

Ecological Investigation of the Common Crane *Grus grus* in Mighan Wetland, Markazi Province, Central Iran

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Abstract: Mighan Wetland is an important wintering habitat which annually attracts numerous migratory birds, in particular the Common Crane *Grus grus*. In a field study conducted between September 2006 and February 2008, the number of cranes and their seasonal fluctuation were studied as were important ecological factors affecting the Common Crane's preferred habitat. Peak numbers of the Common Crane occurred in November and December, when the population reached 10,000–11,000. The Common Cranes mostly preferred the densely vegetated (of *Cyperus Cyperus eremicus*) parts of the wetland. They also used adjacent farmland as feeding grounds. Although data collected for the 2000–2007 period did not show any significant correlation between Common Crane numbers and temperature or number of frost days ($p>0.05$), we predict low temperatures could be a contributory factor in crane mortality. In a daily examination of these factors in this habitat, 611 cranes died due to harsh weather conditions during the three years of this study. The major human threats affecting the wetland are mining, hunting and poaching. Mighan Wetland is the most important wintering area for Common Cranes in central Iran, and also provides important wintering habitat for other migratory waterbirds. Therefore, it should be designated as a Ramsar site and an Important Bird Area (IBA).

Keywords: Common Crane, *Grus grus*, Mighan Wetland, habitat preferences, wintering habitat, population size.

INTRODUCTION

Of the 15 species of cranes in the world, the Common Crane *Grus grus* is the most widely distributed. This crane breeds in Scandinavia, Central and Western Europe, Ukraine, Belarus and Russia east to eastern Siberia, western and northeastern China and northern Mongolia. The wintering areas of the Common Crane include parts of The Netherlands, France, the Iberian Peninsula, North Africa, Sudan, Israel, Jordan, Saudi Arabia, Iran, Iraq, southeastern China and Indonesia. The Common Crane is listed as 'Least Concern' by IUCN and in Appendix II of CITES (Meine & Archibald 1996).

In Iran, the Common Crane has been reported from 34 different localities in 14 provinces during the Mid-winter Waterbird Censuses since 1971 (Ansari 2008). In the 1970s, the total wintering population of Common Cranes in Iran was estimated at only 2,000–3,000 birds (Scott 1980). The International Crane Foundation was involved in

improving the habitat and increasing the population of cranes in Iran, and worked in the Dasht-e Arjan and Lake Parishan wetlands between 1975 and 1978 and from 1983 to 1984, with the assistance of staff from the Department of the Environment of Iran, especially H. Farhadpour (1987). They used seeds which contained alpha-Chloralose to capture 252 Common Cranes, and marked them with orange-green, orange, red and yellow wing tags. One of the most important goals of this project was to discover the breeding grounds of the Common Cranes wintering at Dasht-e Arjan and Lake Parishan. The eggs of the Siberian Crane *Grus leucogeranus* could then be placed in Common Crane nests in an attempt to establish a new population of Siberian Cranes that would spend the winter with the Common Cranes in southern Iran (Farhadpur 1987, H. Farhadpur pers. comm.). Single pairs of Common Crane bred in 1991 and 1993, and 3–4 pairs bred in 1997 in West Azarbaijan Province (Ra'naghad & Ebrahimi 2007).

