Artificial waterbodies in Sarakhs county: important stopover sites for migratory waterbirds in northeastern Iran

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Migration of birds involves long hours of flight interspersed with time spent at stopover sites. Identification and conservation of stopover sites is crucial for the conservation of migratory bird populations. We set out to investigate the passage migrant avifauna of Sarakhs county, northeastern Iran, to determine the importance of this region for stopovers. Of 76 species of waterbirds and shorebirds that we recorded during our survey, 2007–2013, 26 species were passage migrants, mostly recorded on artificial wetlands in the county. Nine of these species were new records for northeast Iran. Our results indicate that the artificial waterbodies built in the area serve as important stopover sites for migratory waterbirds and waders, attracting birds outside their usual distributional range. We believe that conservation of these valuable habitats and the migratory birds that depend on them is possible through involvement of the private owners, mostly through encouraging birdwatching activities and ecotourism.

INTRODUCTION

Sarakhs county is located in the northeasternmost part of Iran (Figure 1) and is where the Karakum plains of Turkmenistan penetrate within Iranian borders. Stretches of the Kopet Dagh mountains of northern Khorasan also reach this area (Darvishzadeh 2003), providing Sarakhs with a diversity of habitats. Sarakhs county encompasses four of the eight bird habitat types of Iran (Scott 1995); true high mountains, deserts and semi-deserts, semi-arid steppe plains and foothills, and wetlands. Each of these habitat types supports

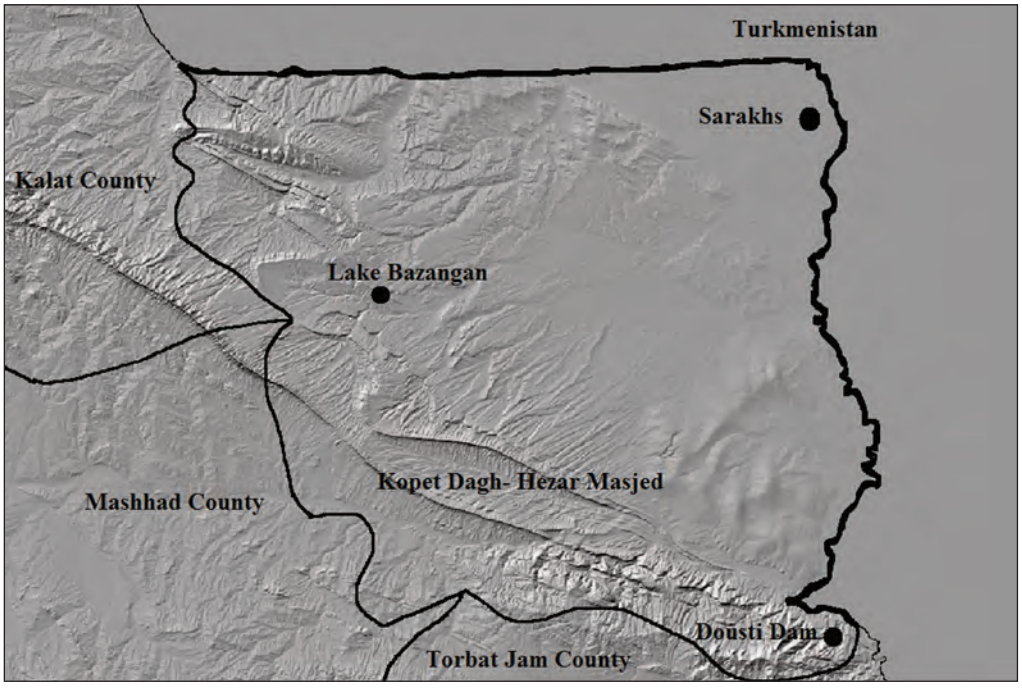

Figure 1. Sarakhs county, northeasternmost Iran. It includes Sarakhs city, lake Bazangan (natural) and the Dousti dam reservoir (largest waterbody in county).

unique communities of birds. Moreover, Sarakhs county is an intersection point of the western and eastern Palearctic and because it is separated from the central Iranian plateau by the Hezar Masjed and Mozdouran mountains, it is the only region in Iran where birds of eastern Palearctic descent such as Turkestan Tit *Parus bokharensis* and Pale-backed Pigeon *Columba eversmanni* can be found.

