

# Importance of urban seasonal waterlogged areas for resident and migrant waterbird species

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## ABSTRACT

The urban seasonal waterlogged areas are the undeveloped residential landscape which received the water through domestic sewage, rainfall drain and industrial waste. The study was carried out in order to understand the importance of urban seasonal waterlogged areas for waterbirds for future conservation and management. A total 17454 waterbird individual (that is, 32.59% resident and 67.41% migrant) of 38 waterbird species (16 resident and 22 migrant) belongs to 10 families were detected through direct observation. Common Teal – *Anas crecca* (10.71%), Northern Shoveler – *Spatula clypeata* (9.34%), Northern Pintail – *A. acuta* (8.54%) and Baikal Teal – *Sibirionetta formosa* (7.22%) were four the most abundant waterbird species. On the contrary, Pied Kingfisher – *Ceryle rudis* (0.11%), Grey Plover – *Pluvialis squatarola* (0.10%) and Sociable Lapwing – *Vanellus gregarius* (0.08%) were three the most rarest waterbird species of urban seasonal waterlogged areas. Anatidae (45.29%) was the most abundant family and Phoenicopteridae (0.19%) was the rarest family of waterbirds. Omnivore (46.16%) was the dominant guild and Piscivore (2.78%) was the rarest foraging guild of waterbirds. The results of study stated that urban seasonal waterlogged areas are potential habitats for a wide array of waterbirds due to shallow depth and richness of food resources. Waterbirds often select different waterlogged sites for foraging where prey is concentrated and water is shallow.

**Keywords:** Waterlogged, waterbirds, habitat, food resource, domestic sewage.

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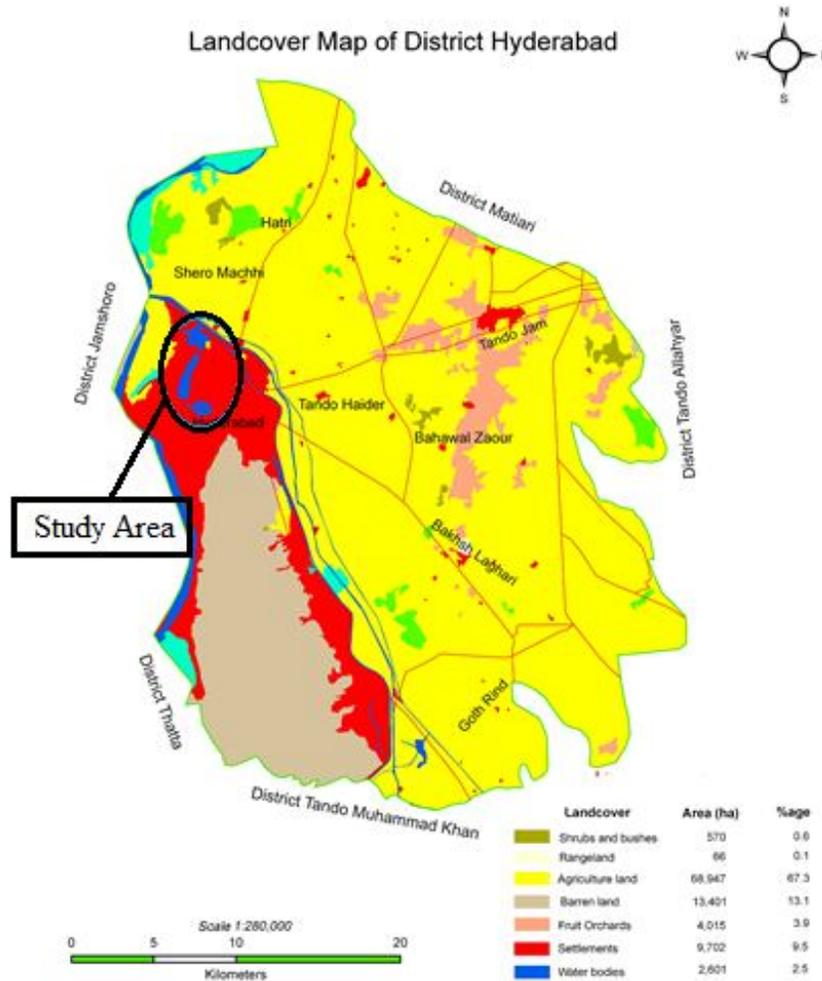
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## INTRODUCTION