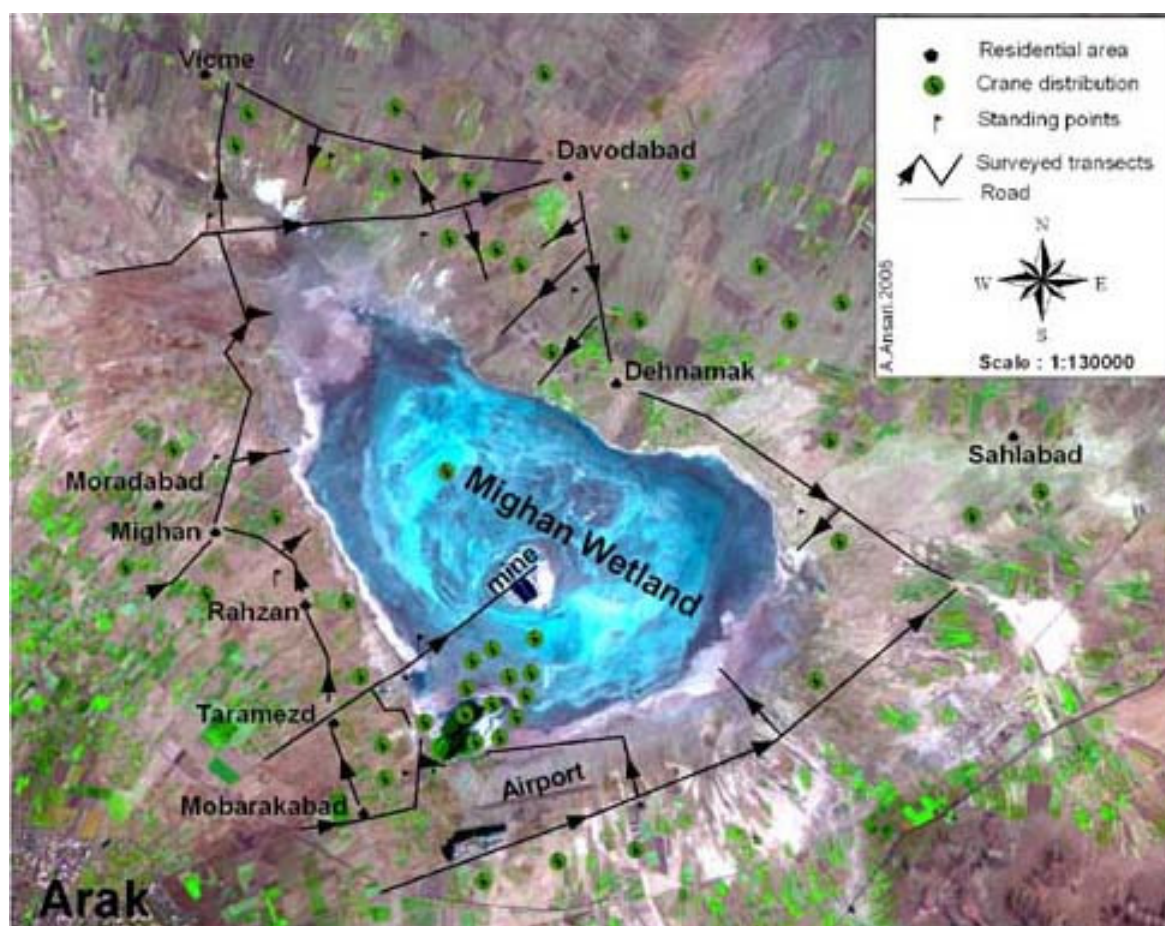


Figure 1. Surveyed transects, sites for standing counts and observation points of Common Crane in Mighan Wetland and adjacent areas.

Mighan Wetland is an unprotected area on the central plateau of Iran that is usually visited by at least 5,000 Common Cranes every year during the period October–December (Behrouzi-Rad *et al.* 1997). The wetland is situated on the migration route of birds crossing western Iran, near important sites such as Gavekhuni Wetland in Isfahan, Saveh Dam in Markazi Province. Therefore Mighan wetland supports large numbers of migratory birds during the autumn and winter. However, Paludan (1940) did not report any Common Cranes observation in May, and Jervis Read (1958), who visited the lake in June and November 1957, found only 12 Common Cranes on 16 November 1957. No Common Cranes were recorded at this wetland during the early 1970s, when the lake was extremely saline and held water only for short periods of time in late winter. The presence of large numbers of Common Cranes at Mighan Wetland would appear, therefore, to be a recent phenomenon. Over 10,000 Common Cranes

have been counted in this area in autumn and winter in recent years (Ansari 2008).

Other wintering areas of Common Cranes in central Iran include small numbers in Band-Alikhan Wetland (53 individuals), Gandoman Marsh (13), Lake Bakhtegan (279), Lake Tashk (6), Maharlu wetland (14), Dasht-e Arjan (23), Lake Parishan (2) and Alghadir Dam (8) (Department of the Environment, unpubl. data).

STUDY AREA

Mighan Wetland (10,640 ha) is located 17 kilometres northeast of Arak in Markazi Province at 34°07'00"–34°21'30"N, 49°04'00"–50°02'00"E (Sadough & Jalalvand 1999). The mean annual precipitation is 258 mm. Its elevation is 1700 m a.s.l. and the maximum water depth is *c.* 140 cm. The total study area comprises 30,000 ha that can be divided into five parts: southwest, north, east, south and west. The southwest part of the wetland is

densely covered with *Cyperus Cyperus eremicus*. The other areas have adjacent lands which are mostly being used for farming, and cranes use these as feeding grounds. Therefore they were included in this study.