Although Iran is mainly a climatically dry country, its network of wetland systems provides valuable staging and wintering areas for migratory waterbirds in the African–Western Eurasian flyway. A number of these wetlands, both natural and man-made, designated as protected areas or identified as Ramsar sites, have legal protection status. The international significance of a considerable number of wetlands has also been verified (BirdLife International 2013). However, there remain a number of important areas in Iran, especially in the understudied regions of the south and east (Khaleghizadeh 2007), which have not received sufficient attention. Sarakhs county is one such area, little studied with regard to birds in general and migratory birds in particular. This is while the records and observations of rangers of the Department of Environment and of birdwatchers indicate a diverse avifauna of migratory birds in this region. In the present study we set out to confirm the importance of this area as a stopover for migratory waterbirds and shorebirds, by surveying the richness of passage migrant species that occur in the region. As there is only one natural waterbody in Sarakhs county, we expected that a considerable portion of wetland migratory birds would depend on the various man-made waterbodies in the area.

MATERIALS AND METHODS

Study area

Sarakhs county (36° 32′ 42″ N, 61° 09′ 28″ E), located in the northeasternmost part of Khorasan-e Razavi province, covers an area of 5472 km^2. The Kashaf Rud river in the south and Tajan river (the Harirud and Kashaf Rud together) in the east are the natural borders of this area. The west and southwest of the county is enclosed by the easternmost limits of the Kopet Dagh mountains. Sarakhs county has common borders with Turkmenistan in the north and east and is located where the eastern Alborz mountain chain meets the lowland plains of Turkmenistan and Afghanistan (Figure 1). The county therefore comprises mountains (Kopet Dagh/Hezar Masjed system) and plains. The most elevated part of the county, located in the Kopet Dagh highlands, is c2500 m asl, while the lowest part, in the southern Sarakhs plains, is 250 m asl. Average annual precipitation varies between 200 mm in the northeast to more than 400 mm in the western highlands and annual temperature ranges from less than 12°C to more than 17°C in the northeastern lowlands. One notable protected area in the county is the Khajeh highlands where one of the few remaining natural stands of Pistachio *Pistacia vera* in Iran remains (Saberi *et al* 2011). The only natural wetland in the county is lake Bazangan, an 0.8 km^2 freshwater lake with maximum depth of 12 m. Numerous artificial waterbodies of various sizes and purposes have been built, some for flood management and water storage and some for agriculture and aquaculture, covering a total area of *c*50 km^2. The reservoir of the Dousti dam is the largest waterbody in the county (49.32 km^2).

Data collection

The present study was carried out 2007–2013 in all four seasons, though not consecutively. Waterbirds were identified with the help of Scott *et al* (1975), Mullarney *et al* (1999) and Porter *et al* (2005) and the maximum number of individuals per visit was recorded for each species. Identification was aided using an 80×80 Swarovski telescope, 8×32 and 7×35 binoculars, and a Canon 40 D camera (sigma lens 50×500). The status of passage migrant was assigned according to season observed and by consulting Birdlife International

species factsheets (www.birdlife.org) and other sources (Scott & Rose 1996, Mullarney *et al* 1999, Mansoori 2008, Kaboli *et al* 2012).

RESULTS

We observed a total of 76 species of waterbirds and shorebirds, in six orders and 16 families, in Sarakhs county during our survey (Table 1). Charadriiformes was the most common order, with 30 species. We determined three species to be resident in Sarakhs county and four as breeding summer visitors, while 26 and 40 species were mainly observed as passage migrants and wintering visitors respectively. Three species were vagrants. Of the 76 species, 30 were present both on natural and artificial waterbodies while observations of 10 species were restricted to the former and 36 to the latter (Table 1). We photographed the unexpected Marbled Teal *Marmaronetta angustirostris* (Plate 1), Long-tailed Duck *Clangula hyemalis* (Plate 2), Corncrake *Crex crex* (Plate 3) and Sociable Lapwing *Vanellus gregarius* (Plate 4).

