

Population Estimation and Breeding Biology of the House Crow *Corvus splendens* on Kharg Island, Persian Gulf

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Abstract: This study was conducted at five sites on Kharg Island in the Persian Gulf: Ershad Guest House, Falat-e Ghare, Melli Bank, Sadaf cinema and the petrochemical site. Estimates of the population size of the House Crow *Corvus splendens* were made on 10 September 2009, 20 December 2009 and 10 January 2010. The breeding population was estimated on 22 July 2010. The population of House Crows was 5,212 individuals on 10 September, 4,950 individuals on 20 December and 5,500 individuals on 10 January (average 5,220 individuals). The breeding population was estimated as 1,451 pairs based on the number of active nests, and a total of 1,871 old nests were also located. During the summer, autumn and winter seasons, the non-breeding House Crows roosted on 32 trees of *Ficus bengalensis*, 62 *Eucalyptus*, and one *Ziziphus aucheri*. The non-breeding population was more than the breeding population (5,220 non-breeding individuals, and 1,451 breeding pairs). Nests of the House Crow were composed mainly of two types of material, wood and pieces of discarded wire. The clutch size was 3–5, but most of the nests had 4 eggs. The population of this species on Kharg Island increased from about 40 individuals in the early 1970s to 5,500 in 2010.

Keywords: *Corvus splendens*, House Crow, Kharg Island, Persian Gulf, population, roosting site.

INTRODUCTION

The House Crow *Corvus splendens* has a native range which stretches throughout the Indian subcontinent, including Myanmar, Nepal and Sri Lanka (Habib Ali 1987, Ryall 2002). The arrival date of the House Crow on islands and coasts of the Persian Gulf is not known clearly, but the population on Kharg Island is assumed to have originated from escaped cage-birds or birds arriving from the Indian subcontinent on board ship (Scott 2008). The House Crow was not listed for Iran by Zarudny (1911) or Jervis Read (1958), but Hüe & Etchécopar (1970) state that the species nests on the south coast of Iran, and show the breeding range extending all along the Mekran coast of Persian Baluchestan. However, in the 1970s, the species was largely confined to Kharg Island in the Persian Gulf. House Crows were first recorded on Kharg Island, Bushehr, on 7–9 May 1970, when about 10 pairs were observed by W.H. Dady (Scott 2008). At least forty were present around the town on 26 August 1973 and again on 29 May to 1 June

1974 (Scott 2008). By 10–11 August 1977, the numbers had increased to about 500 (Argyle 1977), and the species was recorded as common on the island on 20 April 1978 (Scott 2008). The only record away from Kharg Island was a single bird at Bandar-e Lengeh on the Persian Gulf coast on 7 June 1978 (Scott 2008). On 10 July 1980, 700 individuals were observed on Kharg (Behrouzi-Rad 1980). The aim of this study was to identify the main roosting sites of the House Crows, estimate the breeding and non-breeding populations and document some aspects of the breeding biology of the species on Kharg Island.

STUDY AREA

Kharg (also called Khark) Island (29°22'N 50°30'E) is one of Iran's oil export terminals in the Persian Gulf. It is located 57 km to the northwest of Bushehr city and 38 km from Bandar-e Genaveh. The island is 8 km long and 4–5 km wide. This rocky limestone island is unique because it is one of the few islands in

