Punjab Univ. J. Zool., Vol. 31 (2), pp. 203-208, 2016

ISSN 1016-1597 (Print)
ISSN 2313-8556 (online)

Original Article

Winter survey of birds at Keti Bunder, district Thatha, Pakistan

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(**Article history:** Received: July 20, 2016; Revised: September 09, 2016)

Abstract
Keti Bunder is part of Indus Delta and situated at Thatha district, Sindh. The objectives of study were to assessment of avifauna diversity and also noted the threats to the birds of Keti Bunder. To know the avian dominance and diversity of Keti Bunder; we carried out at dawn and dusk in winter season (November, 2015 to February, 2016), using direct and indirect methods. During the survey, total of 49 winter season bird species belonging to 33 genera and 21 families were recorded. A total of 4280 birds were recorded dedicated survey effort from the Keti Bunder. Dominance (D), Shannon-Wiener diversity Index (H'), Simpson Index (S), Evenness (E) and Margalef (R) were observed form the study area as; 0.06, 3.23, 0.94, 0.52 and 5.74 respectively. During the surveys noted that most abundant species of the study area were little egret, cattle egret, greater flamingo, greater egret, and common coot. It is concluded that bird species number are decreasing with passage of time when the data were compared with the previous research due to anthropogenic impacts especially pollution impact.
Key Words: Avian fauna, Keti Bunder, diversity index, linear count method, dominance

To cite this article: ALI, A., ALTAF, M. AND KHAN, M.S.H., 2016. Winter survey of birds at Keti Bunder, district Thatha, Pakistan. *Punjab Univ. J. Zool.,* **31**(2): 203-208.

INTRODUCTION

Pakistan is a country which has largest canal system of world; consists of 225 wetlands. Total area of wetland of Pakistan is 0.78 Million hectares; out of total, 74% of freshwater and 26% of coastal wetland areas and has 19 Ramsar sites (IUCN, 1989; Altaf *et al.,* 2014). There are present different diversity indices to assess the diversity; each index has its own value i.e. Shannon-Weiner, Simpson (indices increased when both species number and population is high), Evenness (this index value increased when maximum species have similar numbers), and Richness (Richness increased when population is higher in number) (Altaf *et al.,* 2013, 2015). The birds of world are noted as 9993 species (Jetz *et al.,* 2012); and more than 2700 species of birds have been noted from Asia (Collar *et al.,* 2001). However, more than 668 avian species are known from Pakistan (Mirza and Wasiq, 2007). Exponential growth of population of human has badly impacted the avian species in many ways such as; habitat loss, deforestation, invasive species, agriculture intensification, urbanization, industrialization, human-avian negative interactions and climate change (McKinney, 2002; Ali, 2005; Ali *et al.,* 2011; Altaf *et al.,* 2015). Urban landscape is different from forest landscape, with the urbanization and related facilities, the forest landscape have been fragmented. Natural landscape is replaced with invasive plant species (McNeill, 2000; McKinney, 2002; Holway and Suarez, 2006; Bierwagen, 2007; Altaf *et al.,* 2012, 2015). While, moderate urbanization creates positive impact on the diversity of generalist species but intensive urbanization creates negative impact on diversity and density of avian species specifically on specialist birds (Blair, 1996, 2001). These activities seriously degrade the natural landscape of wild bird diversity (Ali, 2005; Ali *et al.,* 2011; Umair *et al.,* 2013; Altaf *et al.,* 2015). Pollution particularly from industrial sources enhances sedimentation; which causes of oxygen deficiency, creates negative impact on avian diversity directly and indirectly (Singh *et al.*, 2014). Therefore this study was planned to assess the avifauna diversity and the prevalent threats in Keti Bunder, District Thatha.

94-PUJZ-61020270/16/0203-0208

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MATERIALS AND METHODS

Study Area

Keti Bunder is situated at the mouth of the River Indus known as Ochito, which enters through Hajamro creek and covers an area of 9,130 hectares (WWF, 2005). Mangrove forests are main forest and ecological feature of this area. These mangroves cover an area of 2631 ha with large size; 1996 ha with medium size; and 3588 ha with sparsely distributed. The remaining part consists of human settlements, sand dunes and water channels. The island consists of large number of channels on the western and the eastern sides; while on the other two sides there are shallow and deep water channels namely Hajamro Creek, Khobbar Creek, Dabbo Creek and Qalandri Creek (WWF, 2005; Zaheer *et al.,* 2012). Keti Bunder consists of 21 Dehs and 195 villages. The total population of whole Keti Bunder is about 27,405 and the number of households is 3915. The population of town is around 1500. The towns are widely distributed in 35 acres area around the sea water (WWF, 2005).