DISCUSSION

Wetlands and waterbirds have long been the subject of many threats in Iran, among which wetland drainage and reclamation for agricultural activities are the most serious (Scott 1995, Behrouzi-Rad 2008, Nourani *et al* 2014). As natural wetlands are drying out or being degraded due to exploitation and livestock grazing throughout the country, the significance of artificial waterbodies as alternative habitats for migratory birds is increasing.

The 26 species of waterbirds and shorebirds mainly observed on passage in Sarakhs county were mostly observed at artificial waterbodies (57%). Man-made wetlands, such as aquaculture and irrigation ponds, flooded agricultural lands, water storage areas *etc* are of high significance as waterbird habitats (Matthews 1993). Some artificial waterbodies are even more plentiful in food and nutrients than are natural wetlands, thus supporting a diversity of plant and animal life. Birds expand their distribution ranges as they are attracted to these waterbodies and migratory birds are attracted to them during migration.

The reservoir of the Dousti dam provides a suitable deep-water habitat resembling a waterbody at early stages of succession, suitable for species such as Goosander *Mergus merganser*, and the shallow nutrient-rich waters of aquaculture ponds and the margins of flood control ponds are attractive to many waders and waterbirds that favour shallow water. Twelve of the sixteen passage migrant species that were new records for Sarakhs county (Mansoori 2008, Kaboli *et al* 2012) were only found at these artificial waterbodies.

Plate 1. Marbled Teal *Marmaronetta angustirostris*, artificial waterbody in north of Sarakhs county, northeast Iran, June 2014. © *Ali Khani*

Plate 2. Long-tailed Duck *Clangula hyemalis*, Sarakhs county, northeast Iran, December 2012. © *Ali Khani*

Table 1. Checklist and status of waterbirds and shorebirds recorded in Sarakhs county, northeastern Iran. Status statements of passage migrants recorded for the first time in Sarakhs county are marked with an asterisk and first records for the northeast of Iran with a double asterisk. Maximum numbers of birds per visit are presented for both natural and artificial waterbodies and wetlands.

	Species	Scientific name	IUCN Red List Category (Ver 3.1)	Season observed				Status	Max number of birds	
				Spring	Summer	Fall	Winter		Natural	Artificial
1	Little Grebe	*Tachybaptus ruficollis*	LC	*				Resident	12	7
2	Red-necked Grebe	*Podiceps grisegena*	LC				*	Winter visitor	0	1
3	Great Crested Grebe	*Podiceps cristatus*	LC	*			*	Winter visitor	16	190
4	Black-necked Grebe	*Podiceps nigricollis*	LC				*	Winter visitor	1	2
5	Dalmatian Pelican	*Pelecanus crispus*	VU				*	Winter visitor	1	1
6	Pygmy Cormorant	*Phalacrocorax pygmeus*	LC				*	Winter visitor	2	0
7	Cormorant	*Phalacrocorax carbo*	LC				*	Winter visitor	0	118
8	Grey Heron	*Ardea cinerea*	LC	*			*	Winter visitor	2	15
9	Purple Heron	*Ardea purpurea*	LC	*	*			Passage migrant	1	1
10	Little Egret	*Egretta garzetta*	LC				*	Winter visitor	0	1
11	Great Egret	*Casmerodius albus*	LC				*	Winter visitor	8	50
12	Cattle Egret	*Bubulcus ibis*	LC		*			Passage migrant**	6	0
13	Little Bittern	*Ixobrychus minutus*	LC	*				Breeding summer visitor	3	0
14	Great Bittern	*Botaurus stellaris*	LC	*			*	Breeding summer visitor/ Resident	1	0
15	Black Stork	*Ciconia nigra*	LC	*				Breeding summer visitor	2	0
16	Glossy Ibis	*Plegadis falcinellus*	LC	*	*	*		Vagrant	2	5
17	Eurasian Spoonbill	*Platalea leucorodia*	LC				*	Passage migrant*	1	2
18	Mute Swan	*Cygnus olor*	LC				*	Winter visitor	0	15
19	Greater White-fronted Goose	*Anser albifrons*	LC				*	Winter visitor	0	11
20	Lesser White-fronted Goose	*Anser erythropus*	VU				*	Winter visitor	0	1
21	Greylag Goose	*Anser anser*	LC				*	Winter visitor	0	6
22	Ruddy Shelduck	*Tadorna ferruginea*	LC				*	Winter visitor	24	140
23	Common Shelduck	*Tadorna tadorna*	LC				*	Winter visitor	2	10
24	Eurasian Wigeon	*Anas penelope*	LC				*	Winter visitor	17	0
25	Gadwall	*Anas strepera*	LC				*	Winter visitor	13	30
26	Eurasian Teal	*Anas crecca*	LC	*			*	Winter visitor	40	21
27	Mallard	*Anas platyrhynchos*	LC	*		*	*	Winter visitor	459	1100
28	Northern Pintail	*Anas acuta*	LC				*	Winter visitor/ Passage migrant	0	4
29	Garganey	*Anas querquedula*	LC				*	Winter visitor	0	1
30	Northern Shoveler	*Anas clypeata*	LC				*	Winter visitor	14	20
31	Marbled Teal	*Marmaronetta angustirostris*	VU	*				Passage migrant**	0	1
32	Red-crested Pochard	*Netta rufina*	LC				*	Winter visitor	9	2
33	Common Pochard	*Aythya ferina*	LC				*	Winter visitor	150	68
34	Ferruginous Duck	*Aythya nyroca*	NT				*	Winter visitor	0	5

