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Avifaunal study in the Nature Trail Park, a protected coastal zone of Digha, Purba Medinipur, West Bengal

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Abstract

The objective of the current study was to assess the levels of avian diversity and abundance within the Nature Trail Park, Digha. The study was conducted using the line transects method, spanning from December 2020 to March 2022. A comprehensive tally of avian species was conducted, resulting in the identification of 118 bird species. These species were classified into 16 orders and 46 families, with two of them falling under the category of Near Threatened (NT) species. The order Passeriformes exhibited the highest level of dominance, encompassing a total of 46 species. Additionally, the Scolopacidae family, consisting of wader birds, displayed the greatest level of distribution within the park and its surrounding vicinity, comprising a total of 14 species.

Keywords: Diversity, birds, Digha, habitat, Passeriformes, Nature Trail Park

1. Introduction

Urbanisation, land-use changes, and the impact of climate change have been identified as significant threats to global biodiversity (Soule, 1991; White et al., 1997; Lerman and Warren, 2011; Chen et al., 2011; Sekercioglu et al., 2012). According to Davidson (2014), a significant proportion of coastal wetlands across the globe, approximately 30%, has experienced a decline

in their existence as a result of recent anthropogenic actions. The presence of nature-based tourism and recreational activities in and around protected areas can potentially result in adverse environmental consequences for biodiversity. These impacts may arise from factors such as urban development, landscape fragmentation, pollution, and heightened levels of disturbance (Huhta and Sulkava, 2014).

The establishment of this Nature Trail Park located in the Digha coastal area of the Bay of Bengal, serving as a transitional zone between terrestrial and aquatic ecosystems has instilled hope regarding the preservation of its natural resources. The location of the site is situated approximately 187 kilometres southwest of Kolkata. The vicinity surrounding Digha beach experienced significant devastation in the aftermath of Cyclone Yas, resulting in a landscape resembling debris and ruins. The forest department has made the decision to engage in the conservation of local biodiversity and raise awareness among the general public regarding the wildlife present in the area, emphasising the benefits derived from these efforts by establishing a park.

2. Materials and Methods

Digha, situated in eastern India, is renowned as a prominent coastal destination characterised by its expansive size. Over the course of its existence, Digha has encountered significant challenges related to erosion, prompting extensive engineering interventions since the 1970s.

The park is located at the geographical coordinates of 21°36'47.84"N latitude and 87°29'21.01"E longitude, and it has an elevation of 38 metres above mean sea level. The researchers employed the line transect method to sample birds, wherein they covered a distance of approximately 1 kilometre in a linear fashion within the park and along the shoreline (Bibby et al., 2000). Random walks were performed at the sampling location during two separate time intervals: morning (6:30am-8:30am) and afternoon (3:30pm-5:30pm), with the scheduling of each walk dependent on the presence of enough daylight. The Olympus Binocular 10x50 was employed to carry out detailed observations of diverse species. The Olympus Binocular 10x50 was utilised for conducting close observations of various species. The photographic documentation of various species was conducted using the Nikon B600 and Nikon P900 cameras. The compilation of species was generated in accordance with Grimmett et al., (2016).

Vegetation

The Digha Nature Trail Park has been established to encompass the sand dune located in the coastal region of Digha. The planting of a diverse range of tree species, including Casuarina, Golden Shower, Bollygum, and Yellow Trumpet, was undertaken in order to mitigate dune erosion. The region exhibits the presence of diverse indigenous cacti, such as Triangular Spurge, Columnar Cactus, and Pipestem Prickly Pear, which are observed to grow in substantial clusters. The area exhibits a rich diversity of shrubs, including species such as Giant Milkweed, Gin Berry, Forest Num-num, Hill Glory Bower, and Lantana. Additionally, various herbaceous plants, such as Mexican Prickly Poppy, Sticky Nightshade, Indian heliotrope, Large Caltrops, and Wild Tobacco, are present. Ground creepers, such as Chinese creeper, Yellow Nicker, Indian Birthwort, Hemigraphis, and Goat's foot vine, also contribute to the ecological composition of the area.

Fig. 1. Map of the study area taken from Google Earth

3. Result

During a comprehensive field study of the Nature Trail Park and its surrounding area in Digha, a total of 118 avian species belonging to 16 distinct orders and 46 families were successfully identified (Table.1). The order Passeriformes exhibited the highest prevalence, encompassing a total of 46 species (Fig. 2). Scolopacidae, which contains 14 species, was the family with the most diversity among the others (Table 1).

