using the point transect approach, the birds were watched and recorded at each position. The birds were photographed with a Nikon D300 digital single-lens reflex camera and binoculars for observation. Field guides were used to identify the birds (Grimmett, Inskipp C, Inskipp T-2011; Ali, Salim – 1996; Salim Ali – 2002). According to "The Book of Indian Birds," the birds were categorized and tallied based on their frequency and ecological condition (Salim Ali, 2002).

III. FIGURES AND TABLES

Fig 1 Map showing the study points around the creek



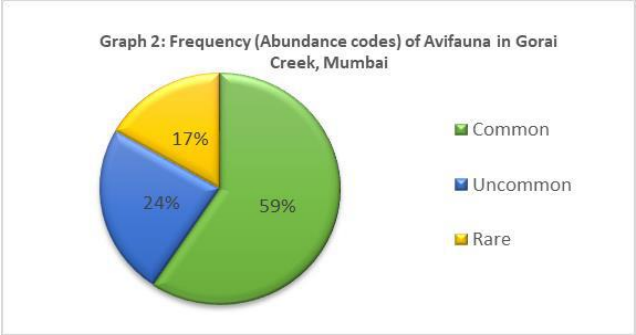


Table 1. List of birds of Gorai Creek which are globally threatened.

Common Name	Scientific Name	Conservation Status
Black-headed Ibis	Threskiornis melanocephalus	NT
Black-necked Stork	Ephippiorhyncus asiaticus	NT
Oriental Darter	Anhinga melanogaster	NT
Lesser Flamingo	Phoenicopterus minor	NT
Masked Finfoot	Heliopais personatus	EN
Eurasian Curlew	Numenius arquata	NT
Pallas's Fish Eagle	Haliaeetus leucoryphus	EN
Greater Spotted Eagle	Aquila clanga	VU
Alexandrine Parakeet	Psittacula eupatria	NT

Table 2. Annotated checklist of birds of Gorai Creek, Mumbai, India.

Order	Family	Common name	Scientific Name	Conservation Status	Habitat	Abundance code
Pelecaniformes	Ardeidae	Little Egret	*Egretta garzetta*	LC	R	C
		Cattle Egret	*Bubulcus ibis*	LC	R	C
		Intermediate Egret	*Mesophoyx intermedia*	LC	R	C
		Great Egret	*Casmerodius albus*	LC	R	C
		Western Reef Egret	*Egretta gularis*	LC	R	C
		Purple Heron	*Ardea purpurea*	LC	R	UC
		Indian Pond Heron	*Ardeola grayii*	LC	R	C
		Grey Heron	*Ardae cinerea*	LC	WM	C
		Black-crowned Night Heron	*Nycticorax nycticorax*	LC	R	C
	Threskiornithidae	Black-headed Ibis	*Threskiornis meloanocephalus*	NT	R	UC
Ciconiiformes	Ciconidae	Black-necked Stork	*Ephippiorhyncus asiaticus*	NT	R	r
		Asian Open Bill	*Anastomus oscitans*	LC	WM	r
Suliformes	Anhingidae	Oriental Darter	*Anhinga melanogaster*	NT	WM	C
	Phalacrocoracidae	Little Cormorant	*Phalacrocorax niger*	LC	R	C
		Indian Cormorant	*Phalacrocorax fuscicollis*	LC	WM	C
		Great Cormorant	*Phalacrocorax carbo*	LC	WM	C
Phoenicopteriformes	Phoenicopteridae	Greater Flamingo	*Phoenicopterus roseus*	LC	WM	C
		Lesser Flamingo	*Phoenicopterus minor*	NT	SM	r
Anseriformes	Anatidae	Common Teal	*Anas crecca*	LC	WM	C
		Lesser Whistling Duck	*Dendrocygna javanica*	LC	R	C
		Eurasian Wigeon	*Anas penelope*	LC	WM	C
		Northern Pintail	*Anas acuta*	LC	WM	C
Gruiformes	Rallidae	Purple Swamp Hen	*Porphyrio porphyrio*	LC	R	C
		Common Moorhen	*Gallinula chloropus*	LC	R	C
		White-Breasted Water Hen	*Amaurornis phoenicurus*	LC	R	UC
		Common Coot	*Fulica atra*	LC	R	C
		Slaty-breasted Rail	*Galliralus striatus*	LC	R	UC
	Heliornithidae	Masked Finfoot	*Heliopais personatus*	EN	R	r
Charadriiformes	Laridae	Heuglin's Gull	*Larus fuscus*	LC	WM	C

