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Research Paper

STATUS OF AQUATIC BIRDS AT AJI-1 WATER RESERVOIR, RAJKOT, GUJARAT, INDIA

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Abstract

This paper presents a study on status of Aquatic birds at Aji-1 water reservoir Rajkot, Gujarat, India. Aji - 1 water reservoir located around southern-east zone of Rajkot city. The city of Rajkot lies at latitude 21º34' N, longitude 70º52' E and altitude 138 m above mean sea level (MSL). To record the data entire work was conducted during July 2014 to February 2015 for eight months. A total of 51 species of Aquatic birds were recorded belonging to 37 genera and 18 different families of class Aves from Aji-1 fresh water reservoir. The resident birds (43%) were observed and recorded during most of the study period but the migratory birds were significant (57%) and observed mostly during winter season. These data suggest that the freshwater reservoirs sites provide more suitable habitat for migratory birds. Preferences for nesting sites were significantly higher on the local trees in study sites, meaning that vegetation is important factor affecting the diversity of avifauna.

Key words: *Aquatic birds, fresh-water reservoir, Status, Rajkot city*.

INTRODUCTION

Birds are vertebrate warm blooded animals; temperature remains more or less constant and independent of the surrounding temperature. Birds were very long back been recognized as an important constituent of ecosystem. Now-a-days, avifaunal diversity has been decreasing due to the destruction of natural habitats and human disturbances. Random destruction of natural habitats by cutting nesting trees and foraging plants for commercial use of woods and lands are the main factor responsible for narrow down in avian foraging habitat and their nesting sites. Water and wetlands, either natural or man-made play a significant role in the survival and reproduction of many bird species. However, wetlands are highly unstable compared to other ecosystems. They change according to the changes in season, vegetation, and rate of sediment formation. Man has been playing a significant role in the creation of water and wetlands. Reservoirs, Canals, ponds of varying sizes, flood gravel pits, are all examples of man-made wetlands. Wetlands play a significant role in the population dynamics of many avian species.

Wetlands are important conservation sites due to their rich biodiversity, they are among the most productive ecosystem in the world, and they harbour many globally threatened species [5], [6], [12] (Getzner 2002, Green 1996, Petrie 1998). The work was determined to study status of aquatic birds at Aji-1 water reservoir Rajkot, Gujarat, India including systematics with updates and familial position of genus and species. Rajkot is located at the center of Peninsular Saurashtra in Gujarat state. The total area of Rajkot city is 104.86 km^2. The actual ordinates of Rajkot lies between latitude 21º34' N and longitude 70º52' E; located and at altitude 138 m above mean sea level (MSL). The climate of Rajkot is tropical arid to semi-arid with three distinct seasons each year, monsoon, winter and summer. The area receives annual rainfall is erratic in its occurrence, duration and intensity. The total rainfall during study period July 2014 to February - 2015 was 455 mm and average range of humidity 70 to 90%; hence these large water reservoirs turns into small catchments during the summer seasons.

Aji-1 Fresh-Water Reservoir is situated from the south-east boundary of the Rajkot city (Fig.1). Its catchments area is 129.5 sq km. and deep with a water storage capacity of 1073 M. C. Ft.; have many smaller and larger islands. Ecological overview of this site has good vegetation's flora like Neem (*Azadirachta indica*), Gulmhor (*Delonix regia*), Flame of the forest (*Butea monosperma*), Garmalo (*Cassia fistula*), Deshi Baval (*Prosopis juliflora*) and Gando Baval (*Prosopis alba*). This fresh water reservoir has many undisturbed habitats available for birds, like wetlands site near Van Chetana Kendra, many small islands, scrub fragments, vegetation layering like grass lands, shrub lands and forest areas towards the site of Van Chetana Kendra near Thorala Vidi. Moreover this site has good Ornamental Botanical Garden at Pandit Din Dayal Updhyay garden comprise high vegetation land provide roosting and resting sites for birds. This site is highly pressurized under anthropogenic activity also such as visit of local publics for food offering to birds as religious ritual, fishing, domestic use (i.e. washing of vehicles, animals, cloths and swimming), pilgrims function near temple site, tourist and human settlement. As monsoon ends this deep water-reservoir in winter gradually turns into wetlands and aas a wetland it is an ideal place to host thousands of migratory birds, as well as resident birds.

