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Status and Diversity of Wetland Birds at Ancient Township Ratanpur of Chhattisgarh, India

Devendra Singh Porte*, Seema Gupta

Department of Zoology, Govt. Nagarjuna P.G. College of Science,
Raipur - 492010, India

Study Area: Ratanpur, Chhattisgarh, India
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Abstract

Wetlands are important habitat for native as well as migratory water birds especially for roosting, foraging and breeding activities. The present study area, Ratanpur (Chhattisgarh) has many natural and man-made water bodies which play an important role not only for agricultural uses but also for resident bird fauna of the region. An avifaunal survey carried out on ten selected wetlands of Ratanpur for two consecutive years viz., 2013 and 2014 for evaluating the diversity, distribution, and status. The result of the study revealed presence of 4572 wetland birds of 29 species belonging to 12 families and 7 orders. Ciconiiformes was the dominant order with nine species whereas family Ardeidae had the highest diversity. The census revealed that two specific ponds provided the most congenial habitat for many wetland avian species as they harbored 1707 and 1375 birds respectively. The study revealed that the ponds which were sacred or away from the human communities were harbour relatively large number of avian species while the pond situated near settlement areas or were polluted showed less diversity and were specifically occupied by residential heronry birds.

Introduction:

Birds are the omnipresent fauna that occupies both terrestrial and wetland ecosystems. Wetlands could not be referred to a complete terrestrial or aquatic body. According to Ramsar convention wetland are "submerged or water saturated land, both natural and man-made, permanent or temporary filled, that is static or flowing, fresh, brackish or salt including areas of marine water". They are the vital habitats for residential as well as migratory birds for foraging, roosting and breeding activities (Gibbs, 1993; Paracuellos, 2006). Wetland constitutes a treasury of biodiversity. These are complex water and land interactive system and compose 6% of earth land surface (Urfi *et al.*, 2005). These are supposed to be the most fertile and productive site in the world but ecologically fragile, liable to degradation and degeneration under the prevailing anthropogenic pressure (Deshkar *et al.*, 2010). Approximately three hundred and ten wetland bird species are recorded in India (Kumar & Gupta, 2009). Total 50% of these are migratory and visit India from the colder regions of China, Russia, Central Asia, Tibet and the Himalayan region.

The diversity of birds is one of the most significant environmental indicators for determining the health of the habitats. The degradation of wetlands affects the bird population and the diversity. So, there is a necessity for the assessment of wetlands for birds as an ideal habitat. India has 27403 large wetland of which 23444 are inland (Ramamurthy & Rajakumar, 2014). Apart from natural wetlands, which support twenty percent of the known diversity (Deepa & Ramchandran, 1999), there are many man-made wetlands, such as dams, ponds etc. These artificial wetlands can provide suitable habitats for water birds (Paracuellos & Telleria, 2004; Okes *et al.*, 2008; Rendon *et al.*, 2008). Day by day, globally the interest in the conservation of water birds and their wetlands habitats which are under threat of extinction due to anthropological activities and unfavorable environmental conditions (Froneman *et al.*, 2001) are increasing. As per Rosser & Mainka (2002) 12% of the avian species are threatened for extinction throughout the world.

The study area, Ratanpur is a small township in Bilaspur district, Chhattisgarh, India. The town has many temples and ponds which attract a huge number of tourists

*Corresponding Author: portedevendraz6@gmail.com

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Plate-1: Ten water bodies (wetland/Ponds): our study sites

from far and wide places throughout the year. Due to human encroachment and anthropological activities, this area is facing a serious problem of land and water pollution and so the avifauna. Therefore, a study on aspects like distribution, diversity, ecology and other activities of birds become very important. Till date, information on the ecological aspects of avifauna in Chhattisgarh state was very limited (Majumdar, 1984; Chandra & Singh, 2004; Sharma *et al.*, 2014; Vishwakarma *et al.*, 2014; Sangode *et al.*, 2015; Chandra *et al.*, 2015; Vishwakarma, 2015). However, the information regarding the bird fauna of Ratanpur is completely lacking. Hence, this study was planned to assess the diversity, distribution and status of wetland birds in ten different ponds of Ratanpur.

