



Diversity and abundance of shore and wader avifauna in Purba Medinipur coastal belt, West Bengal, India: A Comprehensive Study

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ABSTRACT:

The avifauna shows maximum diversity among all vertebrate faunal groups. Wader is the birds of the order Charadriiformes, commonly found in shorelines and mudflats in order to forage for food in the mud or sand. Most wading bird possess long legs and toes and sometimes curve bills showing adaptations enabling them to live and feed in shallow water habitats. The wader avifauna eats various species of invertebrates and fishes that can be found in the mud or swamps, and mainly sea coast. This study presents wader's diversity in coastal areas of purba Medinipur district. The field survey period was carried out from 1st April, 2021 to 24th October, 2021. In the present study total 60 species of shore and waders representing 13 families under 5 orders were found whereas order Charadriiformes shows greater number of species between those three sites, followed by order Pelicaniformes, Gruiformes, Passeriformes, Suliformes. The study site, Kanaichatta (site-1) shows greater diversity followed by Bankiput (site-2) and lower diversity is seen in Boguran site (site-3) respectively due to human interference. A continuous monitoring of the wader avifauna is necessary for protect them in their natural habitats.

Keywords: Avifauna, diversity, coastal belt, wader.

INTRODUCTION

Avifauna is a general term for bird species. The avifauna shows maximum diversity among all vertebrate faunal groups. Wader is the birds of the order Charadriiformes, commonly found in shorelines and mudflats in order to forage for food in the mud or sand. Wading birds are commonly associated with wetlands, streams, coastal lines and other aquatic habitats. Most wading bird possess long legs and toes and sometimes curve bills showing adaptations enabling them to live and feed in shallow water habitats [Dobkin *et al.*(1998)]. The avifauna diversity

is very rich in Indian sub- continent where study of wader avifauna diversity is the integral part of the assessment of entire biodiversity. The group of wader birds and shore birds is a very diverse one. Actually wader birds maintain the ecosystem as pollinators and scavengers, so they are also called as bioindicators. Wading birds have physical and behavioral adaptations for living near water. Their legs are long and thin that not only helps them to keep the balance in muddy and sandy areas but also help them to forage in deep water areas. Sometimes their neck is also adapted to long which help them to hunt.

The wader avifauna eats various species of invertebrates & fishes that can be found in the mud or swamps, mainly sea coast. Coastal areas that support vast biodiversity of flora and fauna are including Sarus, Crane etc. [Verma and Prakash (2017), Prakash and Verma (2019)]. Diversity of wader bird is generally decreasing through natural and anthropogenic activities such as deforestation, flood and plastic pollutions, changes of natural resources [Maurer, (1981), Wiens (1989)]. The conservation of shore birds as well as their habitats is important not only represent a resource shared by several countries but also they play an ecological role in the coastal ecosystem that provides essential services to human population.

The wader avifauna has also declined due to habitat destruction. Recently a cyclone “Yash” (2021) hit in this area and destructed the habitats of avifauna. Also the habitat in coastal area is destroyed over grazing by domestic animals such as cattle etc.

In the Purba Medinipur District of West Bengal there are less extensive studies on wader birds. Therefore, I present an overview of the distribution of wader avifauna species in Purba Medinipur district (the coastal area of Kanaichatta, Bankipuit and Boguran). Taking the baseline study of wader avifauna, an effort has been given to importance as bioindicators for the coastal lands.

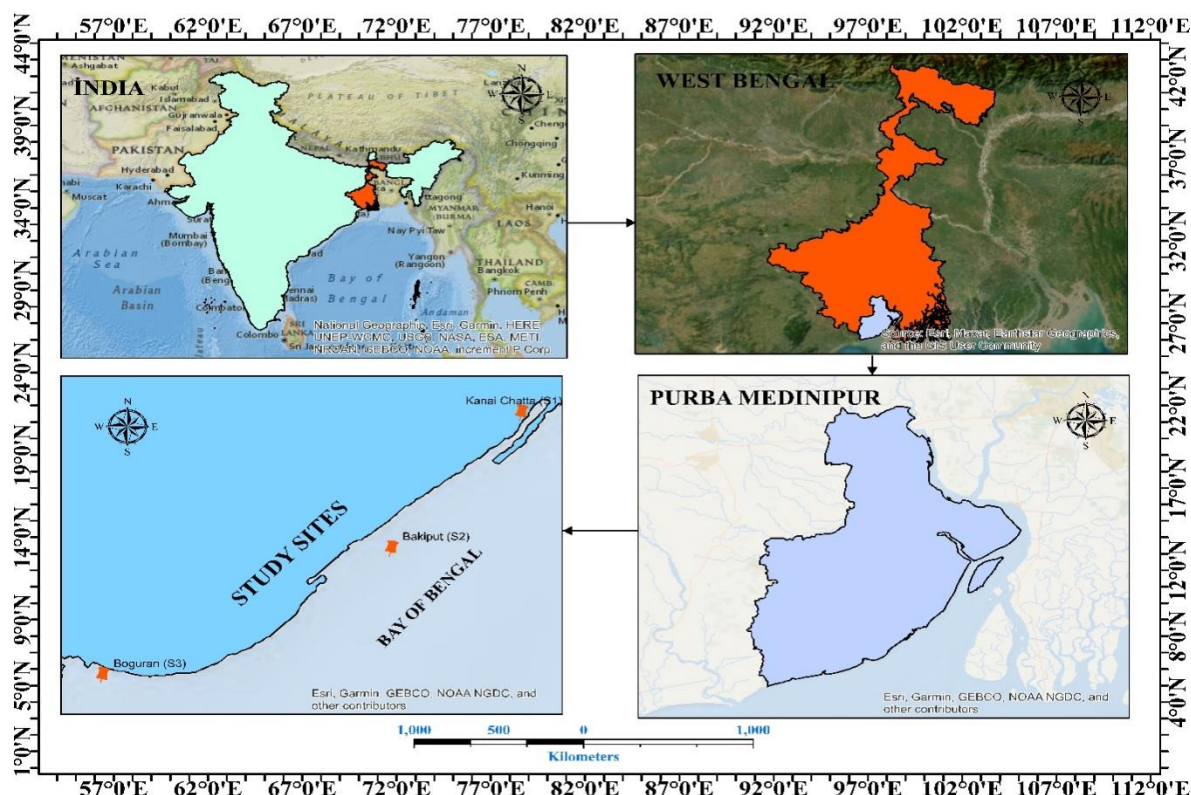
OBJECTIVES

1. To assess the distribution and diversity of shore and wader avifauna in the coastal area of Purba Medinipur district, West Bengal
2. To identify the migratory wader avifauna species in this area
3. To calculate the diversity index

STUDY AREA

Geographical Location:

West Bengal has the coastline extends from 22.9868°N to 87.8550°E. Total covering area of coastline of west Bengal is 158 km. out of total 7516.6 km coastline in India. Our present study was carried out in coastal region of Purba Medinipur district. The coastal area of Purba Medinipur district is more than 60 km in length. Present study area is total of 10 km length out of 60 km coastal area. There were 3 study sites in the study area which is Kanaichatta (Site-1), Bankiput (site-2) and Boguran (Site-3). Within this study sites, Kanaichatta (site-1) has many significant water body besides the coast line. All 3 study sites are famous for tourist spot.