	Species	Scientific name	IUCN Red List Category (Ver 3.1)	Season observed				Status	Max number of birds	
				Spring	Summer	Fall	Winter		Natural	Artificial
35	Tufted Duck	*Aythya fuligula*	LC				*	Winter visitor	25	4
36	Greater Scaup	*Aythya marila*	LC	*				Vagrant	0	1
37	Goldeneye	*Bucephala clangula*	LC				*	Winter visitor	0	3
38	Long-tailed Duck	*Clangula hyemalis*	VU				*	Vagrant	0	3
39	Smew	*Mergus albellus*	LC				*	Winter visitor	0	7
40	Goosander	*Mergus merganser*	LC				*	Winter visitor	0	43
41	Water Rail	*Rallus aquaticus*	LC				*	Winter visitor	2	0
42	Corncrake	*Crex crex*	LC			*		Passage Migrant	1	0
43	Moorhen	*Gallinula chloropus*	LC	*	*		*	Resident	3	0
44	Eurasian Coot	*Fulica atra*	LC	*			*	Winter visitor	35	21
45	Common Crane	*Grus grus*	LC					Passage migrant	0	15
46	Eurasian Oystercatcher	*Haematopus ostralegus*	LC	*				Passage migrant**	0	41
47	Black-winged Stilt	*Himantopus himantopus*	LC	*				Passage migrant	5	30
48	Pied Avocet	*Recurvirostra avosetta*	LC	*				Passage migrant	0	5
49	Black-winged Pratincole	*Glareola nordmanni*	NT		*			Passage migrant**	0	16
50	European Golden Plover	*Pluvialis apricaria*	LC				*	Winter visitor	0	5
51	Little Ringed Plover	*Charadrius dubius*	LC	*				Breeding summer visitor	1	2
52	Northern Lapwing	*Vanellus vanellus*	LC				*	Winter visitor	125	3600
53	Sociable Lapwing	*Vanellus gregarius*	CR			*		Passage migrant	0	7
54	White-tailed Lapwing	*Vanellus leucurus*	LC	*	*		*	Passage migrant	5	16
55	Common Snipe	*Gallinago gallinago*	LC					Winter visitor	9	55
56	Black-tailed Godwit	*Limosa limosa*	NT	*			*	Passage migrant	0	2
57	Wood Sandpiper	*Tringa glareola*	LC	*	*			Passage migrant	2	2
58	Common Redshank	*Tringa totanus*	LC	*		*		Passage migrant	8	50
59	Common Greenshank	*Tringa nebularia*	LC				*	Passage migrant**	1	2
60	Green Sandpiper	*Tringa ochropus*	LC			*	*	Winter visitor	1	1
61	Common Sandpiper	*Actitis hypoleucos*	LC	*	*			Passage migrant*	10	0
62	Ruddy Turnstone	*Arenaria interpres*	LC	*				Passage migrant**	0	1
63	Little Stint	*Calidris minuta*	LC	*	*		*	Winter visitor	7	15
64	Dunlin	*Calidris alpina*	LC	*		*		Passage migrant*	0	31
65	Broad-billed Sandpiper	*Limicola falcinellus*	LC	*				Passage migrant**	0	2
66	Ruff	*Philomachus pugnax*	LC		*			Passage migrant*	0	2
67	Red-necked Phalarope	*Phalaropus lobatus*	LC	*				Passage migrant	25	40
68	Caspian Gull	*Larus cachinnans*	LC				*	Winter visitor	0	12
69	Pallas's Gull	*Larus ichthyaetus*	LC				*	Winter visitor	0	41
70	Little Gull	*Larus minutus*	LC	*			*	Winter visitor	0	2
71	Slender-billed Gull	*Larus genei*	LC	*			*	Winter visitor	0	5
72	Gull-billed Tern	*Sterna nilotica*	LC	*				Passage migrant**	0	7
73	Sandwich Tern	*Sterna sandvicensis*	LC	*				Passage migrant**	0	2
74	Common Tern	*Sterna hirundo*	LC	*				Passage migrant*	0	2
75	Whiskered Tern	*Chlidonias hybrida*	LC	*	*			Passage migrant	0	4
76	White-winged Tern	*Chlidonias leucopterus*	LC	*				Passage migrant*	0	2