Wetlands are waterlogged areas with shallow water overlying the soil occupied by aquatic submerged and emergent vegetation (Zhang et al., 2010). They are the most productive and fragile ecosystem on earth, that is, they support and provide suitable habitat for a wide array of wildlife species such as birds, amphibians, reptiles and mammals (Van der Walk, 2006). More than 50% of the world's population inhabit in cities (Mackintosh and Davis, 2013). A rapid increase in urbanization (that is, draining and infilling of wetland for development) may have caused the disappearing of wetlands from landscape (Sutula and Stein, 2003). The loss and degradation of wetland areas has increased runoff from urban sewage and industrial plants, which has adversely affected the hydrology of waterways and the remaining rest of wetlands (Cattford et al., 2007; Vermoden et al., 2009; Davis et al., 2010).

Urban sewage along with rainfall drain and fill in the wasteland near or within the vicinity of urban areas and form seasonal waterlogged areas which serve as habitat for diversity of avian species (Hoffmann and Dodson, 2005). The hydrology of urban seasonal waterlogged areas is influenced by the discharge inflow of domestic sewage, industrial waste and rainfall pattern. Within urban landscape, seasonal waterlogged areas provide an important stopover as suitable foraging sites for migrant as well as resident waterbird species. Very little attention has been paid for protecting urban seasonal waterlogged areas and often considered as wasteland even though these areas are ideal stopover and may harbor a wide variety of waterbird species to feed and rest (Ehrenfeld, 2000; Gibbs et al., 2005).

Migrant waterbird species travel a long distance each year from their breeding grounds in Pakistan during the



**Figure 1.** Location map of Hyderabad District, Sindh Pakistan.

winter due to severe winter. They inhabit various wetlands and waterlogged areas to refuel, rest, breed and forage during migration periods (September to March). Around 2000 bird species, 20% of known bird species migrate from their native home to wintering grounds. It has also been reported that 40% of migrant bird species are declining, that is, nearly 200 bird species are listed as threatened worldwide due to habitat loss, illegal hunting, poisoning and pollution (BirdLife International, 2015).

Unfortunately, urban seasonal waterlogged areas has been lost and degraded due to human intervention such as pollution (domestic sewage and industrial discharged) and fragmentation of habitat because of the industrial development as well as residential societies. A detailed information on the effects of vegetation composition on waterbird distribution and diversity is lacking. Currently no detailed study has been carried out in urban wetland areas of Hyderabad even though these habitats support a wide array of waterbirds and are located within the heart of the city. Therefore the aim of this study was to

determine the avian richness and diversity of migrant as well as resident waterbird species in order to understand the importance of urban seasonal waterlogged areas for future conservation and management.

## MATERIALS AND METHODS

### Study area

The urban seasonal waterlogged areas are situated within the heart of Hyderabad city 25° 22' 45" N latitude and 68° 22' 06" E longitude (Figures 1 and 2) east bank of the Indus River. This city is densely populated, that is, 2,323 million urban inhabitant and covers an area 3,198 km<sup>2</sup>. This city gets monsoon rainfall from mid-April to late June and mostly remains warm (that is, 50 to 119°F) year-round, but sometime temperature may fall at 34°F during winter.

The urban seasonal waterlogged areas are undeveloped residential landscape which is under control of cantonment board. These areas encompass the ditches and low laying grounds which receive water from domestic sewage and rainfall. The ditches are dominated with Cattail plant *Typha* sp. and Giant Cane – *Aurdo donax*, Torpedo Grass–*Panicum repens*, Guinea Grass – *Panicum maximum*, Elephant grass – *Pennisetum purpureum*, Common