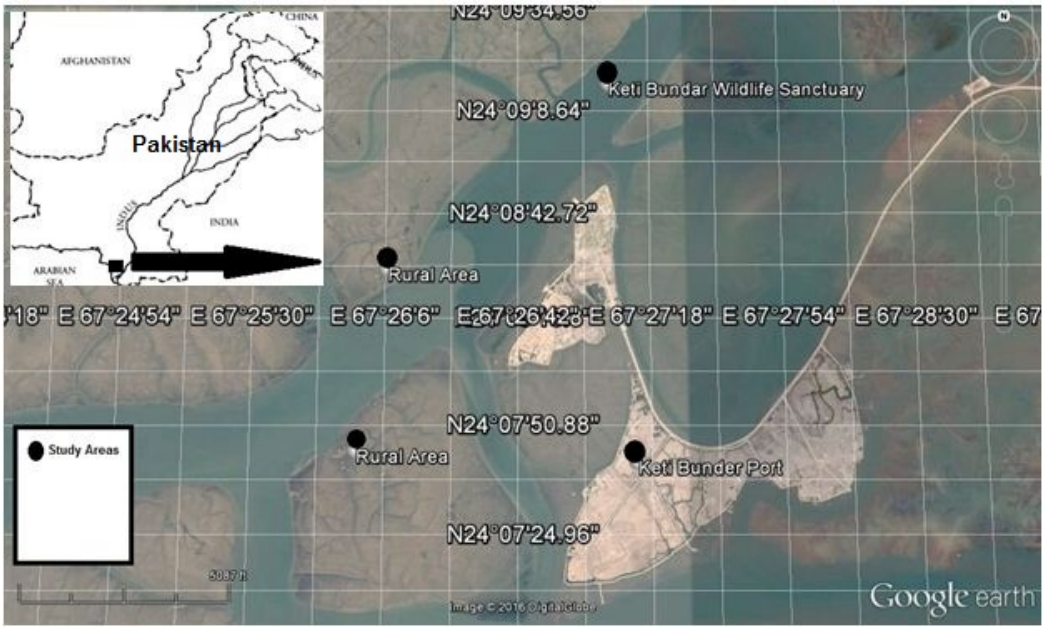

Figure 1: The Map of Keti Bundar, Pakistan.

Almost, 90% people of the study area are fisherman. Different casts present in the area while Syed and Memon communities are said to be well reputed in terms of socioeconomic status, while majority of them have small business and agriculture (WWF, 2005). The people of the study are involved in fisheries in different ways as; fishermen, boat owners, boat captain, helpers in factories, transporters, merchant shops and drivers of fish carrier vehicles (WWF, 2005).

Biodiversity

Keti Bunder is a Wildlife Sanctuary; for the conservation of waterbirds. The winter visitor and summer breeder's birds are herons, egrets, waders, pelicans and raptors. Common terrestrial mammals are fishing cat (*Prionailurus viverrrinus*), Indian wild boar (*Sus scrofa*), Asiatic jackal (*Canis aureus*) and Indian porcupine (*Manis crassicaudatus*). Most common reptiles are sea snakes, vipers, cobras and lizards (Roberts, 1991, 1992, 1997, 2005a, b; Khan, 2006).

Methodology

Direct and indirect linear count methods were applied for assessment of avifauna diversity of Keti Bunder area. Direct linear count method involved total count and voice records while indirect linear count method focused on counting of eggs, nests, feathers, carcasses and marks on trees. In addition, focused group discussions and interview were also used. A field guide "Birds of Pakistan" by Grimmett *et al.* (2008) was used for identification of birds of the study area. For the identification of avian species binoculars (32x50) were used.

Total four transect lines were selected, out of total one was wildlife sanctuary, 2nd was

Keti Bunder port and remaining two were rural areas of the habitats. The data were collected during winter season (November, 2015 to February, 2016) at dawn (6 am to 8 am) and dusk (4 pm to 6 pm). Each place was visit for four months; once in each month and twice a day at dawn and dusk. Only one bird watcher move from one place to other through ship or boat to measure bird diversity.