Plate 3. Corncrake *Crex crex*, near Tajan river, Sarakhs county, northeast Iran, October 2010. © *Ali Khani*

Plate 4. Sociable Lapwing *Vanellus gregarius*, near Tajan river, Sarakhs county, northeast Iran, October 2010. © *Ali Khani*

Nine of the newly-recorded species were not previously recorded for northeastern Iran (Table 1) and the closest known stopover sites for them were mostly Miankaleh peninsula (Mazandaran province) and Turkaman steppes in Golestan province (Kaboli *et al* 2012). This considerable number of new records indicates the suitability of artificial waterbodies in Sarakhs as a stopover, attracting these species to extend their usual distributional ranges.

The location of Sarakhs as an important stopover for a number of migratory birds, such as Wood Sandpiper *Tringa glareola* and White-winged Tern *Chlidonias leucopterus*, indicates that as these birds fly for hundreds of kilometres between their breeding grounds in Siberia and wintering grounds in Africa, they fly over Iran in spring and autumn and identify the most suitable sites to stop over. Occurrence of these species in Sarakhs suggests that this region serves as a valuable stopover for waterbirds and shorebirds migrating within the African–Eurasian flyway, attracting globally-threatened species such as Marbled Teal (VU) and Sociable Lapwing (CR). However, no thorough management and conservation plan has been proposed to ensure the sustainability of artificial waterbodies in the county. This is while these artificial habitats, if managed properly, will not only support a significant diversity of passage migrants, but could also serve as complementary or alternative habitats for wintering populations of migratory waterbirds (Kloskowski *et al* 2009, Choi *et al* 2013). We included maximum numbers for each species in this survey to provide a basic approximation of waterbird richness in the area. We suggest regular monitoring of migratory populations in the region to enable management and conservation planning as well as allowing for assessment against the quantitative criteria of Important Bird Areas and the Ramsar convention.

CONSERVATION IMPLICATIONS

At a time of loss and degradation of natural wetlands in Iran (Behrouzi-Rad 2008, Nourani *et al* 2014), our study brings attention to the significance of artificial waterbodies in the conservation of migratory waterbirds. As more migratory species are being attracted to man-made wetlands in Sarakhs, it is of paramount importance that the owners of artificial waterbodies become involved in regional conservation plans. Raising the awareness of local land owners on economic and environmental values of migratory birds can have a significant impact on conservation of waterbirds and wetlands. Such can be achieved by providing land owners with practical guidelines on proper management of artificial waterbodies to attract higher diversities of migratory birds, with an incentive of increasing profits from promoting birdwatching activities and ecotourism.

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