METHODOLOGY

Field Survey:

There were 3 study sites in the study area which is Kanaichatta (Site 1), Bankiput (site – 2) & Boguran (site-3). The field survey period were carried out from 1st April, 2021 to 24th October, 2021. I have taken 2 km for each site and there were 2-4 km distance from one site to another. Field surveys were conducted twice in a month for each site and total 6 days were surveyed in a month for those 3 study sites.

Data Collection:

I have used two working methods: the transect method and the observation method from a fixed point. The transect method divided into two parts: walking on sea shore land and water, or by cycling on sea shore. Field data collection and count were started after one hour of full high tide to next 2 hours. After 1 hour, sea shore started to exposed and wader birds is started to come to the sea shore for feed that were collected through direct observation method with the help of Olympus Binocular (8-16*40X) and Nikon CoolPix (P900) point & shoot camera, where 3 persons were there, one were written the data and another two persons were counted the bird.

Identification of Birds:

Birds were identified using standard field guides (Ali and Ripley, World Scientific News 74(2017), 209-237-212- (1987) Grimmett *et al.* (1998), Manakadan and Pittie, 2001; Ali, 2002; Grewal *et al.*, 2002; Kumar *et al.* (2005). Grimmett *et al.* (2011) and few face book group (Ask id of Indian Birds, Wildlife of West Bengal) and various other Organisation's websites (BNHS, Biodiversity of West Bengal). Few birds were identified with the help of "Wildlife Board of West Bengal".

Data Analysis:**Diversity management:**

Shannon-Weiner index (H') is widely used abundance – based diversity index assuming all species are represented in the sample by using the formula as follow:-

$$H' = -\sum_{i=1}^s p_i \ln p_i$$

Here, 'H' is the species diversity index, 's' is the number of species, and 'p_i' is the proportion of individuals of each species belonging to the ith species of the total no. of individuals and 'ln' is the natural logarithm.

Similarly, another diversity index, Simpson's diversity index also use by the following formula: - $D = 1 / [\sum_{n=1}^s n(n-1) / N(N-1)]$

Here, 'D' is the index of diversity, 'n' is the no. of ith species and 'N' is the total no of individuals.

Richness Index: Margalef's index is use for species richness index by following the formula, $D_{mg} = (S-1) / \ln N$

Here, 'S' is the no. of species; 'N' is the total no. of individuals.

Evenness index: Pielou's index is use for species evenness index by the following formula, $J' = H' / H'_{max}$

Here, 'J' is species evenness, 'H' is the Shannon – Weiner index and "H" max is the maximum possible value of H'. The value of 'J' was ranges from 0 to 1.

RESULT**Vegetation:**

Table :(A).In Kanaichatta different types of mangroves are found, such as:-

Mangroves :	Pre dominant grasses :	Associate species of plants :
Scientific Name :		
<i>Avicennia alba</i>	<i>Fimbristylis barbata</i>	<i>Acanthus illicifolious</i>
<i>Aegiceras corniculatum</i>	<i>Porteresia coarctata</i>	<i>Pandanus odoratissimus</i>
<i>Bruguiera gymnorrhiza</i>		<i>Sesuvium portulacstrum</i>
<i>Ceriops decandra</i>		<i>Suaeda maritima</i>
<i>Excoecaria agallocha</i>		<i>Casuarina equisetifolia</i>
<i>Avicennia marina</i>		
<i>Rhizophora mucronate</i>		

Table :(B).In Bankiput few types of mangroves are found such as:-

	Scientific Name
	<i>Avicennia officinalis</i>

Mangroves :	<i>Aegiceras corniculatum</i>
	<i>Bruguiera gymnorrhiza</i>
	<i>Ceriops decandra</i>
	<i>Excoecaria agallocha</i>
	<i>Rhizophora mucronate</i>

Table: (C).In Boguran different types of mangroves are found, such as:-

Mangroves :	Scientific Name
	<i>Avicennia alba</i>
	<i>Avicennia marina</i>
	<i>Bruguier gymnorrhiza</i>
	<i>Ceriops decandra</i>
	<i>Excoecaria agallocha</i>
	<i>Sonneretia apetala</i>
	<i>Rhizophora mucronate</i>
	<i>Acanthus illicifolious</i>
	<i>Pandanus odoratissimus</i>
	<i>Sesuvium portulacstrum</i>
	<i>Porteresia coarctata</i>
	<i>Suaeda maritima</i>

Species Richness:

In the present study of three different sites, i.e. Kanaichatta (site-1), Bankiput (site-2), Boguran (site-3), total 60 species of 13 family under 5 order were found whereas order Charadriiformes (n=39) shows greater number of species between those three sites, followed by order Pelicaniformes (n=13), order Gruiformes (n=4), order Passeriformes (n=3), order Suliformes (n=1).

Table: (E).Shows check list of Shore and Wader birds of three sites, where presence of species indicates by “++” and absence of species indicates by “--”.

SL NO	ORDER : FAMILY	COMMON NAME: / SCIENTIFIC NAME	SITES :		
			S-1	S-2	S-3
1.	Gruiformes : Rallidae	White breasted water hen (<i>Amaurornis phoenicurus</i>)	++	++	++
2.		Grey-headed swamp hen (<i>Porphyrio poliocephalus</i>)	++	--	--
3.		Common moor hen (<i>Gallinula chloropus</i>)	++	--	--
4.		Common coot (<i>Fulica atra</i>)	++	--	--
5.	Pelecaniformes: Ciconiidae	Asian open bill (<i>Anastomus oscitans</i>)	++	++	++
6.	Pelecaniformes: Ardeidae	Cinnamon bittern (<i>Ixobrychus cinnamomeus</i>)	++	++	--
7.		Black bittern (<i>Ixobrychus flavicollis</i>)	++	++	--
8.		Black crown night heron (<i>Nycticorax nycticorax</i>)	++	--	--
9.		Striated heron (<i>Butorides striata</i>)	++	++	--
10.		Indian pond heron (<i>Ardeola grayii</i>)	++	++	++
11.		Cattle egret (<i>Bubulcus ibis</i>)	++	++	++
12.		Grey heron (<i>Ardea cinerea</i>)	--	++	--
13.		Purple heron (<i>Ardea purpurea</i>)	++	--	--
14.		Great egret (<i>Ardea alba</i>)	++	++	++
16.		Little egret (<i>Egretta garzetta</i>)	++	++	++
17.		Pelecaniformes: Phalacrocoracidae	Little cormorant (<i>Microcarbo niger</i>)	++	++
18.	Suliformes: Anhingidae	Oriental darter (<i>Anhinga melanogaster</i>)	++	++	--
19.	Charadriiformes: Burhinidae	Great thick knee (<i>Esacus recurvirostris</i>)	++	--	--
20.	Charadriiformes: Recurvirostridae	Pied avocet (<i>Recurvirostra avocetta</i>)	++	--	--
21.		Black winged stilt (<i>Himantopus himantopus</i>)	--	--	++
22.	Charadriiformes: Charadriidae	Grey plover (<i>Pluvialis squatarola</i>)	++	++	--
23.		Pacific golden plover (<i>Pluvialis fulva</i>)	++	++	++
24.		Little ringed plover (<i>Charadrius dubius</i>)	++	--	++
25.		Kentis plover (<i>Charadrius alexandrinus</i>)	++	++	++
26.		Lesser sand plover (<i>Charadrius mongolus</i>)	++	++	++
27.		Greater sand plover (<i>Charadrius leschenaultia</i>)	++	++	++
28.		Grey-headed lapwing (<i>Vanellus cinereus</i>)	++	--	--
29.		Red-wattled lapwing (<i>Vanellus indicus</i>)	++	++	++
30.		Charadriiformes: Rostratulidae	Greater painted snipe (<i>Rostratula benghalensis</i>)	++	--
31.	Charadriiformes: Jacanidae	Pheasant-tailed jacana (<i>Hydrophasianus chirurgus</i>)	++	--	--
32.		Bronzed-winged jacana (<i>Metopidius indicus</i>)	++	--	--
33.	Charadriiformes: Scolopacidae	Whimbrel (<i>Numenius phaeopus</i>)	++	++	++
34.		Eurasian curlew (<i>Numenius arquata</i>)	++	++	++
35.		Black-tailed godwit (<i>Limosa limosa</i>)	++	++	--
36.		Curlew sandpiper (<i>Calidris ferruginea</i>)	++	--	++
37.		Temminck's stint (<i>Calidris temminckii</i>)	++	++	++
38.		Sanderling (<i>Calidris alba</i>)	--	--	++
39.		Little stint (<i>Calidris minute</i>)	++	++	++
40.		Terek sandpiper (<i>Xenus cinereus</i>)	++	++	++