Statistical analysis

Five Diversity Indices (Dominance, Shannon-Wiener diversity Index, Simpson Index, Margalef and Evenness) were used to measure the avian diversity with the help of PAST version 2.17C (Hammert *et al.,* 2001).

RESULTS AND DISCUSSION

A total of 49 winter season bird's species and 4280 population of birds were recorded from Keti Bunder as shown in table 1. A total 4280 individuals of avifauna was recorded from the Keti Bunder, District Thatha as shown in table 2. Dominance (D), Shannon-Wiener diversity Index (H'), Simpson Index (S), Margalef (R) and Evenness (E) were observed form the study area as; 0.06, 3.23, 0.94, 5.74 and 0.52 respectively as shown in table 2. Most abundant species of the study area were recorded as; little egret (641), cattle egret (422), greater flamingo (408), greater egret (358), common coot (285), black headed gull (111), little grebe (108), pallas's gull (107) and common shelduck (106) as mention in Table III.

Roberts (1991, 1992) recorded 86 winter season bird species from the Jiwani Coastal wetland. Grimmett *et al.* (1998) recorded 74 species of birds in winter season. While during present research only 49 winter season avian species recorded. Comparison of past and present recorded winter data showed that avian species are decreased with the passage of time.

Table I: Avifauna diversity of Keti Bunder

Scientific Name	Common Name	Family	Distribution	Status	Numbers
Accipiter badius	Shikra	Accipitridae	Resident	LC	14
Acridotheres tristis	Common Myna	Sturnidae	Resident	LC	57
Acridotheres ginginianus	Bank Myna	Sturnidae	Resident	LC	65
Alcedo atthis	Common Kingfisher	Alcedinidae	Resident	LC	32
Anas acuta	Northern Pintail	Anatidae	Migrant	LC	74
Anas clypeata	Shovler	Anatidae	Migrant	LC	88
Anas crecca	Common Teal	Anatidae	Migrant	LC	85
Aquila heliacal	Imperial Eagle	Accipitridae	Resident	VU	1
Aquila nipalensis	Steppe Eagle	Accipitridae	Resident	EN	2
Ardea cinerea	Grey Heron	Ardeidae	Resident	LC	27
Aredeola grayii	Indian Pond heron	Ardeidae	Resident	LC	34
Aythya ferina	Common Pouchard	Anatidae	Migrant	LC	104
Bubulcus ibis	Cattle Egret	Ardeidae	Resident	LC	422
Butorides striatus	Little Heron	Ardeidae	Resident	LC	26
Ceryle rudis	Pied Kingfisher	Alcedinidae	Resident	LC	25
Circus aeruginosus	Marsh Harrier	Accipitridae	Migrant	LC	5
Dicrcrurus macrocercus	Black Drongo	Dicruridae	Resident	LC	14
Egretta alba	Greater Egret	Ardeidae	Resident	LC	358
Egretta gazetta	Little Egret	Ardeidae	Resident	LC	641
Elanus caeruleus	Black Shoulder Kite	Accipitridae	Resident	LC	6
Elanus migrans	Black Kite	Accipitridae	Resident	LC	26
Fulica atra	Common Coot	Rallidae	Migrant	LC	285
Gelochelidon nilotica	Gull billed Tern	Sturnidae	Migrant	LC	75
Halcyon capensis	White- Throated kingfisher	Alcedinidae	Resident	LC	54
Haliastur indus	Brahminy Kite	Accipitridae	Resident	LC	8

To be continue..