		Steppe Gull	*Larus barabensis*	LC	WM	C
		Black-headed Gull	*Larus ridibundus*	LC	WM	C
		Caspian Tern	*Hydroprogne caspia*	LC	WM	UC
	Stercorariidae	Arctic Skua	*Stercorarius parasiticus*	LC	WM	r
	Recurvirostridae	Black-winged Stilt	*Himantopus himantopus*	LC	WM	C
	Charadriidae	Red-wattled Lapwing	*Vanellus indicus*	LC	R	C
		White-tailed Lapwing	*Vanellus leucurus*	LC	WM	r
		Caspian Plover	*Charadrius asiaticus*	LC	WM	r
		Grey Plover	*Pluvialis squatarola*	LC	WM	UC
		Kentish Plover	*Charadrius alexandrinus*	LC	WM	C
	Scolopacidae	Marsh Sandpiper	*Tringa stagnatilis*	LC	WM	C
		Red-necked Phalarope	*Phalaropus lobatus*	LC	WM	UC
		Eurasian Curlew	*Numenius arquata*	NT	WM	r
		Little Stint	*Calidris minuta*	LC	WM	C
		Temminck's Stint	*Calidris temminckii*	LC	WM	C
Falconiformes	Falconidae	Peregrine Falcon	*Falco peregrinus*	LC	R	C
Accipitriformes	Accipitridae	Brahminy Kite	*Haliastur indus*	LC	R	C
		Black Kite	*Milvus migrans*	LC	R	C
		Shikra	*Accipiter badius*	LC	R	C
		Pallas's Fish Eagle	*Haliaeetus leucoryphus*	EN	R	r
		Black Eagle	*Ictinaetus malayensis*	LC	R	UC
		Greater Spotted Eagle	*Aquila clanga*	VU	WM	UC
	Pandionidae	Osprey	*Pandion haliaetus*	LC	WM	C
Columbiformes	Columbidae	Spotted Dove	*Streptopelia chinensis*	LC	R	C
		Blue Rock Dove	*Columba livia*	LC	R	C
Psittaciformes	Psittaculidae	Rose-ringed Parakeet	*Psittacula krameri*	LC	R	C
		Alexandrine Parakeet	*Psittacula eupatria*	NT	R	r
Cuculiformes	Cuculidae	Greater Coucal	*Centropus sinensis*	LC	R	UC
		Lesser Coucal	*Centropus bengalensis*	LC	R	UC
		Eurasian Cuckoo	*Cuculus canolus*	LC	SM	UC
		Pied-crested Cuckoo	*Clamator jacobinus*	LC	SM	UC

		Asian Koel	*Eudynamys scolopaceus*	LC	R	C
Piciformes	Megalaimidae	Coppersmith Barbet	*Psilopogon haemacephalus*	LC	R	C
Coraciiformes	Meropidae	Green Bee-Eater	*Merops orientalis*	LC	R	C
	Alcedinidae	White-throated Kingfisher	*Halcyon smyrnensis*	LC	R	C
		Ruddy Kingfisher	*Halcyon coromanda*	LC	R	r
		Black-capped Kingfisher	*Halcyon pileata*	LC	R	UC
		Common Kingfisher	*Alcedo atthis*	LC	R	C
		Pied Kingfisher	*Ceryle rudis*	LC	R	UC
Passeriformes	Pachycephalidae	Mangrove Whistler	*Pachycephala cinerea*	LC	R	UC
	Pycnonotidae	Red-whiskered Bulbul	*Pycnonotus jocosus*	LC	R	C
		White-browed Bulbul	*Pycnonotus luteolus*	LC	R	C
	Muscicapidae	Indian Robin	*Saxicoloides fulicatus*	LC	R	C
	Leiothrichidae	Rufous Babbler	*Argya subrufa*	LC	R	r
	Zosteropidae	Oriental White-eye	*Zosterops palpebrosus*	LC	R	C
	Cisticolidae	Common Tailorbird	*Orthotomus sutorius*	LC	R	C
	Rhipiduridae	White-throated Fantail	*Rhipidura albicollis*	LC	R	r
		White-browed Fantail	*Rhipidura aureola*	LC	R	C
	Monarchidae	Asian Paradise Flycatcher	*Terpsiphone paradisi*	LC	SM	UC
	Dicaeidae	Pale-billed Flowerpecker	*Dicaeum erythrorhynchos*	LC	R	C
	Estrildidae	Black-headed Munia	*Lonchura malacca*	LC	R	UC
	Passeridae	Baya Weaver	*Ploceus philippinus*	LC	R	UC
		House Sparrow	*Passer domesticus*	LC	R	C
	Sturnidae	Asian Pied Starling	*Gracupica contra*	LC	R	UC
		Common Myna	*Acridotheres tristis*	LC	R	C
		Bank Myna	*Acridotheres ginginianus*	LC	R	C
		Rosy Starling	*Pastor roseus*	LC	WM	UC
		Common Starling	*Sturnus vulgaris*	LC	WM	r
	Dicruridae	Black Drongo	*Dicrurus macrocercus*	LC	R	C
	Oriolidae	Eurasian Golden	*Oriolus oriolus*	LC	R	UC