41.		Common sandpiper (<i>Actitis hypoleucos</i>)	++	++	++
42.		Green sandpiper (<i>Tringa ochropus</i>)	++	--	++
43.		Spotted red shank (<i>Tringa aerythropus</i>)	++	++	++
44.		Common red shank (<i>Tringa tetanus</i>)	++	++	++
45.		Common green shank (<i>Tringa nebularia</i>)	++	++	++
46.		Wood sandpiper (<i>Tringa glareola</i>)	--	++	++
47.		Marsh sandpiper (<i>Tringa stagnatilis</i>)	++	++	++
48.		Great knot (<i>Calidris tenuirostris</i>)	++	++	++
49.		Red knot (<i>Calidris canutus</i>)	--	++	++
50.	Charadriiformes: Laridae	Black-headed gull (<i>Chroicocephalus ridibundus</i>)	++	++	++
51.		Brown headed gull (<i>Chroicocephalus brunnicephalus</i>)	++	++	--
52.		Pallas's-gull (<i>Ichthyaetus ichthyaetus</i>)	++	++	++
53.		Little tern (<i>Sternula albifrons</i>)	++	++	++
54.		Whiskered tern (<i>Chlidoni ashybrida</i>)	++	++	++
55.		White-winged tern (<i>Chlidonias leucopterus</i>)	--	++	--
56.		Greater-crested tern (<i>Thalasseus bergii</i>)	--	++	++
57.		Common tern (<i>Sterna hirundo</i>)	++	++	++
58.		Passeriformes: Motachillidae	Western yellow wagtail (<i>Motacilla flava</i>)	++	++
59.	White Wagtail (<i>Motacilla alba</i>)		++	++	++
60.	Citrine wagtail (<i>Motacilla citreola</i>)		++	++	++
Total No. of species			53	44	42

In those three sites Kanaichatta (site-1) shows greater species richness – 39% (n=53) followed by Bankiput (site-2)-33 % (n=44) and lower species richness observed in Boguran (site-3)-29 % (n=42).

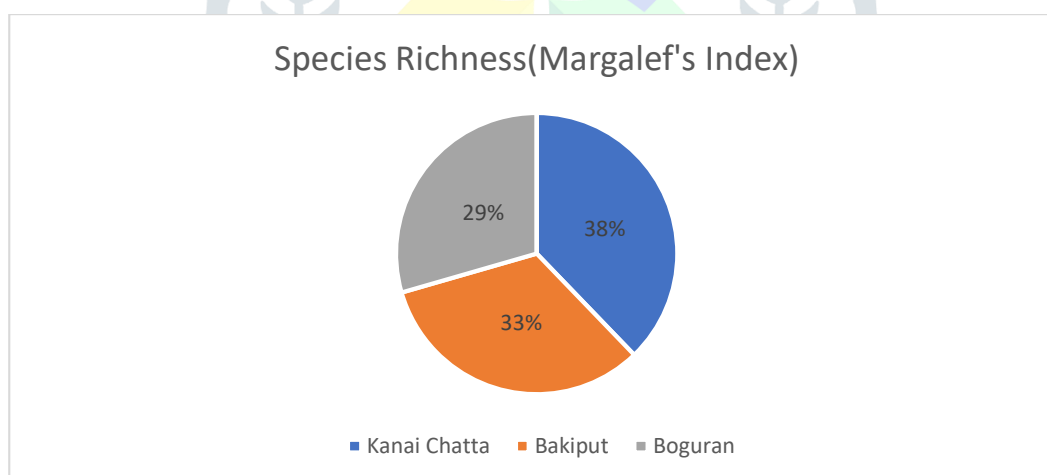
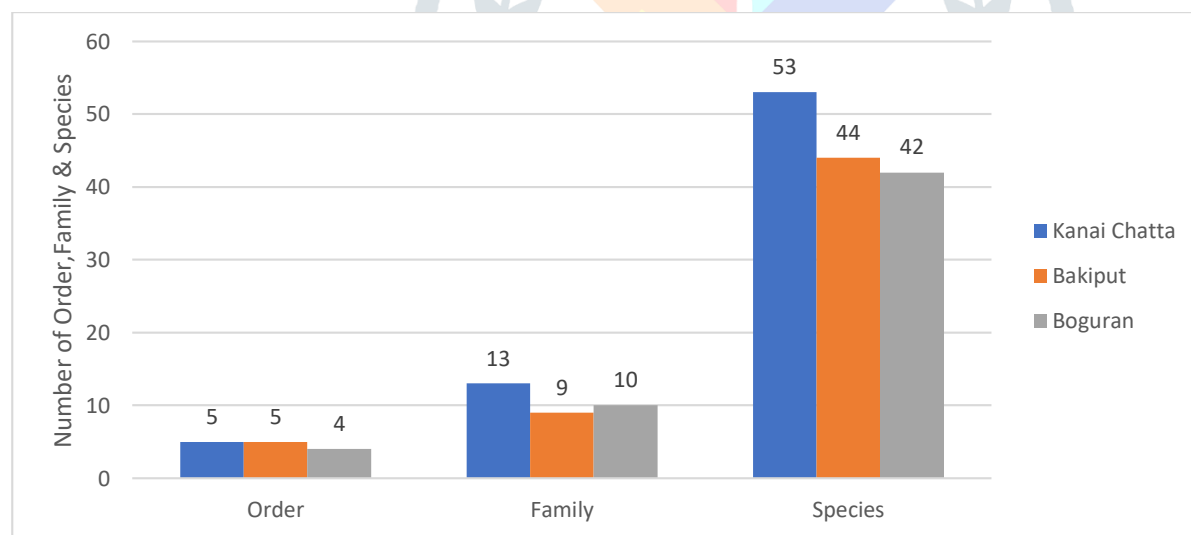


Fig-(3).This pie diagram shows species richness (Margalef's Index) of three sites.