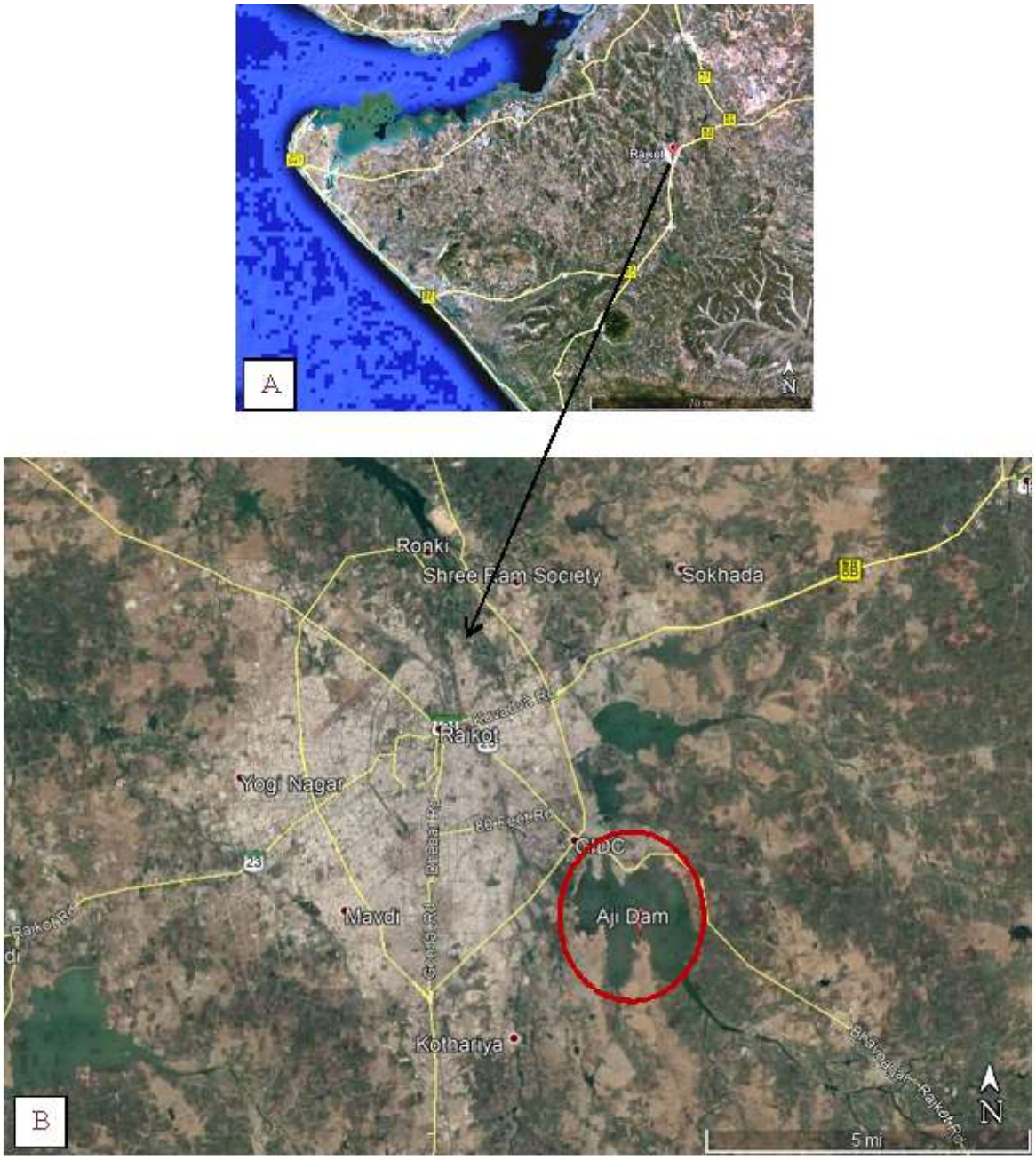

Fig. 1 Location of Study Areas.
A. Location of Rajkot City in Gujarat, India.
B. Study sites of Aji-1 water reservoir in Rajkot City (Red circle).