		Oriole				
	Corvidae	Jungle Crow	*Corvus macrorhynchos*	LC	R	C
		House Crow	*Corvus splendens*	LC	R	C
Strigiformes	Strigidae	Barn Owl	*Tyto alba*	LC	R	UC
		Oriental Bay Owl	*Phodilus badius*	LC	R	r
		Buffy Fish Owl	*Ketupa ketupu*	LC	R	r
		Spotted Owlet	*Athene brama*	LC	R	C
		Eurasian Eagle Owl	*Bubo bubo*	LC	R	C

IV. RESULTS AND DISCUSSION

The current investigation, which lasted two years, discovered 96 species of avifauna from 39 families and 16 orders, both terrestrial and aquatic. Residents, summer and winter migrants were all seen to be reliant on the tidal creek for survival. Anatidae, Ardeidae, Cuculidae, Accipitridae, Sturnidae, Strigidae, Laridae, Charadridae, Scolopacidae, and Rallidae were the most regularly observed bird families. Residents (observed throughout the year and are residents of the locality); Winter Migrants (observed only during the winter season, i.e., December to January); and Summer Migrants (observed only during the summer season, i.e., June to August) (observed only during the summers i.e., April to June). There were 64 resident birds, 28 winter migrants, and four summer migrants among the observations. Depending on the observations made throughout the research period, the observed birds were additionally abundance categorized as Common, Uncommon, or Rare.

• C (Common) (Found in moderate to large numbers, and easily found in appropriate habitat at the right time of year).

• Uncommon (UC) (found in limited numbers, usually—but not always—with some effort in proper habitat at the correct time of year)

• Rare (r) (Occurs once a year in extremely small quantities.) It's not something you'd expect to find on any one day, but it may be located with enough effort throughout the course of the relevant season(s).

There were 57 common, 23 uncommon, and 16 rarely occurring species found and recorded. The percentage of birds spotted based on abundance codes is shown in graph 2.

Out of the total species of birds observed, there were 9 species whose conservation status is globally threatened according to the IUCN/ Birdlife International Red Data List 2011.

The presence of nine globally vulnerable bird species means that the species must be regularly monitored and conserved as needed. Even though the number of birds of each of these species seen was quite low, they were found in lonely groups spread throughout the extensive mangrove vegetation in the stream. They have been seen to rely on the ecosystem for reproducing and nesting as their primary means of survival. The existence of two globally vulnerable bird species, *Psittacula eupatria* and *Phoenicopterus minor*, belonging to the families Psittaculidae and Phoenicopteridae, was discovered in prior research was undertaken by Chatthan et al. in 2008.

Chatthan et al., 2008 found 66 species from 25 families in the same area. The recent study revealed a higher number of species detected, indicating that the mangroves have been home to a wide range of bird diversity, as well as a rise in their population, indicating that the region is ideal for their survival. Because of their density, mangroves are known to serve as breeding grounds and nesting sites. Because of their variety and sensitivity, birds are frequently used as bioindicators (Jarvinen and Vaisanen, 1979). The number of birds in an ecosystem shows the area's environmental quality, pollution level, security, and food and habitat availability (Pachpande and Pejaver, 2016). This indicates that there is less pollution in the area and that anthropogenic activities in the area are minimal. The Maharashtra Maritime Board developed jetties on both banks of the Gorai stream. The only significant activity in the region is the ferries that connect Gorai Village to Borivali West and another that connects the amusement park Essel World to Borivali. A few fishermen rely on the region as their primary source of fish and income. However, given the abundance of avifauna in the area, it is reasonable to assume that these activities have little impact on the environment. Because of the Maharashtra Maritime Board's care, the waters of the tidal stream are also quite clean and pollution-free.

Due to the sensitive nature and significance of mangrove ecosystems and their thick lush green habitats for nesting and breeding birds, many comparable studies have been

conducted in mangrove ecosystems to examine the variety of avifauna in numerous tidal creeks across the world. In the Gulf of Kuchchh mangroves in Gujarat, Oswin documented 87 species of waterbirds in 2002. Verma et al., 2004 identified 149 bird species from Mehul Creek, Mumbai, divided into 14 orders and 35 families. Saravanan et al. (2008) found 14 species from the Pondicherry mangroves in India, divided into four orders and ten families. 46 species of terrestrial and aquatic birds were identified from 30 families in the Mallathahalli Lake of Bangalore by Padmakumar et al. (2020). In 2009, Kumar and Gupta discovered 54 species of wetland birds, divided into 36 genera, 15 families, and 5 orders around Kurukshetra. Pawar discovered 56 species of birds in the mangroves of the Uran coast in 2011, spanning 11 orders, 29 families, and 46 genera. Pachpande and Pejaver (2016) conducted point-count bird surveys in Thane Creek in Mumbai, which revealed the presence of 95 species, indicating the creek's high production. In the Bhitarkanika Mangroves, Gopi and Pandav documented 263 species of birds from 63 families in 2007.