Materials and methods:

Study site: Ratanpur is located about 25 Km away from the district Bilaspur of state Chhattisgarh, India and famous for its historical and religious importance. It is situated at an elevation of 306 m from the sea level. It harbours more than a hundred small and large ponds abound with agricultural fields and numerous big trees. The water bodies are used for irrigation purposes and also by the people for their daily needs. Ten perennial ponds viz., Bairagban, Bhedimuda, Bikma, Dulahara, Gireejaban, Jagannath temple, Kaira, Krishnarjuni, Maharaiya and Ratneshwar ponds were selected for the study (Plate-1). Bairagban, Bikma, Dulahara, Gireejaban, Jagannath and Maharaiya pond are sacred pond whereas, Bhedimuda, Kaira, Krishnarjuni and Ratneshwar ponds are situated close to human settlements and were polluted, filled with garbage and affected by anthropogenic practices at the time of the study.

Data collection: We visited the study site twice a week, during the summer, rainy and winter seasons of the year, in order to cover migratory and resident species. Survey was conducted by using distance sampling point count method (Buckland *et al.*, 2004) to observe the bird diversity, distribution in all the selected ten wetlands for two consecutive years (2013 to 2014). The field characteristics were noted down on the ornithological

data sheet. Whenever required, photographs were taken using a Digital Camera with a suitable zoom lens. Bird survey was conducted from 06:00 to 10:00 hrs and from 16:00 to 19:00 hrs. The recorded wetland birds were identified by following Ali & Ripley (1995), Ali (2003), Hossain *et al.* (2004), Kumar *et al.* (2006) and Grimmett *et al.* (2006). The Checklist was prepared using common and scientific name following Manakadan & Pittie (2001). The status of bird population was categorized as VC (very common), C (common), NR (not rare), R (rare), SV (summer visitor), MV (monsoon visitor), WV (winter visitor), LC (least concern) and NT (near threatened) based on observations during the study following IUCN criteria (2014). The data collected during the study period were analyzed using Biodiversity Pro (version-2) Statistical Software.

Results:

During the study period (Jan. 2013 to Dec. 2014), a total of ten wetlands in Ratanpur were surveyed and 4572 wetland birds of 29 species belonging to twelve families from seven orders were tabulated (Table-1). Among the seven orders, Ciconiiformes dominated with nine species constituting 31.03% of the total species whereas Podicipediformes contributed as lowest with only one species (3.44%). Among 12 families, Ardeidae dominated with eight species constituting 27.58%, whereas Charadriidae, Ciconiidae, Podicipedidae, Recurvirostridae, Rostratulidae, and Scolopacidae represented with one species each constituted 3.44%.

Dulahara and Bikma pond harbored 1707 and 1375 individual of bird respectively. Maharaiya and Bairagban ponds also favored wetland avian fauna with 463 and 431 birds respectively (Table 2). The minimum number of water birds was found in Ratneshwar wetland (32). Similarly, the highest number of species occurred in Bikma pond (28) followed by Dulahara (27), Maharaiya (19), Bairagban (18), Jagannath (10), Bhedimuda, Gireejaban and Ratneshwar (9 species each) and the minimum number of species were recorded from Kaira (8) and Krishnarjuni (6). Among 29 species, one species,

Ferruginous pochard, Aythya nyroca was near threatened species according to IUCN red list and rest twenty eight species were least concerned (Table-1). Individuals of family Ardeidae were the dominating birds in the wetlands of Ratanpur. *Aythya nyroca* is a winter visitor and was noticed in Dulahara and Bikma wetland (Table-2).

