

Population status of Painted Stork *Mycteria leucocephala* and Black-headed Ibis *Threskiornis melanocephalus* in southern Rajasthan, India

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Introduction

The Painted Stork *Mycteria leucocephala* and Black-headed Ibis *Threskiornis melanocephalus* are widely distributed in South and South-East Asia (Ali & Ripley 2007). They mainly prefer shallow and marshy wetlands. Both colonial species are listed as Near-threatened (IUCN 2012), because of a decrease in their population due to hunting, habitat destruction and deterioration, trade and agricultural pollution (Pattanaik *et al.* 2008; Choudhury 2012). Much work has been done on these species in India on various aspects, but in context to Rajasthan, few studies are available and found to be confined to Keoladeo National Park, Bharatpur (Naoroji 1990; Ishtiaq 1998).

Rajasthan is the largest state of India and its southern part is relatively more suitable for aquatic birds owing to high rainfall as well as the numerous wetlands. However, information about these two species is sparse. In the present paper, primary information on the abundance of two resident species i.e., Painted Stork and Black-headed Ibis have been documented from southern Rajasthan. This basic information is crucial to formulate any plan for their conservation.

Study area

The southern part of Rajasthan is commonly known as the “Mewar” region, and comprises six districts, namely, Udaipur, Rajsamand, Dungarpur, Banswara, Pratapgarh, and Chittorgarh (Fig. 1), covering about 12.35% of the geographical area of the state. This part is situated in the world’s oldest mountains, the Aravalli Ranges, and contains many seasonal and perennial water bodies. These wetlands provide an excellent habitat for, and harbor many aquatic species. Average rainfall of this region is about 602 mm. The area is characterised by a distinct winter (November–February), summer (March–June), and monsoon (July–October) seasons. Highest temperature (c. 42°C) was recorded in summer and lowest (c. 8°C) from winter season (Koli 2012).

Methodology

To count both species, a road transect of 694 km was conducted in 2008 and 2009 across the six districts (Fig. 1). The average length of a transect in each district was 115 km. Transects were conducted during summer, because wetlands shrink in this season, possibly forcing individuals to flock to the left over

wetlands (Sundar 2006). The route of the transect was decided so that maximum area of each district could be covered. Two or three days were used to complete the transect route in each district to counter effects of local migration of the birds and to prevent the possibility of a double count. A motorcycle was ridden at a speed of c. 20–30 km/hr and all individuals of the two focal species visible 50–800 m on either side of the road were enumerated. There were many wetlands along the road transect. At each, we counted birds from a vantage point using binoculars. If a reservoir was too big to be scanned from one point, the whole periphery was circumambulated by two people walking together (VKK & MY) to perform a count. Walking distance was

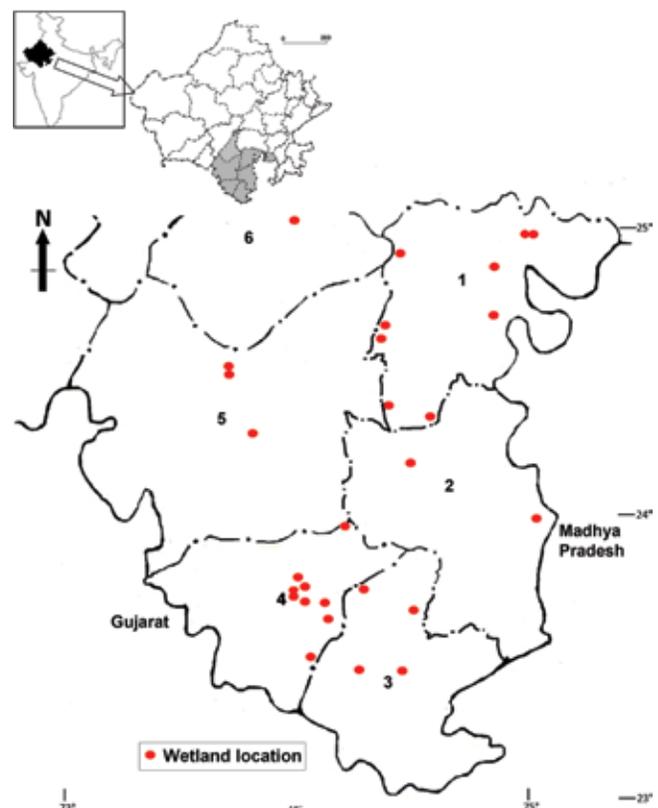


Fig. 1. Study area of Rajasthan state comprising six districts with location of wetlands. Numbers inside the figure indicate districts, for which greater detail is given in Table 1.

not included in the length of the transect. Secondary information was also confirmed during surveys. Adult and juvenile birds were identified with the help of Ali & Ripley (2007); enumeration was used to compute the percentage of juveniles of each species each year.