Table 1: Checklist of birds in Nature Trail Park, Digha, Purba Medinipur

Sl. No.		Common Name	Scientific Name	IUCN status	Residential status	Feeding Habit
	Order: Podicipediformes					
	Family: Podicipedidae					
1		Little Grebe	*Tachybaptus ruficollis* (Pallas, 1764)	LC	R	O
	Order: Ciconiiformes					
	Family: Ciconiidae					
2		Asian Openbill	*Anastomus oscitans* (Boddaert, 1783)	LC	R	C
	Order: Pelecaniformes					
	Family: Ardeidae					
3		Indian Pond Heron	*Ardeola grayii* (Sykes, 1832)	LC	R	C
4		Black-crowned Night Heron	*Nycticorax nycticorax* (Linnaeus, 1758)	LC	R	C
5		Cattle Egret	*Bubulcus ibis* (Linnaeus, 1758)	LC	R	C
6		Great Egret	*Ardea alba* Linnaeus, 1758	LC	R	C
7		Intermediate Egret	*Ardea intermedia* Wagler, 1829	LC	R	C
8		Little Egret	*Egretta garzetta* (Linnaeus, 1766)	LC	R	C
	Order: Suliformes					
	Family: Phalacrocoracidae					
9		Little Cormorant	*Microcarbo niger* (Vieillot, 1817)	LC	R	C
	Order: Accipitriformes					
	Family: Accipitridae					
10		Black-Winged kite	*Elanus caeruleus* (Desfontaines, 1789)	LC	R	C

11		Black kite	*Milvus migrans* (Boddaert, 1783)	LC	R	C
12		Oriental Honey Buzzard	*Pernis ptilorhynchus* (Temminck, 1821)	LC	R	C
13		Shikra	*Accipiter badius* (Gmelin, 1788)	LC	R	C
14		White-bellied Sea Eagle	*Haliaeetus leucogaster* (Gmelin, 1788)	LC	R	C
	Order: Gruiformes					
	Family: Rallidae					
15		White-breasted Waterhen	*Amaurornis phoenicurus* (Pennant, 1769)	LC	R	O
16		Common Moorhen	*Gallinula chloropus* (Linnaeus, 1758)	LC	R	O
	Family: Jacanidae					
17		Bronze-winged Jacana	*Metopidius indicus* (Latham, 1790)	LC	R	O
	Order: Charadriiformes					
	Family: Charadriidae					
18		Red-wattled Lapwing	*Vanellus indicus* (Boddaert, 1783)	LC	R	IV
19		Grey Plover	*Pluvialis squatarola* (Linnaeus, 1758)	LC	WM	IV
20		Pacific Golden Plover	*Pluvialis fulva* (Gmelin, 1789)	LC	WM	IV
21		Kentish Plover	*Charadrius alexandrinus* Linnaeus, 1758	LC	WM	IV
22		Little-ringed Plover	*Charadrius dubius* Scopoli, 1786	LC	WM	IV
23		Lesser Sand Plover	*Charadrius mongolus* Pallas, 1776	LC	WM	IV
24		Greater Sand Plover	*Charadrius leschenaultia* Lesson, 1826	LC	WM	IV

	Family: Recurvirostridae					
25		Black-winged Stilt	*Himantopus himantopus* (Linnaeus, 1758)	LC	WM	IV
	Family: Scolopacidae					
26		Whimbrel	*Numenius phaeopus* (Linnaeus, 1758)	LC	WM	O
27		Eurasian Curlew	*Numenius arquata* (Linnaeus, 1758)	NT	WM	O
28		Spotted Redshank	*Tringa erythropus* (Pallas, 1764)	LC	WM	IV
29		Common Redshank	*Tringa tetanus* (Linnaeus, 1758)	LC	WM	IV
30		Common Greenshank	*Tringa nebularia* (Gunnerus, 1767)	LC	WM	IV
31		Green Sandpiper	*Tringa ochropus* (Linnaeus, 1758)	LC	WM	C
32		Wood Sandpiper	*Tringa glareola* (Linnaeus, 1758)	LC	WM	C
33		Terek Sandpiper	*Xenus cinereus* (Güldenstädt, 1775)	LC	WM	C
34		Curlew Sandpiper	*Calidris ferruginea* (Pontoppidan, 1763)	NT	WM	C
35		Common Sandpiper	*Actitis hypoleucos* (Linnaeus, 1758)	LC	WM	C
36		Marsh Sandpiper	*Tringa stagnatilis* (Bechstein, 1803)	LC	WM	C
37		Sanderling	*Calidris alba* (Pallas, 1764)	LC	WM	IV
38		Temminck's Stint	*Calidris temminckii* (Leisler, 1812)	LC	WM	IV
39		Little Stint	*Calidris minuta* (Leisler, 1812)	LC	WM	IV
	Family: Glareolidae					