MATERIAL AND METHODS

In this survey, we used two sets of data. Firstly, data relating to crane numbers from the Mid-winter Waterbirds Censuses between 2000 and 2007 were gathered. Secondly, we studied the Common Crane population once a week from September 2006 (the time of the arrival of the first groups of cranes) to February 2008, in order to monitor the size of the population and identify the preferred habitats and movements in Mighan Wetland. A pilot study was carried out to determine the habitat used by the Common Crane as well as their behaviour. We then used direct observation to gather the required information. Routes were surveyed on foot or by vehicle. We also used hides near habitats preferred by cranes in order to record presence, numbers and any sign of cranes such as droppings, foot prints and earth disturbance. We used binoculars and a telescope to observe crane behaviour. All the routes were recorded using GPS and the data then imported to Oziexplorer and Arcview software to produce maps (Fig. 1). We used Chi-square analysis to test the differences between the numbers of cranes in the five parts of the wetland and Correlation test for Common cranes number and temperature and number of frost days, using SPSS 14.0 software.

RESULTS

A. Distribution and local movements

Common Cranes fly from the southwest of the wetland at sunrise. They feed on seeds, wheat and hay in adjacent farms. We identified 20 daily and nightly flight lines and 10 stopping points in Mighan Wetland (Fig. 1). Common Cranes also moved as far as 50 km away from the wetland during one day. They subsequently returned to the wetland to use any available cover for roosting. There was not any significant correlation between Common Crane numbers and temperature or number of frost

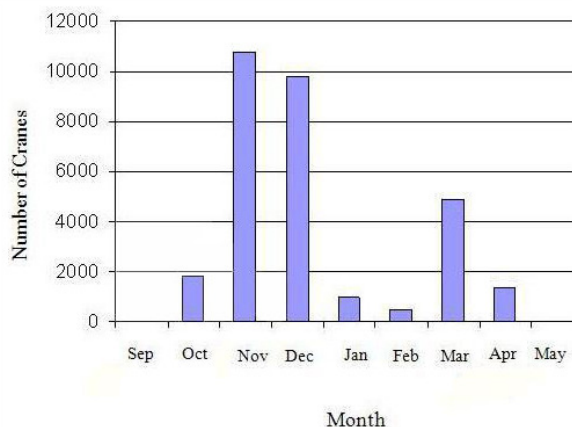


Figure 2. Mean monthly counts of Common Cranes at Mighan Wetland, Arak, from 2000 to 2007.

days ($p>0.05$), but we do expect some significant effect of meteorological factors on the total number of cranes. Most cranes were observed in the southwestern, northern and eastern portions of the study area. Deep water and dense vegetation cover in the southwestern part of this wetland and suitable food resources on adjacent farmland in the north and east made these habitats suitable for the cranes. Fewer cranes were observed in the western and southern parts (Table 1). The presence of built-up areas such as an airport, a wastewater treatment facility and a road, as well as poachers and stray dogs, made these areas less suitable for cranes. The result of the Chi-square goodness-of-fit test shows that there is a significant difference between the maximum number of cranes observed in the five parts of this wetland (Table 1, $p<0.001$).

B. Seasonal fluctuations

The Common Cranes arrive at Mighan Wetland in flocks of approximately 20 individuals. In October, the number of cranes reaches *c.* 2,000, while peak numbers of cranes occur in November and December, when the population may reach *c.* 11,000 (Table 2) (Fig. 2). The Common Cranes leave the area after the first snowfall and only a small number (*c.* 500) remain in this wetland throughout the winter. The number of cranes increases to 5,000 in March because of the return migration of cranes that have wintered farther south. The cranes begin to leave the area in late March and most have left by the end of April (Table 1). Only a few birds have been recorded in May.

Table 1. Maximum number of Common Cranes in each section of Mighan Wetland from September 2006 to June 2007.

Dates	Southwest	East	West	North	South	Flying
September 2006	0	0	0	0	0	0
October 2006	1054	2902	0	8	0	2150
November 2006	1210	5500	355	3360	1	3015
December 2006	2242	0	1862	1250	0	510
January 2007	3255	1279	2560	9	2120	2253
February 2007	0	40	78	10	0	108
March 2007	2853	260	2100	6	0	2180
April 2007	1593	0	9	0	0	234
May 2007	26	0	1	0	0	8
June 2007	0	0	0	0	0	0

Table 2. Numbers of Common Cranes, casualties and weather data at Mighan Wetland from 2000 to 2008.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Maximum no. of observed Common Cranes	6000	8000	9500	10,000	10,500	9500	10,500	11,000	10,500
No. of Crane Casualties	550	0	0	0	6	0	0	0	55
Weather Conditions	Snow and Frost, very Cold	Cold	Cold	Cold	Snow and Frost, very Cold	Cold	Cold	Cold	Snow and Frost, very Cold
Mean Temperature in January	+1.9	+5.5	+2	+2.6	+2.4	-2.7	-0.7	-3.4	-8.3
Mean Temperature in February	-4.6	-0.2	+0.8	+1.4	+4.5	-5.1	+4.3	+2.2	-5.1
No. of days of frost in January	24	29	20	26	22	29	23	30	30
No. of days of frost in February	27	27	26	28	20	28	16	22	20