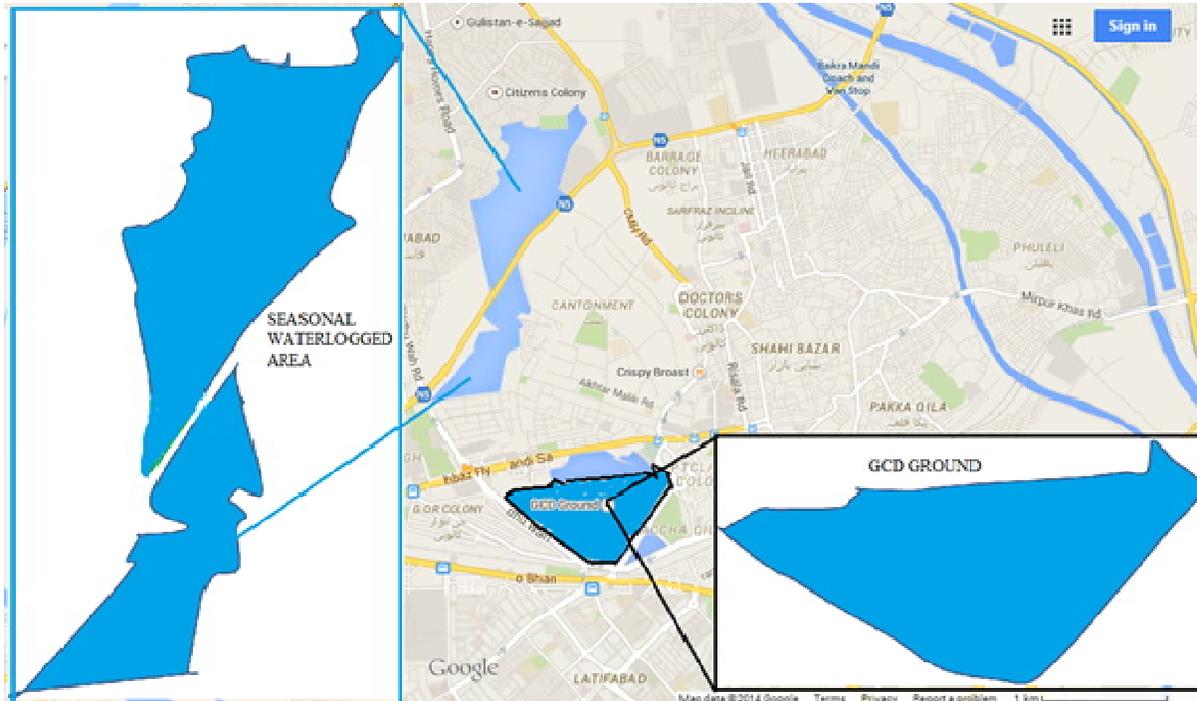


Figure 2. Location map of the study area.

Reed – *Phragmites australis*, Farash – *Tamarix dioica*.

### Bird survey

The occurrence of the migrant as well as resident waterbird species were determined through direct observation employing 10 × 42 binoculars. The observation was done from 0800 to 1100 hours. Avian species were detected from September 2013 to March, 2014. The species were considered abundant detected regularly in the study area or rare if it was detected occasionally and in small numbers. The methodology used was followed as in Richardson et al. (2001) and Yu-Seong et al. (2008).

### RESULTS

A total 17454 waterbird individual (that is, 5688 or 32.59% resident and 11766 or 67.41% migrant) of 38 waterbird species (16 resident and 22 migrant waterbird species) belongs to 10 families were detected through direct observation. Common Teal – *Anas crecca* (10.71%), Northern Shoveler – *Spatula clypeata* (9.34%), Northern Pintail – *A. acuta* (8.54%) and Baikal Teal – *Sibirionetta formosa* (7.22%) were four the most abundant waterbird species. On the contrary, Pied Kingfisher – *Ceryle rudis* (0.11%), Grey Plover – *Pluvialis squatarola* (0.10%) and Sociable Lapwing – *Vanellus gregarius* (0.08%) were three of the most rarest waterbird species of urban seasonal waterlogged areas (Table 1).

Table 2 shows that Anatidae (45.29%) is the most abundant family and Phoenicopteridae (0.19%) is the

rarest family of waterbirds in the study area. Besides the results highlight that Ardeidae (33.10%) is the most dominant family of resident waterbirds and Anatidae (67.19%) is the most dominant family of migrant waterbirds in the study area. However, three families namely; Anatidae, Podicipedidae and Phoenicopteridae are absent in resident waterbirds and five families such as Laridae, Phalacrocoracidae, Motacillidae, Rallidae and Alcedinidae are absent in migrant waterbirds inhabited seasonal urban waterlogged areas.

Table 3 frames the foraging guild results showing that Piscivore/Insectivore (71.96%) is the most dominant feeding guild of resident waterbirds and Omnivore (67.47%) is the most dominant guild among migrant waterbirds. On the contrary, Omnivore (2.07%) was the rarest guild of resident waterbirds and Piscivore was totally absent in migrant waterbirds. Generally speaking Omnivore (46.16%) is the dominant guild of waterbirds and Piscivore (2.78%) was the rarest foraging guild in the study area (Table 3).