MATERIALS AND METHODS

The work was carried out during July 2014 to February 2015 for eight months at Aji-1 Reservoir, Rajkot, Gujarat, India. The two different sites were selected to record the data as Site-1 Visitors place (highly disturbed areas) and Site-2 near Thorada Vidi (undisturbed with natural habitat) at Aji-1 water reservoir. Data collection by sighting and total count method using binocular (Super Zenith, 12 X 50) including visible flying individuals and through photographs also at random by point and line transect methods. Data records were obtained thrice in a month by week – end. Entire these manmade water catchment areas were surveyed to assess from convenient directions

by approaching peripheral boundaries by road, walk-ways on bank along with motorbike, walk and surveyed the settled birds present in and around of the selected both study sites.

Total 24 visits (Thrice per month/site) and 48 line transects (per visit single transect/site) were walked; undertook 48 such walk samplings (N=48) distance was approximate 1 to 2km long to cover the entire areas and total time spent five hours by morning (0700 to 1200 hrs).

Systematic updates and identification of birds were done by using field guide such as [1], [2], [3], [7], [9], [10], [12], [14], [15] and [16]. Ali (2002, 2012), Ali and Ripley (1983), Grimmett *et al* (2013), Khacher (1996), Manakadan and Pittie (2002), Parasharya *et al* (2004), Sangha and Naoroji (2005), Srinivas (2004), Sugathan and Varghese (1996).

Data Analysis :

The occurrence status of the species was determined as per [4] GEER (1998).The population status (PS) of the birds recorded with <100 individuals were considered as rare, those between 100 to 500 individuals as common and those recorded >500 individuals as abundant and in migratory status 1consider for resident birds and 2 as migratory or seasonal migratory [11] (Nirmal Kumar *et al,* 2007).

Familial individuals of the water-birds and percentages of the genus and species were calculated (Fig. 2). Shannon – Wiener's (1948) Diversity index H=3.321928/N (N log10 N - ∑ ni 1 log10 ni)(Where N= total number of individuals, ni=total number of species). Simpson diversity index D=N (N-1)/ ∑n (n-1) (Where N is the total number of species during entire study periods, and n is the number of individual in each species). Pielou's (1996) Evenness index E = H/log S (where S = number of species and H = diversity index) were calculated.

RESULTS AND DISCUSSION

The present work reports the status of freshwater avian fauna in Aji-1 water reservoir, Rajkot, Gujarat, India. The work carried out during July 2014 to February 2015, for 8 months; this fresh water reservoir reveal 51 species of aquatic birds, 37 genus belong to 18 families (Table 2).

Familial numbers and percentages of observed individuals, genus and species of Water birds are shown in Table 2 and Fig. 3 respectively. This shows that the member of family Laridae (63.42%) and Anatidae (10.62%) has shown higher population. Maximum genus was found in family Ardeidae (16.2%), Scolopacidae (13.51%) and Anatidae (10.81%); and maximum species in family Anatidae (17.65%), Ardeidae and Scolopacidae (13.73%). These reflect that the study areas are more suited for the members of Laridae birds. Diversity in members of the Ardeidae, Scolopacidae and Anatidae fulfill their all needs to flourish in various macro and micro habitat characteristics of the Aji 1 Reservoirs. Preferences for roosting, resting and nesting these habitats provide significantly higher vegetation layers as grass land fragments, islands, scrub patches, ornamental shrub lands and large tree layer. These clears that vegetation is important factor affecting the diversity of avifauna.

Species Composition and Status

Of these, 29 species were migratory or seasonally resident (57%) and 22 species were resident (43%). Abundant species in resident water birds were Spot-Billed Duck (*Anas poecilorhyncha*), River Tern (*Sterna aurantia*), Black Winged Stilt (*Himanotopus himanotopus*), Little Cormorant (*Phalacrocorax niger*) and in migratory birds included Brown headed Gull (*Chroicocephalus brunnicephalus*), Black headed Gull (*Chroicocephalus ridibundus*), Dalmatian Pelican (*Pelecanus crispus*) and Common Coot (*Fulica atra*). Whereas common and rarely seen resident water birds were 9 species (41%); migratory species include 4 common species (14%) and 21 rare (72%) species respectively (Table 1).