40		Small Pratincole	*Glareola lacteal* Temminck, 1820	LC	WM	I
	Family: Laridae					
41		Pallas's Gull	*Larus ichthyaetus* Pallas, 1773	LC	WM	O
42		Brown-headed Gull	*Larus brunnicephalus* Jerdon, 1840	LC	WM	O
43		Black-headed Gull	*Larus ridibundus* Linnaeus, 1766	LC	WM	O
44		Common Tern	*Sterna hirundo* Linnaeus, 1758	LC	WM	C
	Order: Columbiformes					
	Family: Columbidae					
45		Eurasian Collared Dove	*Streptopelia decaocto* (Frivaldszky, 1838)	LC	R	G
46		Spotted Dove	*Spilopelia chinensis* (Scopoli, 1786)	LC	R	G
47		Yellow-footed Green Pigeon	*Treron phoenicopterus* (Latham, 1790)	LC	R	F
48		Rock Pigeon	*Columba livia* (Gmelin, 1789)	LC	R	G
	Order: Psittaciformes					
	Family: Psittacidae					
49		Rose-ringed Parakeet	*Alexandrinus krameri* (Scopoli, 1769)	LC	R	H
	Order: Cuculiformes					
	Family: Cuculidae					
50		Common Hawk Cuckoo	*Hierococcyx varius* (Vahl, 1797)	LC	R	I
51		Plaintive Cuckoo	*Cacomantis merulinus* (Scopoli, 1786)	LC	LM	I
52		Asian koel	*Eudynamys scolopaceus* (Linnaeus, 1758)	LC	R	F

53		Greater Coucal	*Centropus sinensis* (Stephens, 1815)	LC	R	C
	Order: Strigiformes					
	Family: Strigidae					
54		Spotted Owlet	*Athene brama* (Temminck, 1821)	LC	R	C
	Order: Apodiformes					
	Family: Apodidae					
55		Asian Palm Swift	*Cypsiurus balasiensis* (Gray, 1829)	LC	R	I
	Order: Bucerotiformes					
	Family: Upupidae					
57		Common Hoopoe	*Upupa epops* Linnaeus, 1758	LC	R	I
	Order: Coraciiformes					
	Family: Coraciidae					
56		Indian Roller	*Coracias benghalensis* (Linnaeus, 1758)	LC	R	C
	Family: Alcedinidae					
58		Stork-billed Kingfisher	*Pelargopsis capensis* (Linnaeus, 1766)	LC	R	C
59		White-throated Kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)	LC	R	C
60		Black-capped Kingfisher	*Halcyon pileata* (Boddaert, 1783)	LC	WM	C
61		Common Kingfisher	*Alcedo atthis* (Linnaeus, 1758)	LC	R	C
62		Pied Kingfisher	*Ceryle rudis* (Linnaeus, 1758)	LC	R	C
	Family: Meropidae					
63		Blue-tailed Bee-eater	*Merops philippinus* Linnaeus, 1766	LC	R	I