### DISCUSSION

The recording of 38 waterbird species at urban seasonal waterlogged areas indicated that these areas are the ideal habitat for resident waterbird and stopover for migrant waterbird species in order to forage, loaf, rest and refuel their energy. As the matter of fact these shallow water in urban seasonal waterlogged areas are

**Table 1.** Ranking of waterbird species recorded in urban seasonal waterlogged areas of Hyderabad Sindh, Pakistan.

Family	Common name	Scientific name	Total no. of observation	%
Anatidae	Common Teal (M)	<i>Anas crecca</i>	1870	10.71
Anatidae	Northern Shoveler (M)	<i>Spatula clypeata</i>	1630	9.34
Anatidae	Northern Pintail (M)	<i>Anas acuta</i>	1490	8.54
Anatidae	Baikal Teal (M)	<i>Sibirionetta formosa</i>	1260	7.22
Anatidae	Falcated Duck (M)	<i>Mareca falcata</i>	975	5.59
Ardeidae	Little Egret (R)	<i>Egretta garzetta</i>	870	4.98
Scolopacidae	Little Stint (M)	<i>Calidris minuta</i>	830	4.76
Phalacrocoracidae	Little Cormorant (R)	<i>Microcarbo niger</i>	780	4.47
Anatidae	Garganey (M)	<i>Spatula querquedula</i>	680	3.90
Scolopacidae	Black-winged Stilt (R)	<i>Himantopus sp.</i>	660	3.78
Laridae	Common Tern (R)	<i>Sterna hirundo</i>	640	3.67
Phalacrocoracidae	Indian Cormorant (R)	<i>Phalacrocorax fuscicollis</i>	610	3.49
Podicipedidae	Little Grebe (M)	<i>Tachybaptus ruficollis</i>	589	3.37
Ardeidae	Cattle Egret (M)	<i>Bubulcus ibis</i>	567	3.25
Ardeidae	Intermediate Egret (R)	<i>Egretta intermedia</i>	546	3.13
Laridae	River Tern (R)	<i>Sterna aurantia</i>	486	2.78
Ardeidae	Great Egret (R)	<i>Casmerodius albus</i>	367	2.10
Laridae	Short-tailed Gull (M)	<i>Larus canus</i>	340	1.95
Scolopacidae	Marsh Sandpiper (M)	<i>Tringa stagnatilis</i>	290	1.66
Laridae	Herring Gull (M)	<i>Larus argentatus</i>	240	1.38
Laridae	Short-billed Gull (M)	<i>Larus brachyrhynchus</i>	235	1.35
Scolopacidae	Common Sandpiper (M)	<i>Actis hypoleucos</i>	214	1.23
Scolopacidae	Terek Sandpiper (M)	<i>Xenus cinereus</i>	209	1.20
Motacillidae	Yellow Wagtail (R)	<i>Motacilla flava</i>	181	1.04
Scolopacidae	Green Sandpiper (M)	<i>Tringa ochropus</i>	164	0.94
Motacillidae	White Wagtail (R)	<i>Motacilla alba</i>	150	0.86
Charadriidae	Red-wattled Lapwing (R)	<i>Vanellus indicus</i>	130	0.74
Ardeidae	Indian Pond Heron (R)	<i>Adeola grayii</i>	100	0.57
Rallidae	White-breasted Waterhen (R)	<i>Amauornis phoenicurus</i>	78	0.45
Scolopacidae	Wood Sandpiper (M)	<i>Tringa glareola</i>	50	0.29
Rallidae	Common Moorhen (R)	<i>Gallinula chloropus</i>	40	0.23
Charadriidae	Yellow-wattled Lapwing (M)	<i>Vanellus malarbaricus</i>	40	0.23
Phoenicopteridae	Lesser Flamingo (M)	<i>Phoeniconaias minor</i>	34	0.19
Alcedinidae	White-throated Kingfisher (R)	<i>Halcysmyrnensis</i>	30	0.17
Scolopacidae	Lesser Sand-Plover (M)	<i>Charadrius mongolus</i>	27	0.15
Alcedinidae	Pied Kingfisher (R)	<i>Ceryle rudis</i>	20	0.11
Scolopacidae	Grey Plover (M)	<i>Pluvialis squatarola</i>	18	0.10
Scolopacidae	Sociable Lapwing (M)	<i>Vanellus gregarius</i>	14	0.08
Total			17454	

(M) = Migrant waterbirds; (R) = resident waterbirds.