In Kanaichatta (site-1) where found total 53 species of 13 family under 5 order. In Bankiput (site-2) where found total 44 species of 9 family under 5 order and in Boguran (site-3) where found total 42 species of 10 family under 4 order.

Table: (F). Shows total no. of order, family and species in three study sites:-

ORDER	FAMILY	KANAICHATTA	BANKIPUT	BOGURAN
Gruiformes	Rallidae	4	1	1
Pelicaniformes	Ciconidae	1	1	1
	Ardeidae	10	9	5
	Phalacrocoracidae	1	1	1
Suliformes	Anhingidae	1	1	0
Charadriiformes	Burhinidae	1	0	0
	Recarvirostridae	1	0	1
	Charadriidae	8	6	6
	Rostratulidae	1	0	1
	Jacanidae	2	0	0
	Scolopacidae	14	14	16
	Laridae	6	8	7
Passeriformes	Motachillidae	3	3	3
5	13	53	44	42

**Fig-(4).** This column diagrams shows total no. of order, family & species of my three study sites.**Species Diversity and Evenness :**

In my present study, Kanaichatta (site-1) shows greater diversity (Shannon index = 2.458; Simpson Index = 0.791); followed by Bankiput (site-2) (Shannon index = 2.185; Simpson Index = 0.726) and lower diversity is seen in Boguran site (site-3) (Shannon index = 1.789; Simpson Index = 0.639).

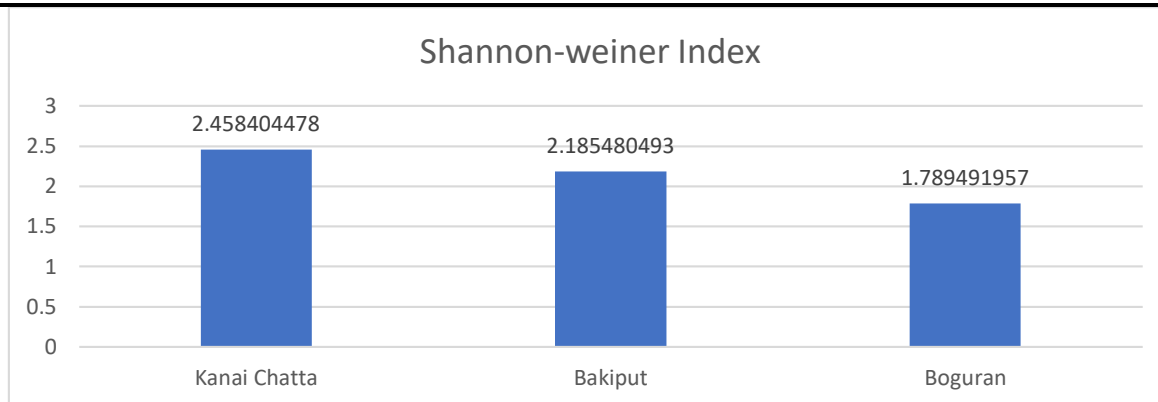


Fig-(5). This column diagrams shows value of Shannon diversity index of three study sites.

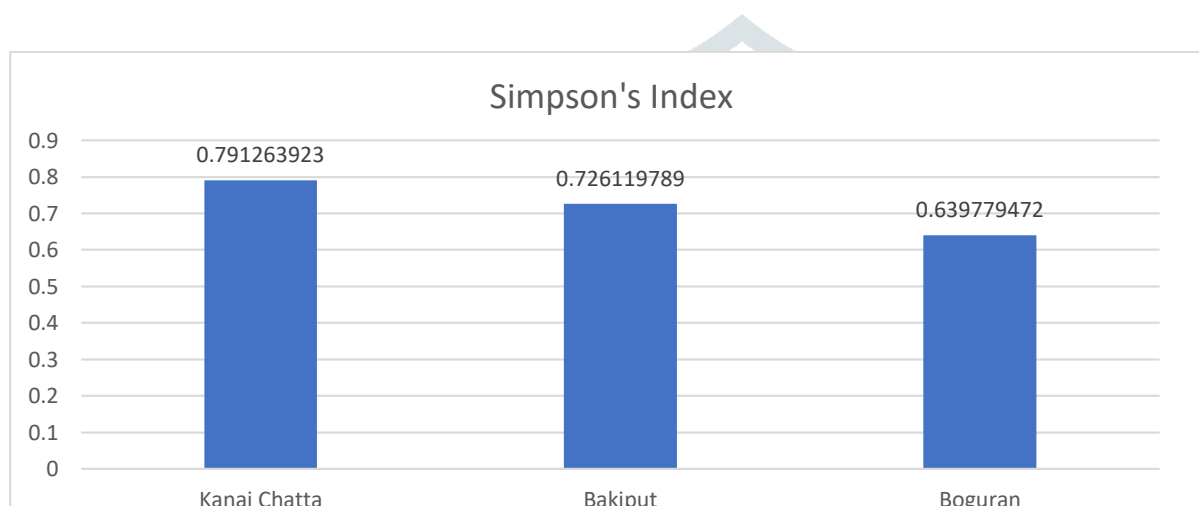


Fig-(6). This column diagrams shows value of Simpson's diversity Index of three study sites.

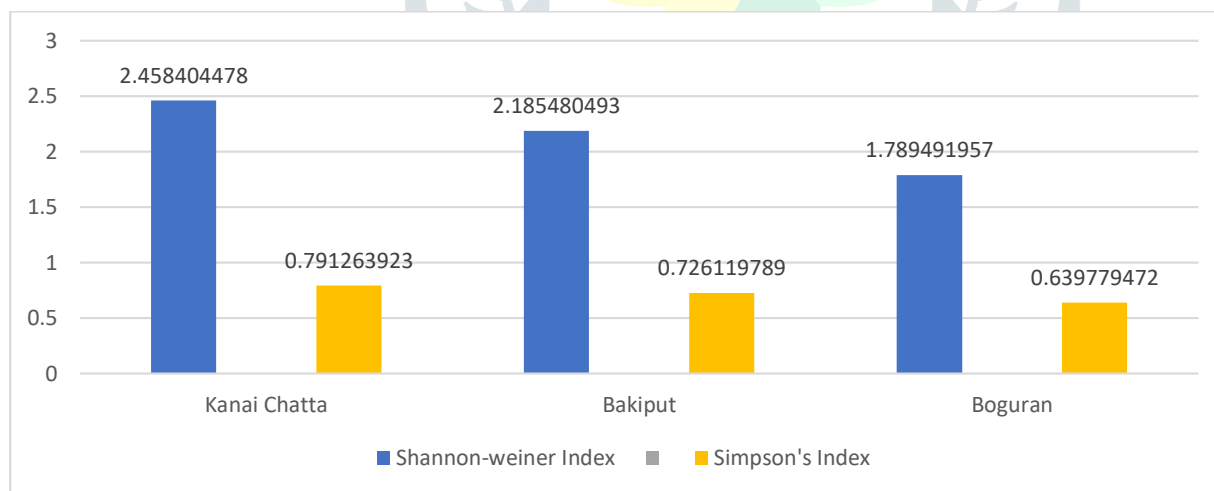


Fig-(7). This Clustered column shows value of diversity indices in together of three study sites.

In this three study sites Boguran (site-2) shows greater evenness (Pielou's Index = 0.478), followed by Bankiput (site-2) (Pielou's Index = 0.577) and lower evenness is seen in Kanaichatta (site-1) (Pielou's Index = 0.619).