Table-1: Avian species recorded from various wetlands of Ratanpur area during Jan.2013 to Dec.2014

Scientific Name	Common Name	I*	M*
Order -Anseriformes (13.79%) Family -Anatidae			
<i>Anas strepera</i>	Gadwall	LC	WV
<i>Aythya nyroca</i>	Ferruginous pochard	NT	WV
<i>Dendrocygna javanica</i>	Lesser Whistling Duck	LC	WV
<i>Nettapus coromandelianus</i>	Cotton Pigmy Goose	LC	WV
Order -Charadriiformes (20.68%) Family -Charadriidae			
<i>Vanellus indicus</i>	Red- wattled Lapwing	LC	NR
Family -Jacanidae			
<i>Hydrophasianus chirurgus</i>	Pheasant-tailed Jacana	LC	WV
<i>Metopidius indicus</i>	Bronze-winged Jacana	LC	VC
Family -Recurvirostridae			
<i>Himantopus himantopus</i>	Black-winged Stilt	LC	SV
Family -Rostratulidae			
<i>Rostratula benghalensis</i>	Greater Painted-snipe	LC	MV
Family -Scolopacidae			
<i>Tringa ochropus</i>	Green Sandpiper	LC	NR
Order -Ciconiiformes (31.03%) Family -Ardeidae			
<i>Ardea alba</i>	Great White Egret	LC	C
<i>Ardea purpurea</i>	Purple Heron	LC	R
<i>Ardeola grayii</i>	Indian Pond-heron	LC	VC
<i>Bubulcus ibis</i>	Cattle Egret	LC	VC
<i>Egretta garzetta</i>	Little Egret	LC	C
<i>Ixobrychus cinnamomeus</i>	Chestnut Bittern	LC	C
<i>Ardea intermedia</i>	Intermediate Egret	LC	C
<i>Nycticorax nycticorax</i>	Black-crowned Night-heron	LC	NR
Family -Ciconiidae			
<i>Anastomus oscitans</i>	Asian Openbill Stork	LC	MV
Order -Coraciiformes (10.35%) Family -Alcedinidae			
<i>Alcedo atthis</i>	Common Kingfisher	LC	C
<i>Ceryle rudis</i>	Pied Kingfisher	LC	C
<i>Halcyon smyrnensis</i>	White- breasted Kingfisher	LC	C
Order -Gruiformes (13.79%) Family -Rallidae			
<i>Amaurornis phoenicurus</i>	White Breasted Waterhen	LC	R
<i>Fulica atra</i>	Common Coot	LC	NR
<i>Gallinula chloropus</i>	Common Moorhen	LC	NR
<i>Porphyrio porphyrio</i>	Purple Swamp Hen	LC	C
Order -Pelecaniformes (6.89%) Family -Phalacrocoracidae			
<i>Phalacrocorax carbo</i>	Great Cormorant	LC	R
<i>Phalacrocorax niger</i>	Little Cormorant	LC	VC
Order -Podicipediformes (3.44%) Family -Podicipedidae			
<i>Tachybaptus ruficollis</i>	Little Grebe	LC	WV

I*-IUCN Status;M*-Migration Status

LC= Least concern, NT= Near threatened, WV= Winter visitor, SV= Summer visitor, MV= Monsoon visitor, VC= Very common, C= Common, NR= Not rare, R= Rare

Table-2: Season-wise the distribution of birds in wetlands of Ratanpur areaduring Jan.2013 to Dec.2014

Name of Species	Season Rain	Winter	Summer	Grand Total
<i>Alcedo atthis</i>	59	20	11	90
<i>Amaurornis phoenicurus</i>	68	49	29	146
<i>Anas strepera</i>	X	55	1	56
<i>Anastomus oscitans</i>	131	210	X	341
<i>Ardea alba</i>	27	44	11	82
<i>Ardea purpurea</i>	123	140	5	268
<i>Ardeola grayii</i>	158	164	198	520
<i>Aythya nyroca</i>	X	62	X	62
<i>Bubulcus ibis</i>	175	193	252	620
<i>Ceryle rudis</i>	6	54	7	67
<i>Dendrocygna javanica</i>	X	114	X	114
<i>Egretta garzetta</i>	43	148	11	202
<i>Fulica atra</i>	X	97	X	97
<i>Gallinula chloropus</i>	X	31	36	67
<i>Halcyon smyrnensis</i>	15	50	18	83
<i>Himantopus himantopus</i>	8	X	14	22
<i>Hydrophasianus chirurgus</i>	X	22	X	22
<i>Ixobrychus cinnamomeus</i>	129	74	100	303
<i>Mesophoyx intermedia</i>	X	61	9	70
<i>Metopidius indicus</i>	109	0	142	251
<i>Nettapus coromandelianus</i>	X	101	20	121
<i>Nycticorax nycticorax</i>	0	181	40	221
<i>Phalacrocorax carbo</i>	X	X	2	2
<i>Phalacrocorax niger</i>	39	45	42	126
<i>Porphyrio porphyrio</i>	X	114	144	268
<i>Rostratula benghalensis</i>	22	16	7	45
<i>Tachybaptus ruficollis</i>	X	56	X	56
<i>Tringa ochropus</i>	20	36	18	74
<i>Vanellus indicus</i>	42	34	100	176
Grand Total	1174	2181	1217	4572