rich of nutrients and food such as fishes, amphibians, insects, crustaceans and aquatic plants which are major component of waterbirds' diet principally for waterfowl, seagulls, cormorant, grebes, plovers, sandpipers, stilt,

egrets etc. Furthermore, it was observed that these urban seasonal waterlogged areas has attracted a wide variety of surface foragers like teal, shovlers, garaney, ducks etc. and waders such as gulls, egrets, sandpipers, stint. This

**Table 2.** Rank of families based on number of detection in urban seasonal waterlogged areas.

Family	Resident waterbirds		Migrant waterbirds		No. of detections	%
	No of detections	%	No of detections	%		
Anatidae	0	0	7905	67.19	7905	45.29
Scolopacidae	660	11.60	1816	15.43	2476	14.19
Ardeidae	1883	33.10	567	4.82	2450	14.04
Laridae	1126	19.80	815	0	1941	11.12
Phalacrocoracidae	1390	24.44	0	0	1390	7.96
Podicipedidae	0	0	589	5.01	589	3.37
Motacillidae	331	5.82	0	0	331	1.90
Charadriidae	130	2.29	40	0.34	170	0.97
Rallidae	118	2.07	0	0	118	0.68
Alcedinidae	50	0.88	0	0	50	0.29
Phoenicopteridae	0	0	34	0.29	34	0.19
Total	5688		11766		17454	

**Table 3.** Foraging guild of resident and migrant waterbird species inhabiting urban waterlogged areas at Hyderabad, Sindh.

Foraging guild	Resident waterbirds		Migrant waterbirds		Total no. of detections	%
	No. of detections	%	No. of detections	%		
Insectivore	331	5.82	1757	14.93	2088	11.96
Omnivore	118	2.07	7939	67.47	8057	46.16
Piscivore	486	8.54	0	0	486	2.78
Piscivore/Insectivore	4093	71.96	1255	10.67	5348	30.64
Scavenger	660	11.60	815	6.97	1475	8.45
Sub-total	5688		11766		17454	

might be due to availability of large shallow waters and richness of food resources. The availability of large shallow water areas which is the major factor to affects the distribution, richness and diversity of waterbirds, that is, ducks, goose, grebes and cormorant prefers to utilize deep water for foraging, while waders such as egrets, herons, sandpipers, plovers, lapwing etc. prefers shallow water having shallow depth than the length of tarsus, that is, deep water restrict their prey accessibility and capturing success (Gawlik, 2002; Brönmark and Hansson, 2005). It has also been stated that richness and diversity of food resource may regulate the distribution and diversity of waterbird species in wetland habitat (Johnson and Sherry, 2001). A wetland accumulated contaminants, that is, pesticide, metal and organic pollutants attracted a higher diversity of waterfowl (Sutula and Stein, 2003).

In addition, the richness of food resource may play a significant role to attract a wide array of waterbird species for example Piscivore such as heron, cormorant, egrets and cormorant foraged on fishes. Likewise, omnivore, that is, waterfowls foraged on a variety of food material such as aquatic plants, fishes, amphibians, etc. Waders such as stilt, sandpipers, lapwing, etc often prey on aquatic invertebrates in shallow water. Guadagnin et al.

(2009) demonstrated that shallow water depth, vegetation structure (Moreno-Mateos et al., 2009; Webb et al., 2010), wetland size (Guadagnin et al., 2009; Tsai et al., 2012) and richness of food resources, are factors determining the habitat selection of wetland birds. The other reason could be that most of the landscape is barren marked by rocks and agriculture fields; that's the reason why these waterlogged habitats has attracted a wide array of migrant as well as resident waterbird species for foraging, loafing and resting. In the same way, Kiviat and MacDonald (2004) stated that urban wetland support higher diversity of fauna and flora. Waterlogged areas in urban landscapes are hosted for diversity of waterbirds, that is, Anseriformes, Gruiformes and Charadriiformes etc (BirdLife International, 2004; Benassi et al., 2007).

Furthermore, this study highlighted that waterbird species select habitat differently: waterfowl prefers open deep water devoid of vegetation, while waders inhabited shallow water having sparse aquatic vegetation. Cormorant prefers deep water for foraging and dead vegetation for loafing. Egrets prefer to utilize shallow water where domestic sewage discharged in the area for foraging and shallow water ditches where prey was concentrated.

The results of this study support the notion that urban seasonal waterlogged areas are potential habitats for a wide array of waterbirds due to shallow depth and richness of food resources.

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