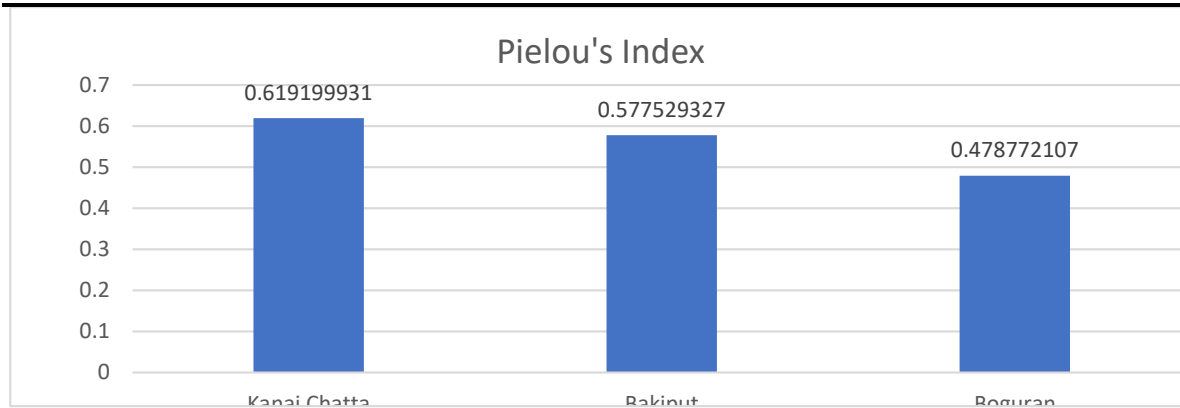


Fig-(8).This column diagrams shows value of Pielou’s diversity Index of three study sites.

Table: (G).Shows value of various Diversity Indexes:-

Diversity Index	SITES		
	KANAICHATTA	BANKIPUT	BOGURAN
Shannon Diversity Index	2.458	2.185	1.789
Simpson’s Diversity Index	0.791	0.726	0.639
Evenness Index	0.619	0.577	0.478
Margalef’s Index	5.968	5.168	4.652

SPECIES RANK-ABUNDANCE DISTRIBUTION:

Among the three study sites, Boguran (site-3) shows greater abundance, where found total 6715 no. of individuals (40%); followed by Kanaichatta (site-1), where total 6077 no. of individuals (36%) and lower abundance shows in Bankiput (site-2), where found total 4104 no. of individuals (24%).

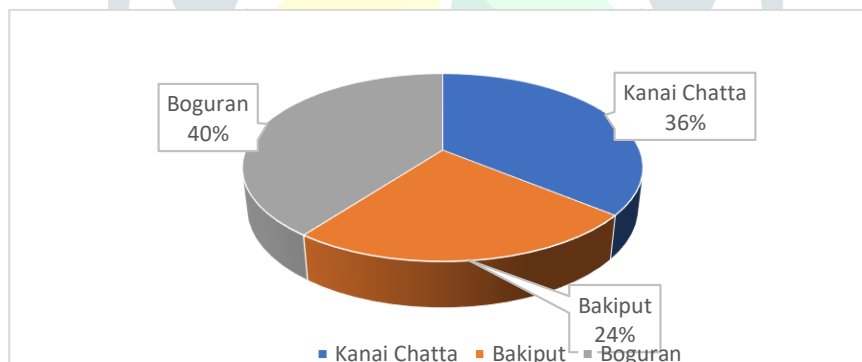


Fig-(9). Pie diagrams show total no. of individuals (Abundance) of three study sites.

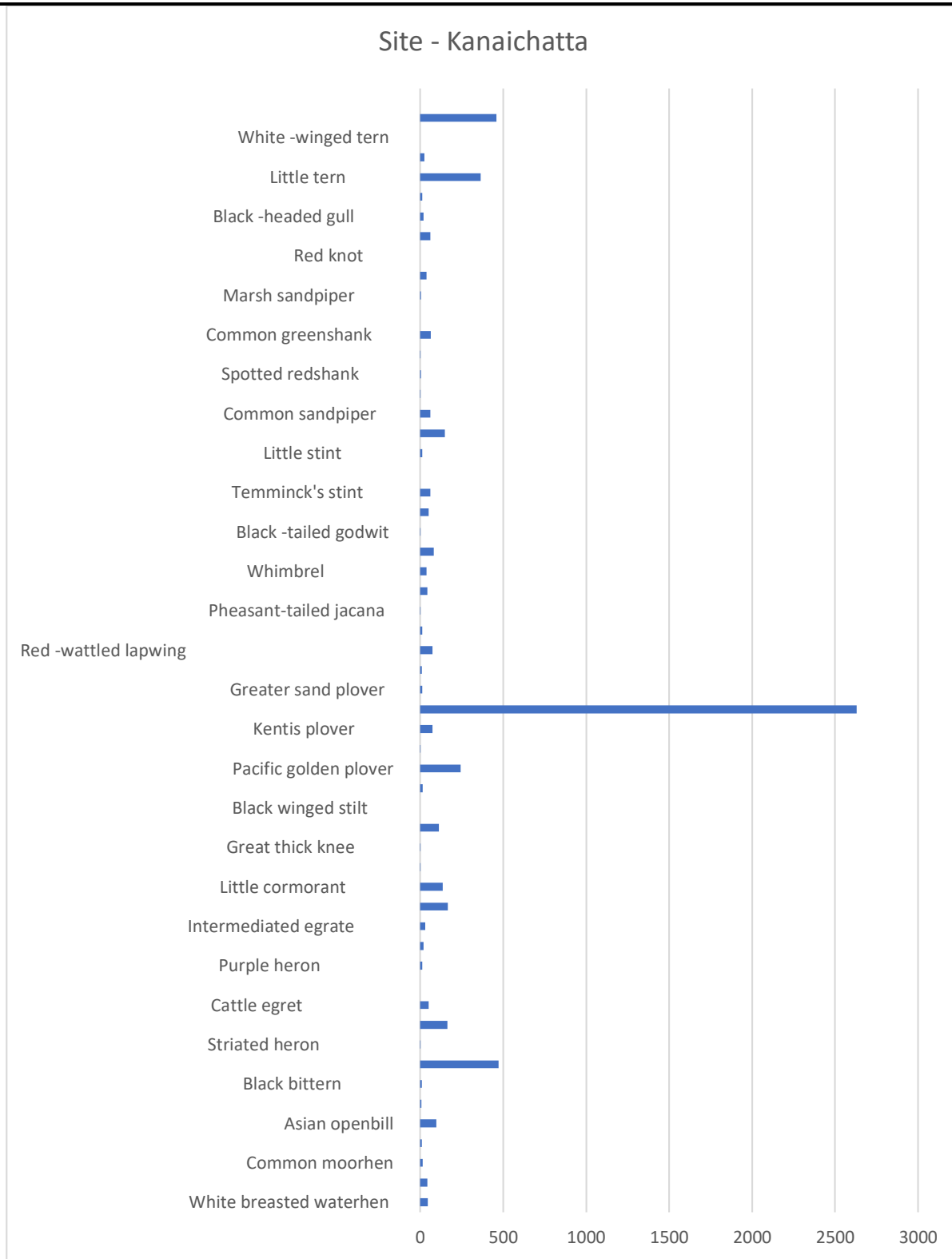


Fig-(10).This Bar diagram shows species wise total no. of individuals in Kanaichatta.