Encounter rates (ER) were calculated using following formula:

$$\text{Encounter rate} = \frac{\text{Number of birds counted on the transect (abundance)}}{\text{Total length of the transect (in km)}}$$

Conservation problems were also noted during the surveys. Chi square test (χ^2) was used to estimate difference in the population of both species during both surveys because uneven rainfall can affect the bird population. Pearson product moment correlation (r) was used to estimate whether any relationship

existed between the number of counted birds to number of wetlands and the transect length in districts (n=6).

Results

Forty wetlands were scanned during the surveys and birds were encountered in 28 reservoirs of six districts. Both species were present together in 22 wetlands, while six wetlands contained a single species.

A total of 495 adult and 53 juvenile of Painted Storks were recorded during 2008, while 605 adult and 45 juvenile were recorded in 2009 (Table 1). Juveniles represented 11% of the total population during 2008, and 7% in 2009. Maximum ER (1) was found in Dungarpur district during 2008, and in Chittorgarh district (2) during 2009 (Table 2). Significant difference ($\chi^2=5.87$,

Table 1. Counts of Painted Stork and Black-headed Ibis in selected wetlands of southern Rajasthan, during road transect conducted in 2008 and 2009

No	District	Reservoir	Location	Painted Stork		Black-headed Ibis	
				2008	2009	2008	2009
1	Chittorgarh	Bassi Dam	25°01'N, 74°49'E	-	-	6a	5a
		Orai Dam	25°01'N, 74°50'E	12a	10a	18 (17a+1j)	15a
		Mangalwar	24°36'N, 74°18'E	-	5a	13a	20a
		Dhamana	24°57'N, 74°16'E	28a	15a	9a	5a
		Gousunda Dam	24°44'N, 74°31'E	-	-	26 (22a+4j)	25 (22a+3j)
		Gambhiri	24°53'N, 74°38'E	13a	23a	-	2a
		Badwai	24°29'N, 74°14'E	48 (43a+5j)	55 (45a+5j)	12a	17a
		Bari Sadri	24°25'N, 70°28'E	10a	13a	7a	13a
		Ngawali pond	24°38'N, 74°17'E	27(25a+2j)	38 (31a+7j)	19a	12a
2	Pratapgarh	Datliya	24°07'N, 74°17'E	38 (30a+8j)	45 (41a+4j)	-	-
		Pratapgarh	24°01'N, 74°46'E	-	-	26 (24a+2j)	20a
3	Banswara	Talwada	23°33'N, 74°19'E	8a	10a	4a	-
		Partapur	23°35'N, 74°10'E	9a	2a	18 (17a+1j)	11a
		Harodam	23°46'N, 74°23'E	14a	22a	2a	5a
		Dasada	23°46'N, 74°10'E	35 (28a+7j)	40 (34a+6j)	-	5a
4	Dungarpur	Aasapur	23°56'N, 74°05'E	-	5a	-	2a
		Badaya	23°54'N, 74°03'E	40 (38a+2j)	21a	14a	13a
		Bodigama	23°50'N, 74°05'E	32 (29a+3j)	40 (33a+7j)	26 (22a+4j)	21(20a+1j)
		Pujpur	23°51'N, 74°01'E	18a	25a	8a	10a
		Nadapachore	23°56'N, 73°57'E	58 (49a+9j)	45 (40a+5j)	14a	15a
		Somkamla	23°58'N, 74°01'E	27a	40 (37a+3j)	26 (23a+3j)	19a
		Sabla	23°51'N, 74°10'E	60 (50a+10j)	35 (34a+1j)	-	4a
		Sagwada	23°40'N, 74°01'E	23a	55 (49a+6j)	8a	11a
		Galiyacot	23°30'N, 74°01'E	6a	16a	15a	3a
5	Udaipur	Pichola	24°34'N, 73°40'E	4a	-	5a	4a
		Fatehsagar	24°55'N, 73°42'E	-	-	2a	5a
		Jaisamand lake	24°16'N, 73°56'E	-	-	3a	7a
6	Rajsamand	Rajsamand lake	24°14'N, 73°55'E	38 (31a+7j)	24 (22a+2j)	22a	27 (21a+6j)
Total				548	650	303	296

Abbreviations: a= adult; j=juvenile

Table 2. Encounter rates (ER) of Painted Stork and Black-headed Ibis in six districts of southern Rajasthan

No	District	Km travelled	ER of Painted Stork		ER of Black-headed Ibis	
			2008	2009	2008	2009
1	Chittorgarh	105	1.31	1.51	1.04	1.08
2	Pratapgarh	80	0.47	0.56	0.32	0.25
3	Banswara	172	0.38	0.43	0.13	0.12
4	Dungarpur	198	1.33	1.42	0.56	0.49
5	Udaipur	75	0.05	0.00	0.13	0.21
6	Rajsamand	64	0.59	0.37	0.34	0.42
Total		694	0.68±0.52	0.71±0.61	0.42±0.34	0.42±0.34

df=5, $P < 0.05$) was found between both years in recorded number of birds in districts. The counted number of birds were found to be significantly related to the number of wetlands surveyed in districts during 2008 ($r = 0.86$, $n = 6$, $P < 0.05$), and 2009 ($r = 0.89$, $n = 6$, $P < 0.05$) but not to transect length ($P > 0.05$) in both years.