64		Green Bee-eater	*Merops orientalis* Latham, 1802	LC	R	I
	Order: Piciformes					
	Family:Megalaimidae					
65		Lineated Barbet	*Psilopogon lineatus* (Vieillot, 1816)	LC	R	O
66		Coppersmith Barbet	*Psilopogon haemacephalus* (Müller, 1776)	LC	R	O
67		Blue-throated Barbet	*Psilopogon asiaticus* (Latham, 1790)	LC	R	O
	Family: Picidae					
68		Fulvous-breasted Woodpecker	*Dendrocopos macei* (Vieillot, 1818)	LC	R	I
69		Rufous Woodpecker	*Micropternus brachyurus* (Vieillot, 1818)	LC	R	I
70		Streak-throated Woodpecker	*Picus xanthopygaeus* (Gray & Gray, 1846)	LC	R	I
71		Black-rumped Flameback	*Dinopium benghalense* (Linnaeus, 1758)	LC	R	I
	Order: Passeriformes					
	Family: Artamidae					
72		Ashy Woodswallow	*Artamus fuscus* Vieillot, 1817	LC	R	I
	Family: Aegithinidae					
73		Common Iora	*Aegithina tiphia* (Linnaeus, 1758)	LC	R	I
	Family: Campephagidae					
74		Small Minivet	*Pericrocotus cinnamomeus* (Linnaeus, 1766)	LC	R	I
	Family: Laniidae					
75		Brown Shrike	*Lanius cristatus* Linnaeus, 1758	LC	WM	C

76		Long-tailed Shrike	*Lanius schach* Linnaeus, 1758	LC	R	C
77		Grey-backed Shrike	*Lanius tephronotus* (Vigors, 1831)	LC	WM	C
	Family: Dicruridae					
78		Black Drongo	*Dicrurus macrocercus* Vieillot, 1817	LC	R	C
	Family: Oriolidae					
79		Indian Golden Oriole	*Oriolus kundoo* Sykes, 1832	LC	LM	O
80		Black-hooded Oriole	*Oriolus xanthornus* (Linnaeus, 1758)	LC	R	O
	Family: Monarchidae					
81		Indian Paradise Flycatcher	*Terpsiphone paradisi* (Linnaeus, 1758)	LC	R	I
	Family: Rhipiduridae					
82		White-throated Fantail	*Rhipidura albicollis* (Vieillot, 1818)	LC	R	I
	Family: Corvidae					
83		RufousTreepie	*Dendrocitta vagabunda* (Latham, 1790)	LC	R	O
84		House Crow	*Corvus splendens* Vieillot, 1817	LC	R	O
85		Eastern Jungle Crow	*Corvus macrorhynchos* Wagler, 1827	LC	R	O
	Family: Paridae					
86		Cinereous Tit	*Parus major* Linnaeus, 1758	LC	R	O
	Family: Hirundinidae					
87		Sand Martin	*Riparia riparia* (Linnaeus, 1758)	LC	WM	I
88		Barn Swallow	*Hirundo rustica* Linnaeus, 1758	LC	WM	I

89		Red-rumped Swallow	*Cecropis daurica* Linnaeus, 1771	LC	R	I
90		Wire-tailed Swallow	*Hirundo smithii* Leach, 1818	LC	WM	I
	Family: Pycnonotidae					
91		Red-whiskered Bulbul	*Pycnonotus jocosus* (Linnaeus, 1758)	LC	R	O
92		Red-vented Bulbul	*Pycnonotus cafer* (Linnaeus, 1766)	LC	R	O
93		White-browed Bulbul	*Pycnonotus luteolus* (Lesson, 1841)	LC	R	O
	Family: Cisticolidae					
94		Plain Prinia	*Prinia inornata* Sykes, 1832	LC	R	I
95		ZittingCisticola	*Cisticola juncidis* (Rafinesque, 1810)	LC	R	I
96		Common Tailorbird	*Orthotomus sutorius* (Pennant, 1769)	LC	R	I
	Family: Acrocephalidae					
97		Clamorous Reed Warbler	*Acrocephalus stentoreus* (Ehrenberg, 1833)	LC	WM	I
98		Blyth's Reed Warbler	*Acrocephalus dumetorum* Blyth, 1849	LC	WM	I
	Family: Phylloscopidae					
99		Greenish Warbler	*Phylloscopus trochiloides* (Sundevall, 1837)	LC	WM	I
	Family: Leiotrichidae					
100		Jungle Babbler	*Turdoides striata* (Dumont, 1823)	LC	R	O
	Family: Sturnidae					
101		Asian Pied Starling	*Gracupica contra* (Linnaeus, 1758)	LC	R	O
102		Common Myna	*Acridotheres tristis* (Linnaeus, 1766)	LC	R	O