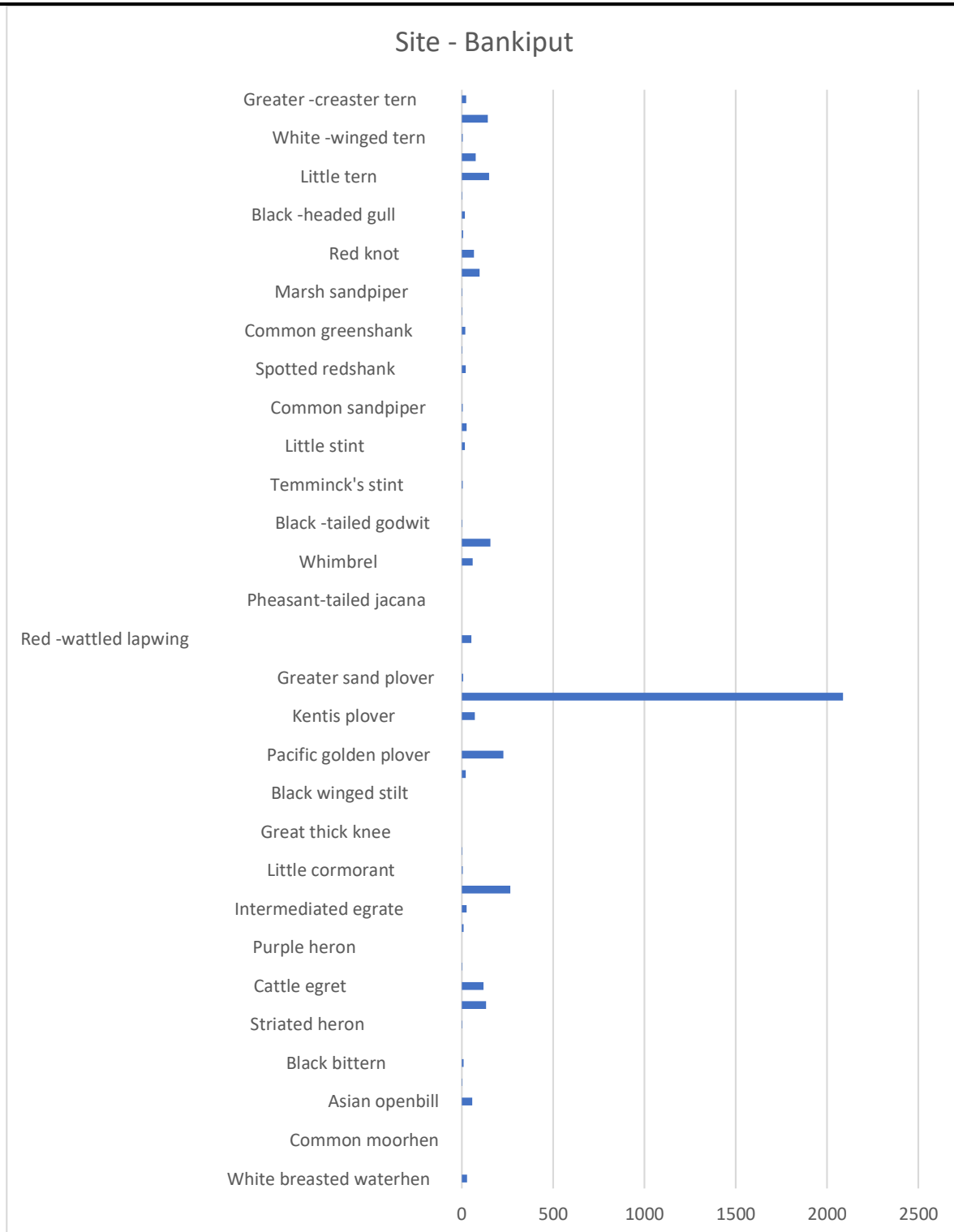


Fig-(11).This Bar diagram shows species wise total no. of individuals in Bankiput.

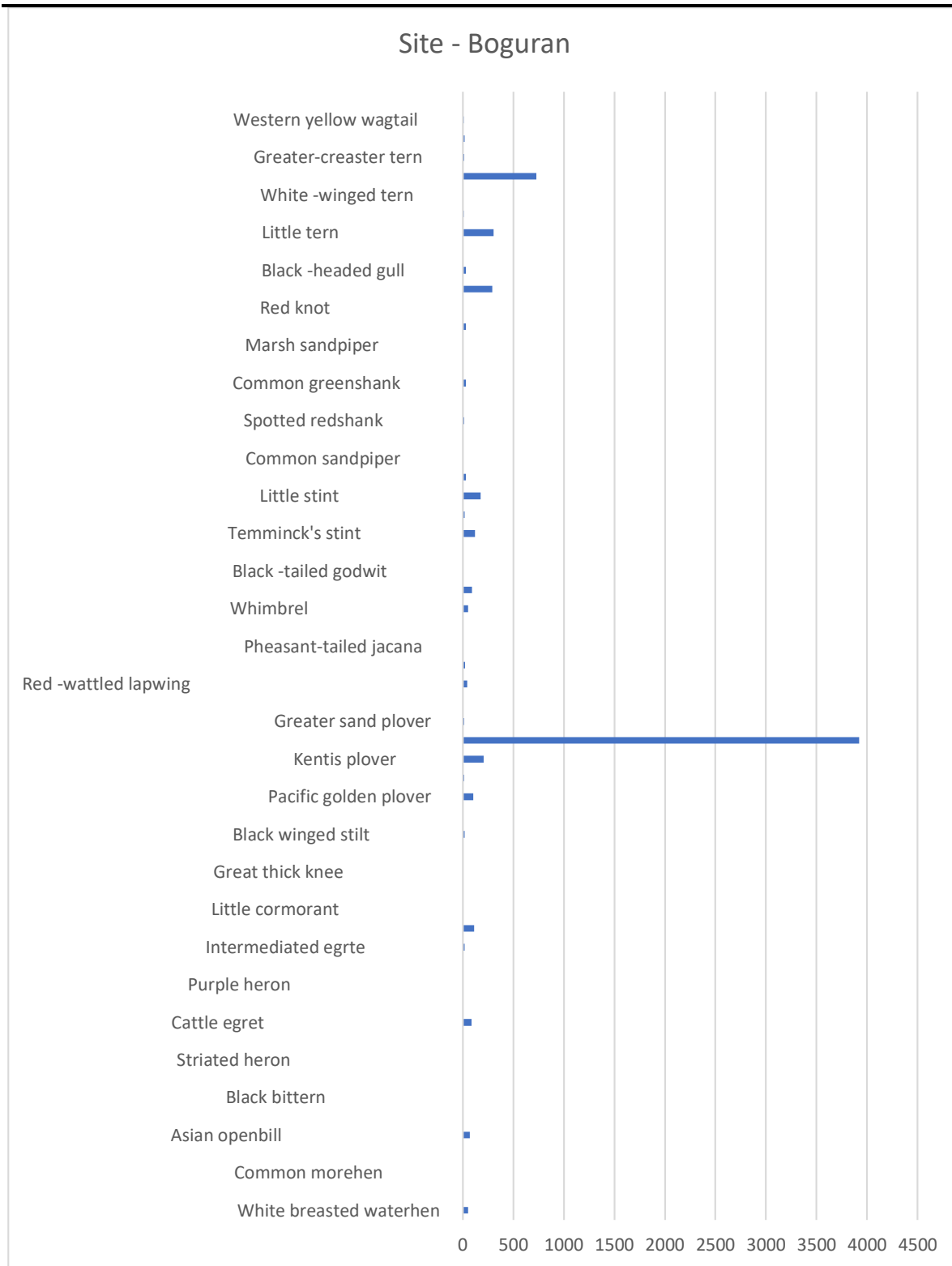


Fig-(12). This Bar diagram shows species wise total no. of individuals in Boguran.