During 2008, a total of 288 adult and 15 juvenile of Black-headed Ibis were recorded, and 286 adult and 10 juvenile were recorded in 2009 (Table 1). Juveniles comprised 5.20% of the total population during 2008, and 3.49% in 2009. ER (1.04 and 1.08) was found high in Chittorgarh district during both surveys (Table 2). No significant difference ($\chi^2 = 7.26$, $df = 5$, $P > 0.05$) was found in the recorded number of birds between both surveys but the correlation was significant ($r = 0.94$, $n = 6$, $P < 0.05$ for 2008 and $r = 0.93$, $n = 6$, $P < 0.05$ for 2009) with number of wetlands. No influence ($P > 0.05$) of transect length was found on its population during both years.

Discussion

Habitat destruction, urbanisation and increasing tourist activities were identified as major problems faced by these species in southern Rajasthan. Many wetlands are facing high pressure of encroachment, e.g., in Rajasmand district, Rajasmand Lake is almost entirely encroached by human settlement and has only few undisturbed areas in northern side which support sound number to bird diversity. Lake complex of Udaipur city is also highly influenced by urbanisation. Fatehsagar Lake is completely surrounded but Pichola Lake is partially surrounded towards the northern side by human settlements. Massive use of these water bodies for ecotourism and use of water boats were also other reasons for reduction in population of aquatic birds. Thereby, water bodies which were far from human disturbance like Badwai, Nagawali pond, Bodigama, Nadapachore, Somkamla, Sabla, and Sagwada were found to be congenial to birds. Sundar (2006) observed that aquatic birds prefer those wetlands having low level of human disturbance. Human activities affect nesting, loafing, and foraging activities of water birds. Lowering feeding rates reduce energy uptake. Therefore, birds access disturbance free wetlands to secure food for themselves, and for their nestlings. It is also important to establish disturbance-free breeding sites (Rodger & Schwikert 2002).

Total numbers of Painted Stork varied during both surveys but the overall ER was found to be almost similar (Table 2). In the case of Black-headed Ibis, number and ER were similar in both surveys. Rainfall was low in the state as well as its southern region during 2008 than 2007 (http://waterresources.rajasthan.gov.in/Daily_Rainfall_Data/Rainfall_Index.htm). This condition dries up many seasonal canals, ponds, and other small water resources, which can play a key role in population dispersal of water birds. Thus, lack of widespread presence of water bodies forces birds to congregate in large water bodies and this may be a causal factor for the increasing population of Painted Stork during 2009 but, difference in ER among districts indicates local movement of birds.

Both wading species have their own particular niche in relation to their feeding habits. Painted Storks feed mainly on fish in fresh water. Occasionally frog and snake are also consumed (Urfi 1989). It was observed foraging in 12–25 cm of water (Kalam & Urfi 2007). Black-headed Ibis depends on invertebrates (Sundar 2006; Ali & Ripley 2007) but also consumes fish, frog, and vegetable matter (Ali & Ripley 2007). Sites of greater water depth are less preferred by Painted Storks

(Kalam & Urfi 2007). This may be a strong reason that at man-made reservoirs or dams such as Bassi Dam, Gosunda Dam, and some lakes such as Fatehsagar, and Pichola, Painted Stork was not found but a population of ibis was observed. The whole of Fatehsagar and most part of Pichola have been enclosed by a wall and construction of tourist hotels, so that instead of flowing out, water level increases in rains, making the depth unsuitable for the species. Co-occurrence of birds may also be influenced by numerous factors, including competition, predation, regional population changes, autecology and habitat response have been identified (Rodger & Schwikert 2002).

Tall trees, commonly present on the margins of lakes, are utilised by many bird species for perching, and as nesting sites. Such a habitat was hardly available in our study area during the surveys, except at some wetlands like Pichola Lake, Ngawli pond, and Jaisamand Lake, which also supported good populations of birds. Khan (1987), and Pattanaik *et al.* (2008) observed that lack of suitable nesting trees affects the breeding potential of the aquatic bird species.

Thus, from the present study it is inferred that Dungarpur district supports the highest number of Painted Stork population during both years while the Black-headed Ibis population was highest in Chittorgarh district.

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