X= not found

Seasonal fluctuation in waterbird species: every season has its impact on diversity and density of bird population. The maximum number of waterbirds (2181) was observed in the winter season while a minimum number of waterbirds (1174) was recorded in rainy season. *Bubulcus ibis* and *Ardeola grayii* was widely distributed water bird in all the selected wetlands. *Ixobrychus cinnamomeus* was also widely distributed bird with its density higher in rainy as compared to summer and winter season. Furthermore, *Phalacrocorax carbo* was reported only in Jagannath pond in the summer season. The population of wetland birds was higher during winter followed by summer and rainy seasons (Fig.-1 & Table-2).

Species diversity indices: The Shannon index was applied for analysis of wetland avian diversity in ten selected pond of Ratanpur, Chhattisgarh. For the summer season, the maximum Shannon diversity index (H') was recorded in Dulahara pond (1.20) (Fig.-2). However, the evenness index (E) was maximum in Gireejaban pond and Ratneshwar pond (0.95) and minimum in Bairagban pond (0.86) (Fig.-3). Shannon diversity index (H') for rainy

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season was recorded highest in Bikma pond (1.08) (Fig.-2). The evenness index (E) for rainy season was maximum in Gireejaban pond and Krishnarjuni pond (0.99) and minimum in Bhedimuda pond (0.89) (Fig.-3). The winter season showed the higher diversity index. The Shannon diversity index (H') was higher in Dulahara pond (1.32) and Bikma pond (1.31) as compared to the other ponds (Fig.-2). The evenness index (J') was maximum in Krishnarjuni pond (0.98) and minimum in Gireejaban pond (0.92) (Table-2). Interestingly, in winter the lowest evenness index was found in Gireejaban pond, whereas the pond showed highest evenness index in summer and rainy seasons (Fig.-3).

Figure-1: Species richness in wetlands of Ratanpur area during Jan. 2013 to Dec. 2014

Figure- 2: Shannon Diversity index in wetlands of Ratanpur area during Jan. 2013 to Dec. 2014

Figure- 3: Species evenness index (E) in wetlands of Ratanpur area during Jan. 2013 to Dec. 2014

Discussion :

In our study, an avian survey was carried out to record the diversity, distribution, and status of wetland birds in

the ten perennial ponds of Ratanpur area. A total of 4572 birds were recorded in all the ten selected ponds of Ratanpur over a period of two years suggesting their wider distribution and adaptability to wetland ecosystem even with the changing environment and anthropologic influence. The higher number and species were recorded in Bikma and Dulhara ponds which are the larger water bodies of the region, perennial and less from anthropogenic activity. The lowest number of species was found in Krishnarjuni may be due to its small sized, situated in between the densely populated city and has greater anthropogenic disturbances. The wetland size influences the species richness and abundance of waterbirds (Froneman *et al.*, 2001; Paracuellos & Telleria, 2004). Many studies have reported changes in species diversity with high species richness in less disturbed habitat as compared to disturbed habitat (Marsden, 1997; Aggrawal *et al.*, 2015). The season has great influence on diversity and density of bird population (Bhatt *et al.*, 2009). Seasonal fluctuation of birds occurs due to change in weather condition or fluctuation in food availability and habitat quality (Norris & Marra, 2007). The results our study revealed that the winter season had maximum avian diversity and distribution as compared from summer and rainy seasons and corroborates to the study of Manohara *et al.* (2016) who attributed this to suitable climate, vegetation, food and less anthropogenic activity. In the rainy and summer season residential wetland avian species dominated while during the winter season, diversity increased due to the addition of various migratory avian species (Rajashekara & Venkatesha, 2014). In our study, total six winter visitor, one each monsoon and summer visitor water birds were recorded.