Table: (H). Shows Migratory status, IUCN status and WPA (Wild Life Protection Act) schedule species where LC (Least Concern), NT (Near Threatened), EN (Endangered), VU (Vulnerable) IUCN Red list; RE (Resident), WV (Winter Visitor), VA (Vagrant), SV (Summer Visitor) Grimett *et al*, (2021).

S L N O .	Order: Family	Species	STA TUS	IU CN ST AT US	WP A S T T U S
1.	Gruiformes : Rallidae	White breasted water hen (<i>Amaurornis phoenicurus</i>)	RE	LC	IV
2.		Grey-headed swamp hen (<i>Porphyrio poliocephalus</i>)	RE	LC	IV
3.		Common moorhen (<i>Gallinula chloropus</i>)	RE	LC	IV
4.		Common coot (<i>Fulica atra</i>)	WV	LC	IV
5.	Pelecaniformes : Ciconiidae	Asian open bill (<i>Anastomus oscitans</i>)	RE	LC	IV
6.	Pelecaniformes : Ardeidae	Cinnamon bittern (<i>Ixobrychus cinnamomeus</i>)	RE	LC	IV
7.		Black bittern (<i>Ixobrychus flavicollis</i>)	RE	LC	IV
8.		Black crown night heron (<i>Nycticorax nycticorax</i>)	RE	LC	IV
9.		Striated heron (<i>Butorides striata</i>)	RE	LC	IV
10.		Indian pond heron (<i>Ardeola grayii</i>)	RE	LC	IV
11.		Cattle egret (<i>Bubulcus ibis</i>)	RE	LC	IV
12.		Grey heron (<i>Ardea cinerea</i>)	RE	LC	IV
13.		Purple heron (<i>Ardea purpurea</i>)	RE	LC	IV
14.		Great egret (<i>Ardea alba</i>)	RE	LC	IV
15.		Intermediated egret (<i>Ardea intermedia</i>)	RE	LC	IV
16.		Little egret (<i>Egretta garzetta</i>)	RE	LC	IV
1	Pelecaniformes :	Little cormorant (<i>Microcarbo niger</i>)	RE	LC	IV

7.	Phalacrocoracidae				
1 8.	Suliformes : Anhingidae	Oriental darter (<i>Anhinga melanogaster</i>)	WV	NT	IV
1 9.	Charadriiformes : Burhinidae	Great thick knee (<i>Esacus recurvirostris</i>)	RE	NT	IV
2 0.	Charadriiformes : Recurvirostridae	Pied avocet (<i>Recurvirostra avocetta</i>)	WV	LC	IV
2 1.		Black winged stilt (<i>Himantopus himantopus</i>)	WV	LC	IV
2 2.	Charadriiformes : Charadriidae	Grey plover (<i>Pluvialis squatarola</i>)	WV	LC	IV
2 3.		Pacific golden plover (<i>Pluvialis fulva</i>)	WV	LC	IV
2 4.		Little ringed plover (<i>Charadrius dubius</i>)	WV	LC	IV
2 5.		Kentis plover (<i>Charadrius alexandrines</i>)	WV	LC	IV
2 6.		Lesser sand plover (<i>Charadrius mongolus</i>)	WV	LC	IV
2 7.		Greater sand plover (<i>Charadrius leschenaultia</i>)	WV	LC	IV
2 8.		Grey -headed lapwing (<i>Vanellus cinereus</i>)	WV	LC	IV
2 9.		Red -wattled lapwing (<i>Vanellus indicus</i>)	RE	LC	IV
3 0.		Charadriiformes : Rostratulidae	Greater painted snipe (<i>Rostratula benghalensis</i>)	RE	LC
3 1.	Charadriiformes : Jacanidae	Pheasant-tailed jacana (<i>Hydrophasianus chirurgus</i>)	RE	LC	IV
3 2.		Bronzed -winged jacana (<i>Metopidius indicus</i>)	RE	LC	IV
3 3.	Charadriiformes : Scolopacidae	Whimbrel (<i>Numenius sphaeopus</i>)	WV	LC	IV
3 4.		Eurresian curlew (<i>Numenius arquata</i>)	WV	NT	IV

3 5.		Black -tailed godwit (<i>Limosa limosa</i>)	WV	NT	IV
3 6.		Curlew sand piper (<i>Calidris ferruginea</i>)	WV	NT	IV
3 7.		Temminck's stint (<i>Calidris temminckii</i>)	WV	LC	IV
3 8.		Sander ling (<i>Calidris alba</i>)	WV	LC	IV
3 9.		Little stint (<i>Calidris minute</i>)	WV	LC	IV
4 0.		Terek sand piper (<i>Xenus cinereus</i>)	WV	LC	IV
4 1.		Common sand piper (<i>Actitis hypoleucos</i>)	WV	LC	IV
4 2.		Green sand piper (<i>Tringa ochropus</i>)	WV	LC	IV
4 3.		Spotted red shank (<i>Tringa erythropus</i>)	WV	LC	IV
4 4.		Common red shank (<i>Tringa totanus</i>)	WV	LC	IV
4 5.		Common green shank (<i>Tringa nebularia</i>)	WV	LC	IV
4 6.		Wood sandpiper (<i>Tringa glareola</i>)	WV	LC	IV
4 7.		Marsh sandpiper (<i>Tringa stagnatilis</i>)	WV	LC	IV
4 8.		Great knot (<i>Calidris tenuirostris</i>)	VA	EN	IV
4 9.		Red knot (<i>Calidris canutus</i>)	VA	NT	IV
5 0.	Charadriiformes : Laridae	Brown-headed gull (<i>Chroicocephalus brunnicephalus</i>)	WV	LC	IV
5 1.		Black-headed gull (<i>Chroicocephalus ridibundus</i>)	WV	LC	IV
5 2.		Pallas's-gull (<i>Ichthyaetus ichthyaetus</i>)	WV	LC	IV
5 3.		Little tern (<i>Sternula albifrons</i>)	RE	LC	IV

5 4.		Whiskered tern (<i>Chlidonias hybrida</i>)	WV	LC	IV
5 5.		White-winged tern (<i>Chlidonias leucopterus</i>)	WV	LC	IV
5 6.		Greater-crested tern (<i>Thalasseus bergii</i>)	RE	LC	IV
5 7.		Common tern (<i>Sterna hirundo</i>)	WV	LC	IV
5 8.	Passeriformes : Motachillidae	White wagtail (<i>Motacilla alba</i>)	WV	LC	IV
5 9.		Western yellow wagtail (<i>Motacilla flava</i>)	WV	LC	IV
6 0.		Citrine wagtail (<i>Motacilla citreola</i>)	WV	LC	IV