Scientific Name	Common Name	Family	Distribution	Status	Numbers
Hirundo rustica	Barn Swallow	Hirundinidae	Resident	LC	34
Ixobrychus minutes	Little Bittern	Ardeidae	Resident	LC	43
Larus brunnicephalus	Brown headed Gull	Laridae	Resident	LC	86
Larus cachinnans	Caspian Gull	Laridae	Migrant	LC	105
Larus ichthyaetus	Pallas's Gull	Laridae	Migrant	LC	107
Larus ridibundus	Black headed gull	Laridae	Migrant	LC	111
Motacilla alba	White Wagtail	Motacillidae	Migrant	LC	16
Motacilla flava	Yellow Wagtail	Motacillidae	Migrant	LC	14
Motacilla maderaspatensis	White Crown Wagtail	Motacillidae	Migrant	NT	11
Nycticorax nycticorax	Black Crown Night Heron	Ardeidae	Migrant	LC	12
Pandion haliaetus	Osprey	Pandionidae	Migrant	LC	1
Pelecanus onocrotalus	White Pelican	Pelecanidae	Migrant	LC	59
Phalacrocorax carbo	Large Cormorant	Phalacrocoracidae	Migrant	LC	27
Phalacrocorax niger	Little Cormorant	Phalacrocoracidae	Resident	LC	65
Phoenicopterus ruber	Greater Flamingo	Phoenicoteridae	Migrant	LC	408
Podiceps cristatus	Great Crested Grebe	Podicepidae	Migrant	LC	95
Riparia riparia	Sand Martin	Hirundinidae	Resident	LC	84
Sterna albifrons	Little Tern	Sturnidae	Migrant	LC	79
Sterna aurantia	River Tern	Sturnidae	Resident	NT	48
Sterna caspia	Caspian Tern	Sturnidae	Migrant	LC	45
Sterna hirundo	Common tern	Sturnidae	Resident	LC	74
Sterna bengalensis	Lesser Crested Tern	Sturnidae	Migrant	LC	14
Tachbaptus rufficollus	Little Grebe	Podicepidae	Resident	LC	108
Tadorna tadorna	Common Shelduck	Anatidae	Migrant	LC	106

Table II: Diversity indices of avifauna of Keti Bundar.

Diversity Indices	Values
Species number (SN)	49
Population (P)	4280
Dominance (D)	0.06
Simpson Index (S)	0.94
Shannon wiener Index (H')	3.23
Evenness Index (E)	0.52
Richness/Margalef Index (R)	5.74

Table III: Most abundant avian species of Keti Bundar.

COMMON NAME	Distribution	Status	Numbers
Little Egret	Resident	LC	641
Cattle Egret	Resident	LC	422
Greater Flamingo	Migrant	LC	408
Greater Egret	Resident	LC	358
Common Coot	Migrant	LC	285
Black headed gull	Migrant	LC	111
Little Grebe	Resident	LC	108
Pallas's Gull	Migrant	LC	107
Common Shelduck	Migrant	LC	106

On the other hand, previous freshwater bird species data showed that Altaf *et al.* (2010) recorded 131 species of birds in winter season from Head Qadirabad, Punjab. Irfan *et al.* (2010) recorded 72 species in winter season from the Changa Manga Forest, Punjab. Higher Simpson (S) and Shannon Diversity (H'), Dominance (D) and Evenness (E) Indices (0.97, 4.1, 0.06 and 0.52 respectively) were observed from winter birds of head Qadirabad (Altaf *et al.,* 2010) as compared with Indices (0.94, 3.23, 0.03, and 0.46 respectively) of present landscape; while lower Margalef (R) recorded from head Qadirabad as compared with Indices (15.5) of present landscape. This comparison showed that freshwater areas of Pakistan have high species number as compared to coastal areas of Pakistan. During the survey and literature review (Ali, 2005; Altaf *et al.,* 2010, 2013, 2015) revealed that freshwater landscapes have higher and unique nesting, roosting, feeding, shelter and breeding sites as compared with coastal areas and other reason is that industrial wastes, pesticides, house hold wastes are dumped in all rivers that polluted rivers water is entered in coastal water from all over the rivers of the Pakistan. During the present study noted that anthropogenic impacts like deforestation, land degradation, agriculture use, shipping, high rate of fishing, urbanization, fertilizers use, pesticide use and ethno-avian use main causes of species depletion. Altaf *et al.* (2013) recorded 4328 winter avian population from head Qadirabad, Punjab, Pakistan; while during the present study 4280 population of birds recorded. The data showed that species number is low while population of bird is higher as compared with freshwater birds. The reason is that homogeneity in the landscape in coastal area e.g. only mangrove plantation is present while freshwater landscapes have heterogeneity in landscapes e.g. grasses, herbs, shrubs and tree plantation. It is concluded that bird species number are decreasing with passage of time and also noted that freshwater birds diversity is higher than coastal birds species. The reason is that pollution rat is increased day by day in coastal areas of Pakistan; and it is also noted that less heterogeneity of landscape of coastal area of Pakistan as compared with the freshwater landscape.

Acknowledgement

The survey of avian species of Keti Bunder project was funded by the Marine Biological Research Laboratory (MBRL), Karachi (Pakistan). Special thanks of MBRL for funding and cooperation of local People of Keti Bunder, District Thatha.

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