103		Jungle Myna	*Acridotheres fuscus* (Wagler, 1827)	LC	R	O
104		Chestnut-tailed Starling	*Sturnia malabarica* (Gmelin, 1789)	LC	R	O
	Family: Muscicapidae					
105		Oriental Magpie Robin	*Copsychus saularis* (Linnaeus, 1758)	LC	R	I
106		Saiberian Stonechat	*Saxicola torquatus* (Linnaeus, 1766)	LC	R	I
107		Taiga Flycatcher	*Ficedula albicilla* (Pallas, 1811)	LC	WM	I
108		Verditer Flycatcher	*Eumyias thalassinus* (Swainson, 1838)	LC	WM	I
	Family: Chloropseidae					
109		Golden-fronted Leafbird	*Chloropsis aurifrons* (Temminck, 1829)	LC	R	O
	Family: Nectariniidae					
110		Purple Sunbird	*Cinnyris asiaticus* (Latham, 1790)	LC	R	N
111		Purple-rumped Sunbird	*Leptocoma zeylonica* (Linnaeus, 1766)	LC	R	O
	Family: Passeridae					
112		House Sparrow	*Passer domesticus* (Linnaeus, 1758)	LC	R	O
	Family: Ploceidae					
113		Baya Weaver	*Ploceus philippinus* (Linnaeus, 1766)	LC	R	G
	Family: Motacillidae					
114		Citrine Wagtail	*Motacilla citreola* (Pallas, 1776)	LC	WM	C
115		White-browed Wagtail	*Motacilla maderaspatensis* (Gmelin, 1789)	LC	R	I

116		Yellow Wagtail	*Motacilla flava* (Linnaeus, 1758)	LC	WM	O
117		White Wagtail	*Motacilla alba* (Linnaeus, 1758)	LC	WM	I
118		Paddyfield Pipit	*Anthus rufulus* (Vieillot, 1818)	LC	R	I

Abbreviations: LC – Least concern, NT- Near Threatened, R- Resident, WM- Winter Migrant, LM- Local migrant, C- Carnivores, F- Frugivores, G- Granivores, I- Insectivores, IV- Invertivores, N- Nectarivores, O- Omnivores, H- Herbivores

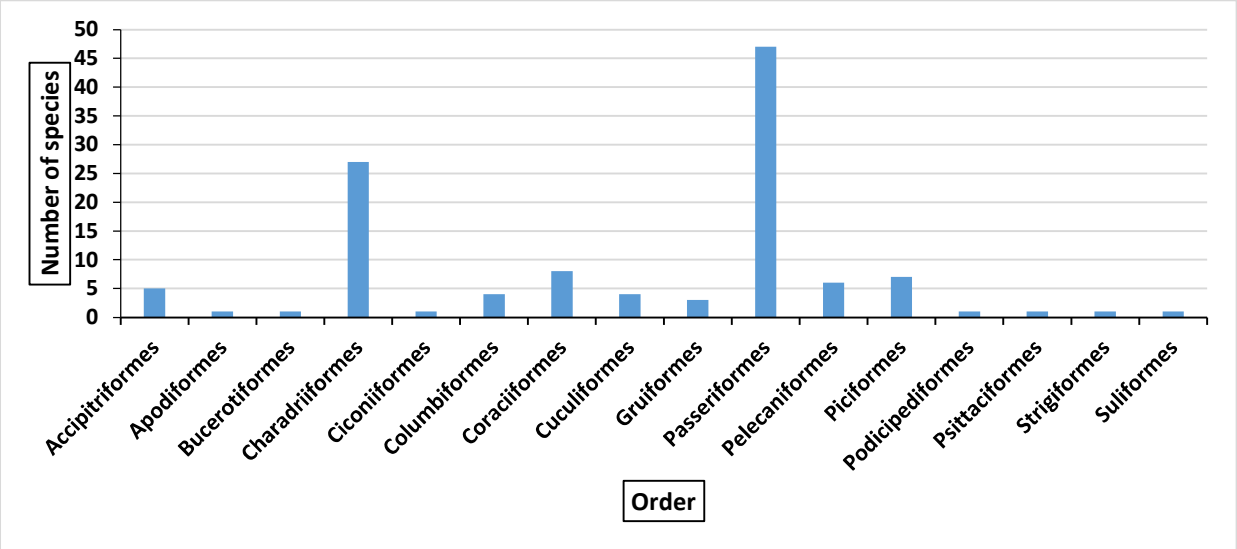

Fig.2. Order wise distribution of species.