C. Mortality

During the nine winters from 2000 to 2008, 611 Common Cranes were found dead at Mighan Wetland. Casualties were highest in the southwestern part of the wetland where the wastewater from a sewage treatment facility enters the wetland and adjacent farmland. The most important factor affecting crane survival in the past nine years has been severe weather, specifically heavy snowfall. During periods of severe weather in 2000, 2004 and 2008, snow covered the feeding grounds of the cranes and the surface of the wetland was frozen (Table 2). Low temperatures and the lack of food resources made the cranes physically weak and incapable of flying. The result was that more than 2,000 cranes were unable to leave the wetland. Some 550, six and 55 cranes died during the severe weather in 2000, 2004 and 2008 respectively. There are no reports of casualties in any other year from 2000 to 2008.

In harsh winters, the cranes' diet changes. The birds gather around residential areas and livestock manure. Common Cranes were observed in flocks of between five and 20 birds at these sites. It seems that the activity of micro-organisms in the livestock manure makes these areas warmer and consequently the snow melts faster in comparison with adjacent ground. The cranes also feed on seeds and worms which occur in the manure. However, they do not gather around rubbish tips because of the possibility of attack by stray dogs. The lack of food resources also, inevitably, causes a number of deaths (Fig. 3). Some cranes are killed by wolves, jackals, foxes and dogs. In the harsh winter of 2008, six cranes found in a weakened condition were captured, banded and released some time later when the habitat was suitable again (in February 2008).

DISCUSSION

There are no reports before 2000 of cranes dying of starvation in Mighan Wetland. On the first occasion, the number of casualties was high because of the lack of knowledge and experience of both local people and wildlife staff. After a heavy snowfall, many cranes died due to starvation and attacks by carnivores. However, in subsequent years, many cranes were rescued. Staff of the Markazi Provincial Office of the DOE, local people and NGOs saved many cranes by feeding them with seeds in 2000, 2004 and 2008. In 2001, a Russian member of the International Crane Foundation visited Mighan Wetland and studied the status of the cranes. One of our recommendations was that sufficient food resources should be made available in the southwest of the wetland in order to prevent cranes dispersing in cold weather and to reduce the number of casualties.

Mighan Wetland was a seasonal wetland in the past but the development of Arak Wastewater Treatment Facility to the southwest of the wetland, with the subsequent runoff of treated water into the area since 1999, has changed it into a permanent wetland. One result of this has been that the cranes now spend more time than in the past at this wetland; *e.g.* 236 cranes remained at Mighan in February 2007 (Table 1). Before 1999 the number of Common Cranes resting here, using it as a stop-over place, was about 5000 (Behrouzi-Rad *et al.* 1997) but now they remain for longer periods in autumn and winter. The waste water now entering the wetland has decreased the salinity of the soil in the southwestern part of the wetland, and has helped to create a dense cover of *Cyperus Cyperus eremicus*. Common Cranes feed on these plants as a preferred food source (A. Ansari pers. obs.). These changes have had a significant effect on the ecology of this part of the wetland, and made it a suitable habitat for cranes and other birds. Most of the cranes recorded during the present study were observed in this area (Table 1).

Conservation

Situated on the western edge of Iran's central plateau, Mighan Wetland is on the migration routes for many species of waterbirds and is now also a valuable habitat for more than 10,000 Common Cranes during autumn. As



Figure 3. Common Crane mortality in Mighan Wetland, Arak, winter 2008, © A. Ansari.

recommended by Tohidifar & Zarei (2007), the regular occurrence of over 10,000 Common Cranes and the presence of endangered species such as Sociable Lapwing *Vanellus gregarius* would justify the designation of this wetland as an Important Bird Area (IBA), which could become a major bird-watching area in Central Iran. We therefore recommend that it should be designated as a RAMSAR international wetland under the Convention on Wetlands (Ramsar) and as an Important Bird Area (IBA).

One area of concern is that every year in autumn and winter, large numbers of poachers come to the area to hunt wild duck, geese, coot and other birds (Tohidifar & Zarei 2007), a potentially great threat to the biodiversity of the region. Our recommendation would be that hunting should be more controlled. Mighan Wetland faces other threats such as mining and nearby land use changes which reduce the suitability of this important habitat for cranes and other birds. Recently, public knowledge and awareness of the value of the wetlands has increased, and this has led to great efforts to reduce the threats affecting the wetland ecosystems. For example, a comprehensive plan to reduce air pollution in Arak forbids any industrial activity near this wetland, and the Natural Resources Office in Markazi Province monitors activities that could affect the wetland. All these efforts could lead to effective protection of the wetland and the Common Cranes, which visit it every year, either on migration or for longer periods during the winter.

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