Simpson diversity (D) shows and Margalef's species richness (d) shows significant higher value 5.208 and 4.992 respectively. This may certainly because of various macro and micro habitat characteristics of this study area. Moreover, seasonal differences in habitat structures as water level decrease in winter and deep water turns into wetland food availability reflects higher the species density and richness. Shannon diversity –H' and evenness-J reveal moderate higher value (H=2.302, J=0.585) (Fig.3). This may reflect comparatively less stress in their environment; and the climatic factor and their physiography may provide suitable habitat.

CONCLUSION

In conclusion, this water reservoir and their surrounding wetland areas attract many migratory birds and provide favorable habitat as level of water decrease during season provide sufficient food resources. Migratory as well as residential diverse taxa of water and wetland birds of this site may support the statement by [8] Karr (1980) that food resource distribution and abundance, physical environment, vegetation structure and co-evolutionary pressures interact in complex ways to determine resources utilization pattern of species and the complex communities they form.

Table 1 Status of Aquatic Birds of Aji-1 Water Reservoir, Rajkot, Gujarat, India (N=48).

Sr.No	Scientific Name	Common Name	M	PS	MS
1	*Podiceps cristatus*	Great Crested Grebe	1.38	R	2
2	*Pelecanus onocrotalus*	Great White Pelican	0.63	R	2
3	*Pelecanus crispus*	Dalmatian Pelican	109.13	A	2
4	*Ahninga melanogaster*	Darter	8.38	R	1
5	*Phalacrocorax carbo*	Great Cormorant	37.38	C	1
6	*Phalacrocorax fuscicollis*	Indian Cormorant	24.75	C	1
7	*Phalacrocorax niger*	Little Cormorant	72.38	A	1
8	*Ardea cinerea*	Grey Heron	8.75	R	1
9	*Ardea purpurea*	Purple Heron	1.63	R	1
10	*Nycticorax nycticorax*	Night Heron	1.00	R	1
11	*Bubulcus ibis*	Cattle Egret	15.38	C	1
12	*Casmerodiusalbus*	Great Egret	15.25	C	1
13	*Mesophoyx intermedia*	Intermediate Egret	1.50	R	1
14	*Egretta garzetta*	Little Egret	18.00	C	1
15	*Mycteria leucocephala*	Painted Stork	4.50	R	1
16	*Plegadis falcinellus*	Glossy Ibis	19.88	C	1

17	*Pseudibis papillosa*	Red naped Ibis	18.75	C	1
18	*Threskiornis melanocephalus*	Black-headed Ibis	48.38	C	1
19	*Platalea leucorodia*	Eurasian Spoonbill	6.75	R	1
20	*Phoenicopterus roseus*	Greater Flamingo	47.38	C	2
21	*Anas acuta*	Northern Pintail	0.25	R	2
22	*Anas poecilorhyncha*	Spot billed Duck	228.88	A	1
23	*Anas strepera*	Gadwall	1.63	R	2
24	*Anas clypeata*	Northern Shoveler	31.50	C	2
25	*Anas crecca*	Common Teal	7.25	R	2
26	*Anas penelope*	Eurasian Widgeon	1.88	R	2
27	*Sarkidiornis melanotos*	Knobbed bill Duck	20.63	C	1
28	*Tadorna ferruginea*	Ruddy Shelduck	0.50	R	2
29	*Aythya ferina*	Common Pochard	4.75	R	2
30	*Fulica atra*	Common Coot	107.25	A	2
31	*Amaurornis phoenicurus*	White breasted Water hen	0.13	R	1
32	*Vanellus indicus*	Red-wattled Lapwing	36.25	C	1
33	*Charadrius dubius*	Little Ringed Plover	3.88	R	2
34	*Limosa limosa*	Black tail Godwit	1.38	R	2
35	*Calidris minuta*	Little Stint	5.50	R	2
36	*Tringa ochropus*	Green Sandpiper	2.63	R	2
37	*Tringa glareola*	Wood Sandpiper	2.38	R	2
38	*Tringa totanus*	Common Redshank	12.38	R	2
39	*Gallinago gallinago*	Common Snipe	0.13	R	2
40	*Philomachus pugnax*	Ruff	5.63	R	2
41	*Himantopus himantopus*	Black Winged Stilt	77.88	A	1
42	*Chlidonias hybrida*	Whiskered Tern	25.13	C	2
43	*Sterna aurantia*	River Tern	171.00	A	1
44	*Chroicocephalus ridibundus*	Black headed Gull	535.13	A	2
45	*Chroicocephalus brunnicephalus*	Brown headed Gull	1043.13	A	2
46	*Esacus recurvirostris*	Great Thick-knee	0.63	R	1
47	*Halcyon smyrnensis*	White -Breasted Kingfisher	0.38	R	1
48	*Motacilla medraspatensis*	White Browed Wagtail	0.38	R	2
49	*Motacilla flava*	Yellow Wagtail	3.00	R	2
50	*Motacilla alba*	White Wagtail	0.25	R	2
51	*Hirundo rustica*	Barn Swallow	5.00	R	2