Among the 118 species observed, a majority of 64% were classified as resident birds, while 34% were identified as winter migrants. The remaining 2% were categorised as local migrants, as depicted in **Fig.3.**

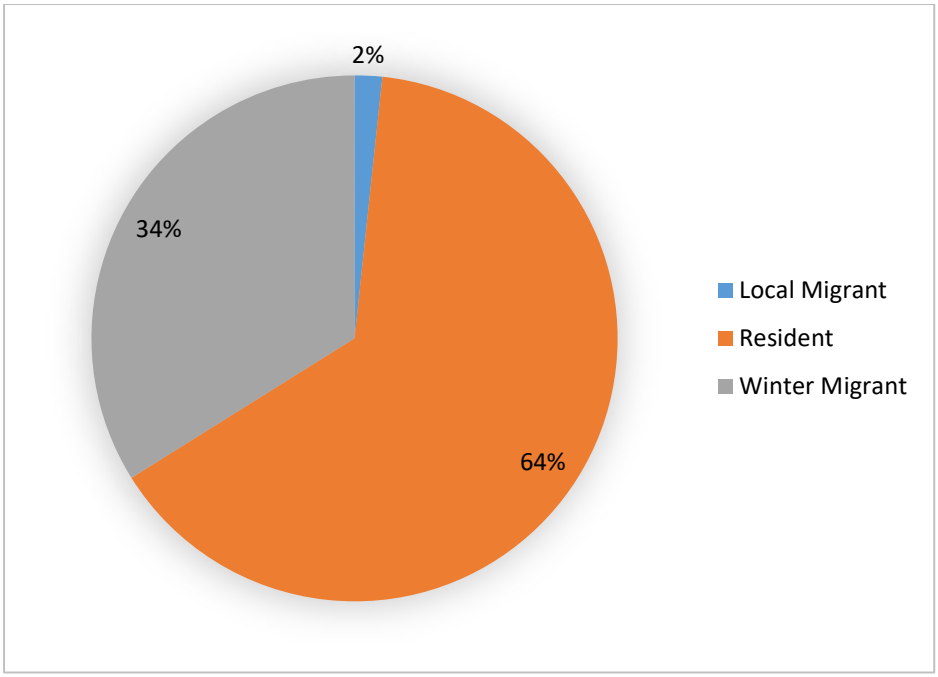

Fig. 3. Distribution of the birds on the basis of residential and migratory status.

The avian population in the Nature Trail Park region is primarily composed of carnivorous birds (33) and insectivores birds (33). This is followed by birds that have an omnivorous diet (30), those that primarily consume invertebrates (14), granivorous birds (4), frugivorous birds (2), as well as a single species each of nectarivores and herbivores. (**Fig. 4**).

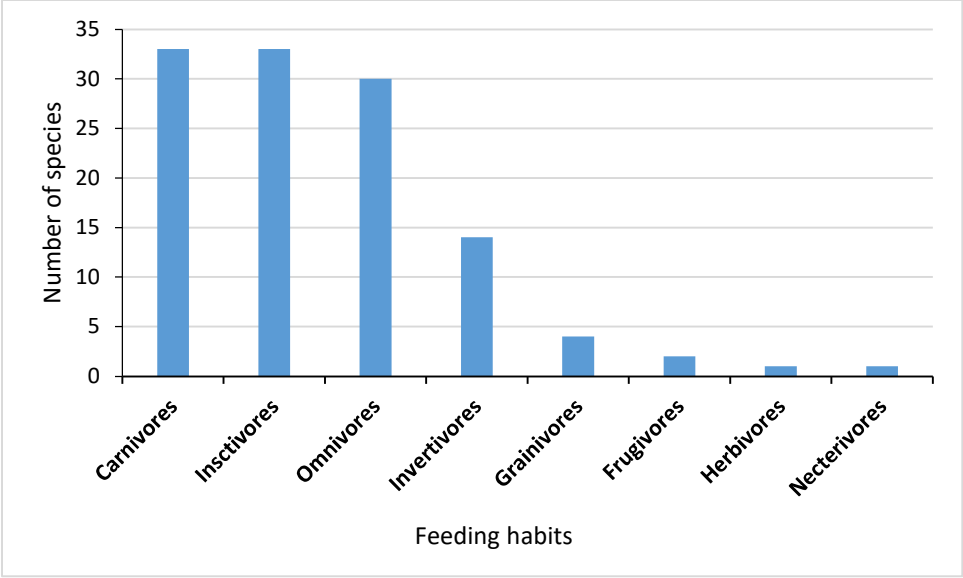

Fig. 4. Feeding habitat of different bird species in the study area.