REFERENCES

[1] Chatthan, R. R., Shingadia, H. U., & Sakthivel, V. (2008). Survey of avifauna of Borivali mangroves along the coast of Mumbai. *Nature Environment and Pollution Technology*, 7(2), 229.

[2] Chaudhari-Pachpande, S., & Pejaver, M. K. (2016). A preliminary study on the birds of Thane Creek, Maharashtra, India. *Journal of Threatened Taxa*, 8(5), 8797-8803.

[3] Gregory, R. D. and van A. Strien (2010). Wild bird indicators: Using composite population trends of birds as measures of environmental health. *Ornithological Science*, 9(1): 3 – 22.

[4] Grimmett, R. Inskipp, C. and Inskipp, T (2011). Birds of the Indian subcontinent, Oxford University Press. New Delhi-8-88.

[5] Gopi, G. V., & Pandav, B. (2007). Avifauna of Bhitarkanika mangroves, India. *Zoos' Print Journal*, 22(10), 2839-2847.

[6] Holguin, G., P. Gonzalez-Zamorano, L.E. de-Bashan, R. Mendoza, E. Amador and Y. Bashan (2006). Mangrove health in an arid environment encroached by urban development – a case study. *Science of the Total Environment*, 363: 260 – 274.

[7] Järvinen, O., & Väisänen, R. A. (1979). Changes in bird populations as criteria of environmental changes. *Ecography*, 2(2), 75-80.

[8] Khannan, R. (1998). Avifauna of the Anaimolai hills (Western Ghats) of South India. *Journal of Bombay Nat. Hist. Soc*, 95(2), 193-214.

[9] Kumar, P. and S. K. Gupta. (2009). Diversity and Abundance of Wetland Birds around Kurukshetra, India. *Our Nature*, 7: 212 – 217.

[10] Mac Arthur and Mac Arthur (1961). On bird species diversity. Ecology 42: 594-598.

[11] Mann, K. (1982). Ecology of coastal waters: a system approach. Berkeley: University of California.

[12] Mestre, L.A.M., Krul, R.; Moraes, V.S. (2007): Mangrove bird community of Paranaguá Bay - Paraná, Brazil in Brazilian Archives of Biology and Technology Vol. 50, no 1: pp. 75-83 http://www.scielo.br/scielo.php?

[13] Oswin, S. D. (2002). Biodiversity and Ecology of the Gulf of Kachchh Mangroves, Gujarat. Procd. Nat. Semi. on Creeks, Estuaries and Mangroves – Pollution and Conservation, Organized by, B. N. B. College of Science, Thane, Mumbai on 28th – 30th Nov 2002, pp 78–83.

[14] Padmakumar, Vidya., C. Silamabarasan., Joseph, Shine (2020). Avifaunal diversity of Mallathahalli Lake in Bangalore Urban dt., Karnataka, India. *The Bioscan*, 15(2): 165-167.

[15] Pawar, P. R. (2011). Species diversity of birds in mangroves of Uran (Raigad), Navi Mumbai, Maharashtra, West coast of India. *Journal of Experimental Sciences*, 2(10), 73-77.

[16] Rajpar, M. N., & Zakaria, M. (2010). Density and Diversity of Waterbirds and Terrestrial birds at Paya Indah Wetland Reserve, Selangor Peninsular Malaysia. *Journal of Biological Science*, 10 (7), 658-666.

[17] Salim Ali. (2002). The book of Indian birds (13th Revised edition) Oxford University Press, New Delhi, 326.

[18] Saravanan, K. R., K. Ilangovan and A. B. Khan. (2008). Floristic and macrofaunal diversity of Pondicherry mangroves, South India. *Tropical Ecology*, 49(1): 91 – 94.

[19] Verma, A., S. Balachandran, N. Chaturvedi and V. Patil (2004). A preliminary report on the Biodiversity of Mehul Creek, Mumbai, India with special reference to Avifauna, *Zoo's Print Journal*, 19(9): pp 1599 – 1605.

[20] Zakaria, M., & Rajpar, M. N. (2015). Assessing the fauna diversity of Marudu Bay mangrove forest, Sabah, Malaysia, for future conservation. *Diversity*, 7(2), 137-148.