Abbreviations:

M-Mean (Individuals number of birds), MS - Migratory status, PS - Population status, A-Abundance, C-Common, R-Rare, 1=Resident, 2=Migratory.

<100 Individuals -rare, between 100 to 500 –common, > 500 –Abundant [4].(GEER, 1998).

Table 2 Family-wise Number of Individuals, Genus and Species of Water Birds of Aji-1 Reservoirs, Rajkot. (N=48)

Sr. No.	Family	Individual	Genus	Species
1	Podicipedidae	11	1	1
2	Pelecanidae	878	1	2
3	Anhingidae	67	1	1
4	Phalacrocoracidae	1076	1	3
5	Ardeidae	492	6	7
6	Ciconiidae	36	1	1
7	Threskiornithidae	750	4	4
8	Phoenicopteridae	379	1	1
9	Anatidae	2378	4	9
10	Rallidae	859	2	2
11	Charadriidae	321	2	2
12	Scolopacidae	239	5	7
13	Recurvirostridae	623	1	1
14	Laridae	14195	3	4
15	Burhinidae	5	1	1
16	Alcedinidae	3	1	1
17	Motacillidae	30	1	3
18	Hirundininae	40	1	1
	Total	**22382**	**37**	**51**

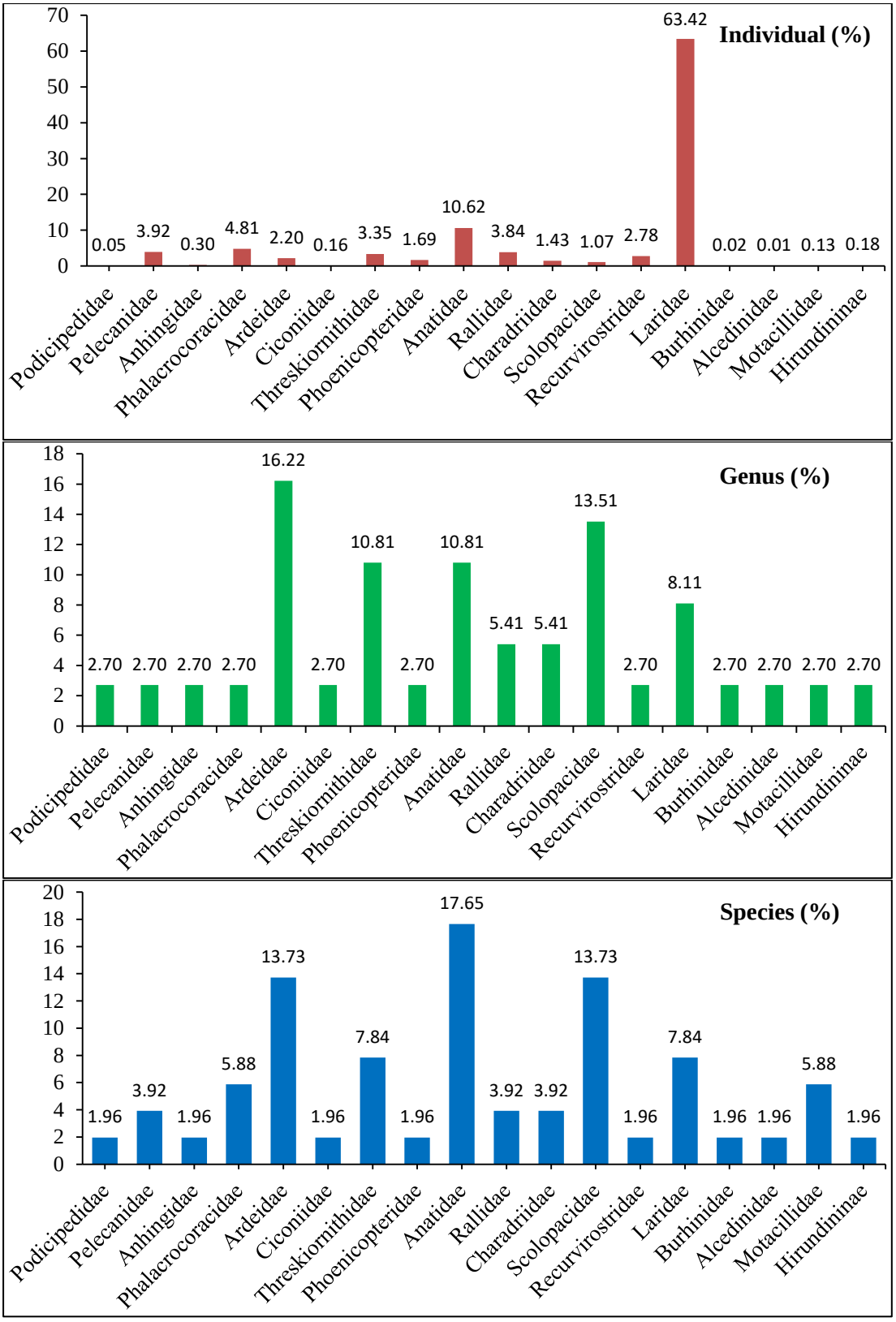

Fig 2 Familial Percentages of Water Birds Population, Genus and Species of Aji-1 Water Reservoirs.

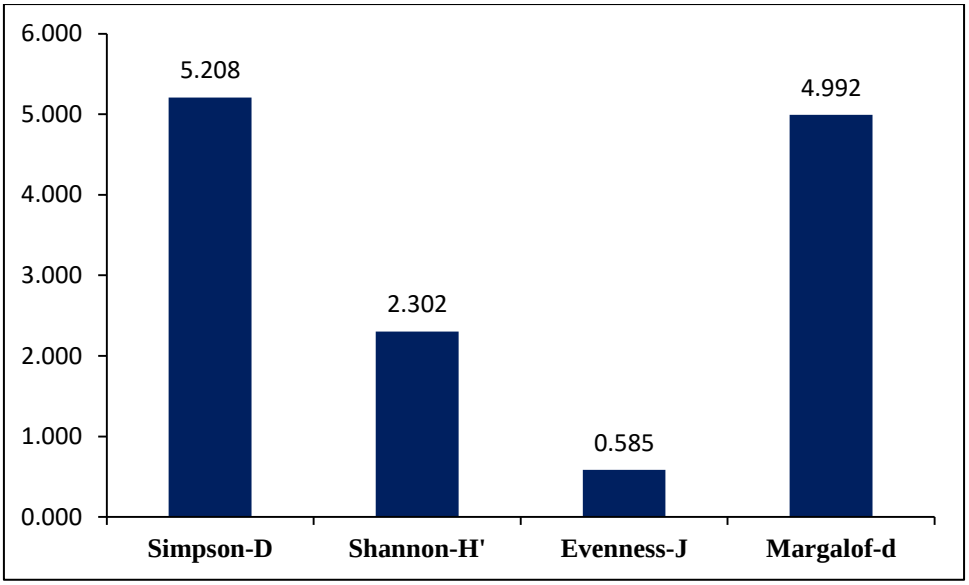

Fig 3 Simpson Diversity (D), Shannon-H', Evenness-J and Margalof – d of Aquatic Birds of Aji - 1 Water reservoirs.

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