According to the IUCN Red List of Threatened Species (2017), out of 118 bird species, 2 species were Near Threatened (NT), and the rest all the species were Least Concern (LC) (Table 1).

4. Discussion

This location serves as the intermediary region connecting terrestrial and aquatic ecosystems. The presence of a large expanse of *Casuarina equisetifolia* forest, along with other mangrove trees and gardens, as well as extensive sea beaches, serves as a significant draw for various avifaunal species. A significant proportion of avian species, specifically 64%, exhibit residency patterns, remaining in a particular area throughout the year. These resident birds also engage in breeding activities within their respective habitats. Approximately 34% of species exhibit the behaviour of winter migration, indicating that they are not permanent residents but rather temporarily relocate during the winter season from various regions in different nations. The majority of winter migratory avian species observed in this location were members of the Charadriiformes order, primarily consisting of wading birds (see Table 1). Some of the winter migratory bird species include *Halcyon pileata*, *Lanius cristatus*, *Lanius tephronotus*, *Riparia riparia*, *Hirundo smithii*, *Acrocephalus stentoreus*, *Acrocephalus dumetorum*, *Ficedula albicilla*, *Eumyias thalassinus*, *Motacilla citreola*, and *Motacilla alba*, among others. A limited number of avian species exhibited local migratory behaviour, specifically *Cacomantis merulinus* and *Oriolus kundoo*.

Multiple studies (e.g., Beissinger and Osborne, 1982; Clergeau et al., 1998; Jokimaki and Suhonen, 1998) have indicated that omnivorous species exhibit a propensity for population growth within urban environments, likely attributable to an augmented food supply. On the other hand, the process of urbanisation or development often exerts a detrimental impact on insectivorous species (Clergeau et al., 1998; Allen and O'Connor, 2000; Lindsay et al., 2002). However, in the case of the Nature Trail Park, the population of insectivorous and carnivorous birds was found to be the highest and approximately equal in number. The richness of omnivorous bird species exhibited an increase subsequent to their presence, indicating a favourable availability of food resources within the park and its surrounding vicinity.

Among the total of 118 species examined, it was observed that two species were categorised as Near Threatened, while the remaining species were classified as Least Concern. The two species classified as Near Threatened were *Numenius arquata* and *Calidris ferruginea*.

The observed species richness and abundance in this location was found to be favourable, with a total of 118 bird species belonging to 16 orders and 46 families. In a previous study conducted by Patra and Chakrabarti (2014), a total of 86 bird species were documented in the Digha region. These species were classified into 10 orders and 35 families. In their study, Payra et al., (2017) documented a comprehensive inventory of avian species found in the six coastal sites within the district. They identified a total of 171 bird species, which encompassed 18 orders and 54 families. In a comprehensive study conducted by Payra (2020), a total of 225 bird species belonging to 17 orders and 61 families were meticulously compiled and recorded. The development of this Nature Trail Park occurred shortly prior to the onset of the COVID-19 pandemic. The survey was conducted during the interim period between two COVID lockdowns. The findings of this survey indicate that, in the absence of significant human-induced activities, the area has the potential to develop into a highly favourable habitat for avian species. The checklist provides a discernible indication that the area exhibits a remarkable level of biodiversity, despite its development on a sand dune.

The Nature Trail Park located in Digha effectively preserves the avifaunal diversity by actively conserving their natural habitat. The implementation of ecotourism in this location is carried out by the Government and the Forest Division. The local forested areas and dunes are experiencing a decline in response to a combination of rapid developmental activities, natural calamities, and anthropogenic pressure resulting from tourism. The impact of human activities within intertidal zones on coastal biodiversity, specifically migratory water bird species and the associated ecosystem services, is a subject of concern. Restrictions on human activity in coastal areas will be implemented to mitigate pollution and preserve foraging habitats. There is a pressing need to increase the plantation of Casuarina trees in coastal regions, as this would significantly contribute to the conservation of local biodiversity and effectively mitigate soil erosion.

5. Acknowledgment

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