Species richness, density, and diversity of bird population are frequently used as indicators to determine the habitat quality (Pandiyan *et al.*, 2013). In our study, the order Ciconiiformes showed maximum diversity (9 species) with the presence of residential heronry birds along with a chief winter migratory Asian Openbill Stork, *Anastomus oscitans*. The *Bubulcus ibis* (620), *Ardeola grayii* (520), *Ixobrychus cinnamomeus* (303) and *Egretta garzetta* were the dominant species at Ratanpur wetland areas. Similar results were reported in Kopara reservoir, Bilaspur by Rahalkar *et al.* (2012). Sharma & Vishwakarma (2014) reported abundance of *Ardeola grayii*, *Egretta garzetta*, *Phalacrocorax niger*, *Nycticorax nycticorax*, *Dendrocygna javanica*, *Nettapus coromandelianus*, *Metopides indicus*, *Vanellus indicus*, *Gallinula chloropus*, *Tachybaptus ruficollis* in Gidhwa and Parsada wetlands in Bemetra, Chhattisgarh. Our observation evidenced that the ponds which were sacred or away from the town (Bikma, Bairagban, Dulahara, Gireejaban, Maharaiya) were inhabited by large number of avian species while the pond situated near settlement areas or polluted

Plate-2: Some notable wetland bird species captured during species. a-*Anastomus oscitans*, b-*Aythya nyroca*, c-*Dendrocygna javanica*, d-*Hydrophasianus chirurgus*, e-*Phalacrocorax carbo*, f-*Phalacrocorax niger*, g-*Porphyrio porphyria*, h-*Tringa ochropus*, i-*Nettapus coromandelianus*, j-*Metopidius indicus*.

(Bhedimuda, Jagannath, Kaira, Krishnarjuni, Ratneshwar) showed less diversity and were generally occupied by residential avian species mostly heronry birds. Therefore, the maximum species richness was observed in Bikama and Dulahara pond and minimum in Bhedimuda. Such fluctuation of the population helps to understand whether the area is normal or polluted. In our study, it was found in Bikma, Bairagban, Dulahara, and Maharaiya ponds that were unpolluted. Its maximum number was found in Bikma and Dulahara. *Phalacrocorax carbo* was found only in Jagannath pond during summer season in a very low frequency. The presence and absence of wetland birds may indicate the ecological condition of the particular area (Rajpar & Zakaria, 2011). The fifty percent of the wetlands are under the tremendous anthropogenic pressure (Sulaiman *et al.*, 2014). The anthropogenic activities and developmental measures in and around ponds are remarkably affecting wetland birds. Illegal hunting, fishing practices, deforestation and water

pollution were the major threats for wetland avian fauna (Khan & Ali, 2014; Mistry & Mukherjee, 2015). The wetlands of Ratanpur are surrounded by agricultural area offering suitable roosting and breeding site for wetland avifauna to increase its density, abundance, and diversity. However, the ecosystem and existing avian diversity of some of the wetlands in the region are under anthropogenic pressure that may directly affect the avifauna in future.

Conclusion:

Our study provides useful information about the assessment of wetland ecosystem using wetland birds. Out of twenty nine species, one near threatened species was also recorded. Many of these wetlands are used for the collection of lotus, water lily leaves and for flowers and fruits that causes the habitat destruction in respect to wetland avian species. Few ponds were filled by the garbage, waste materials and even suffering from encroachment by the local people. Hunting of avian fauna and habitat modification were also noticed within the study area. Various religious idol immersions during the festival time also pollute these wetlands. Thus, to sustain the avian diversity of these wetland areas some necessary step should be taken by the local administration to make aware the inhabitants of this region about the importance of avian species in the wetland ecosystem.

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