Grey-Headed swamp hen



Striated Heron



Inter-mediate Egret



Great Egret



Indian Pond Heron



Asian Openbill



Grey Heron



Oriental Darter



Oriental Darter & Grey Heron



Grey Heron



Little Cormorant



Great Thick-knee



Black-winged Stilt



Black-winged Stilt sitting on her nest



Lesser-sand Plover



Flock of Lesser Sand Plover



Lesser Sand Plover (Breeding Plumage)



Grey plover



Little-ringed plover



Pacific Golden Plover(juvenile)



Pacific Golden Plover



Temnick's Stint



Little Stint



Eastern-Yellow wagtail



Common Sandpiper



Marsh Sandpiper



Terrek Sandpiper



Spotted Redshanks



Common Redshank



Common Greenshank



Curlew Sandpiper



Sanderling



Flock of Sanderling



Black-tailed Godwit



Wood Sandpiper



Bronzed-winged Jacana (juvenile)



Great knot



Red knots



Flock of Great Knots



Whimbrels



Euressian Curlews



Euressian Curlew



Common Tern



Greater-crested Tern



Whiskered Tern



Pied Avocet



Flock of Pied Avocets



Pallas's Gull



Brown-headed Gull



Palla's Gull (Juvenile)



Flock of Brown-headed Gull



Purple Heron



Black Bittern



Flock of Brown-headed Gull

DISCUSSION

Present study was carried out from April, 2021 to October, 2021, almost 7 months. This study was covered from mid-summer to monsoon season. It was very short time for understand

the waders birds diversity because most of the birds was found up to date, is winter migrant and this study is not covered winter season. Still last one month of this study survey were found much number of species & much number of individuals as well.

In this present study work, I was found total 60 species of 13 families under 5 orders of avifauna. In comparison of three study sites, total 5 order were Gruiformes (n=4), Pelicaniformes (n=13), Suliformes (n=1), Passeriformes (n=3) and Chradriiformes (n=39); total 13 family were Rallidae (n=4), Ciconidae (n=1), Ardeidae (n=11), Phalacrocoracidae (n=1), Anhingidae (n=1), Burhinidae (n=1), Recuvirostridae (n=2), Charadridae (n=8), Rostratulidae (n=1), Jacanidae (n=2), Scolopacidae (n=17), Laridae (n=8), Motachilida (n=3).

Site-1 shows greater number of species (53), because this site has varied types of habitat, like significant large fresh-water wetland and it was less disturbed.

Site-2 shows medium type of species richness (44), because most portion of the site is covered by grass and most of the disturbance is happens mostly by cattle and few tourists.

Site-3 shows lowest number of species (42), because most part of this site is disturbed by tourists and fisherman.

In this study, three birds, i.e.- Grey-headed Swamp hen (*Porphyrio poliocephalus*); (Gruiformes : Rallidae), Great Knot (*Calidris tenuirostris*); (Charadriiformes: Scolopacidae) and Red Knot (*Calidris canutus*); (Charadriiformes: Scolopacidae), were sighted recently, where Grey-headed Swamp hen (Gruiformes : Rallidae) observed in Kanaichatta (site-1) only; Great Knot (*Calidris canutus*) (Charadriiformes: Scolopacidae) was sighted in three study sites and Red Knot (*Calidris canutus*); (Charadriiformes : Scolopacidae) in Bankiput and Boguran sites.

In this present study, one bird was found under the status of Endangered, i.e. Great knot (*Calidris tenuirostris*); (Charadriiformes: Scolopacidae).

Total 6 birds, in the study area, were found, those are under the status of Near Threatened, i.e.-Oriental darter (*Anhinga melanogaster*) (Suliformes: Anhingidae), Great thick knee (*Esacus recurvirostris*) (Charadriiformes: Burhinidae), Euresian curlew (*Numenius arquata*) (Charadriiformes: Scolopacidae), Black-tailed godwit (*Limosa limosa*) (Charadriiformes: Scolopacidae), Curlew sandpiper (*Calidris ferruginea*) (Charadriiformes: Scolopacidae), Red knot (*Calidris canutus*) (Charadriiformes: Scolopacidae). Remaining 53 birds of the study area is under the status of least concern. In 3 study area (Kanaichatta, Bankiput and Boguran), out of these 60 species including 5 order of 13 family there are 23 species of resident wader, 35 species of winter visitor wader and 2 species of vagrant wader. All birds are included in “schedule -IV” according to Indian Wildlife Protection Act (WPA), 1972.

Due to the high position in aquatic food webs and considerable mobility, wading birds are important functional components in wetland ecosystems (Frederick and Ogdem, 2003). They are considered as good indicators of wetlands quality (Kushlan, 1993). Sea birds are top predator in marine food chain and key components of the food web, so they may be indicates the status of habitat.

Present study shows that decrease of the number of wader bird in this coastal area which indicates the destruction of habitat due to anthropogenic activity.

THREATS AND CONSERVATION

Present study was conducted in three sites of Purba Medinipur coastal area. Three selected study sites (Kanaichatta, Bankiput and Boguran) were taken to assess the total wader birds in that region. One river i.e. Rasulpur river joins to Bay of Bengal near Petuaghat, it's a nearest point of my study site of Kanaichatta & we know that brackish water is much potential and shows much diversity of various invertebrate's.

It is observed that the wetlands are undergoing un-wanted change in biodiversity due to anthropogenic pressure which creates dangerous effects on migratory birds. Sometimes the

numbers of migratory wader avifauna species in our coastal area is bring down severely in summer time but in winter season it increases respectively.

To come back the earlier well favorable or more favorable environment for the migratory bird species, first of all it is needed to develop awareness among civilized being like human. Activities of the tourists are also causing disturbances to the coastal ecosystem. There should be strict management rules for visitors for the conservation of biodiversity in the sea shore of coastal area and should be announced as a polythene free zone. Govt. should take further steps to protect sea shore of coastal area as well as related wetland's diversity. A sustainable and holistic management planning is necessary for conservation of coastal area and it's surrounding's.

CONCLUSION

The present study were conducted in varied types of habitat of the region, such as sea shore, attached fishery land, fresh water wet land, agricultural field etc. Within 1.00 km distance from the sea shore, many resident birds, winter visitors, summer visitors and vagrant birds are found.

In this present study, I was found total 60 species of 13 families under 5 order of wader bird. In comparison of the present study and previous study of avifauna, three species of wader bird is enlisted in the check list of present study suchas Grey-headed Swamp hen (*Porphyrio poliocephalus*) (Gruiformes: Rallidae), Great Knot (Charadriiformes : Scolopacidae) and Red Knot (Charadriiformes : Scolopacidae), those birds were not recorded in previous latest avifauna study (Payra *et al.* 2020). This study shows that many birds will be sighted in recent future. At the same time various anthropogenic activity like tourism activity, increasing dry fish industries near sea beach, grazing activity by various domestic animals etc. become a threats in the present study area. The public awareness is essential to protect the habitat and diversity not only for wader birds but also entire avifauna and other wild animals as well.

The present survey result will serve as significant base line data of wader bird of Purba Medinipur. A very long term quantitative and qualitative study of wader birds as well as avifauna is needed to be taken in future for well documentation of wader bird.

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