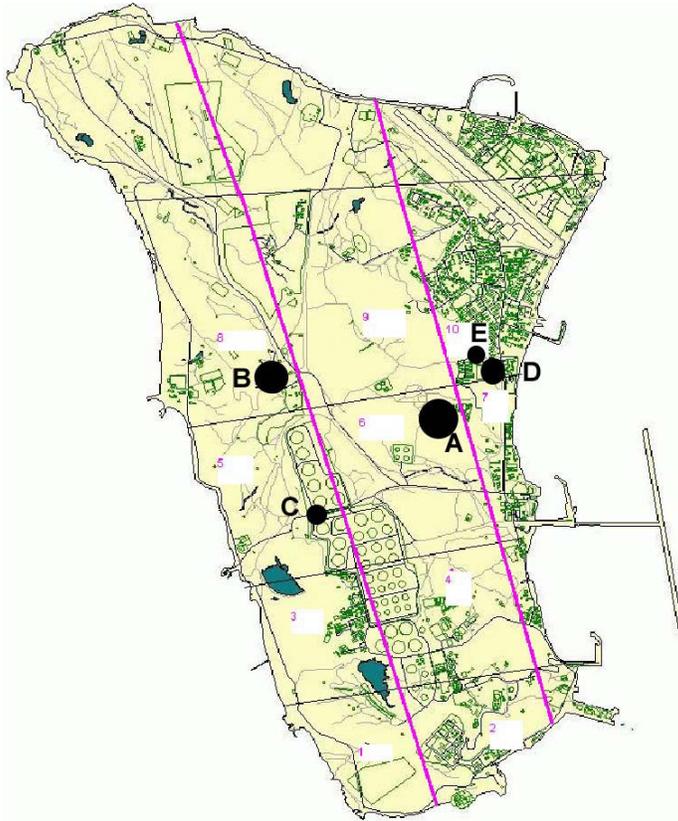


Figure 1. Study area, roosting sites and nest count plots of the House Crow on Kharg Island. Key to symbols: A= Ershad Guest House, B= Falat-e Ghare, C= Melli Bank, D= Sadaf cinema and E= petrochemical site. Numbers 1 to 13 indicate the 2×2 km squares in which nests were counted.

the Persian Gulf with freshwater collected within the porous limestone. In addition to its commercial and strategic importance, the freshwater has biological importance, supporting populations of gazelles *Gazella subgutturosa* and other species of fauna. Kharg Island is administered by the adjacent coastal Bushehr Province, and provides a sea port for the export of oil. Kharg and the nearby much smaller island of Kharku, 3 km to the northeast, were designated as a Protected Region in 1960 with a total area of 2,438 ha. This reserve was upgraded to Wildlife Refuge in the early 1970s, but the Kharg portion was de-notified a few years later leaving only Kharku protected in the Kharku Wildlife Refuge (312 ha). The area of Kharg Island is 2,100 ha. The highest elevation on Kharg is Dideban Mountain (83 m. a.s.l.). There are two other hills, Koh-e Takhat (63 m) and Koh-e Gardan Oshtor (78 m), but most of the island is

flat. The main vegetation on the island consists of *Ficus bengalensis*, *Prosopis*, *Tamarix*, *Eucalyptus*, *Ziziphus*, *Phragmites australis*, *Juncus* and some Graminae species. There are two small wetlands on Kharg, one of them less than one hectare in area and the other about 2 hectares in area (Fig. 1). The weather is dry and hot, with an average humidity of 61.6%, an average rainfall of 256.6 mm, and maximum and minimum temperatures of 47°C and 3°C, respectively. The local population of Kharg is currently estimated at about 17,000 people.

MATERIALS AND METHODS

The Total Count method was used at roosting sites to obtain an estimate of the non-breeding population. Three people were involved in the counts (one person at each site) on 10 September and 20 December 2009, and 10 January 2010. House Crows began to arrive at their roosting sites about 30 minutes before sunset and finished about 20 minutes after sunset. The

counts were undertaken just before darkness, when all the House Crows had entered their roosting sites and settled in trees.

To estimate the breeding population, we counted both old and active nests. The nest counts were carried out on 10 January and 22 July 2010. For counts of old nests, the island was divided into 2×2 km grid squares (13 squares in total), using a GPS. Two teams (each team with two people) started from the south and moved to the north, counting nests in each square on 10 January 2010. Active nests (with eggs or chicks) were also counted within the same 13 squares on 22 July 2010 (Fig. 1). At the end of the breeding season, 39 nests were collected from three habitats in the study area (15 nests from trees near the roosting site in the north of the island, 21 nests from pipes and poles and 3 nests from other sites). The measurements of the nests and nest-cups were recorded when the nests were still in their

original situation in trees or on pipes. The nests were removed intact and weighed on a three bar weighing balance. Measurement of the eggs was carried out using a digital balance with an accuracy of 0.1 g.

RESULTS

Population

The population of House Crows on Kharg Island was estimated at 5,212, 4,950, and 5,500 individuals on 10 September 2009, 20 December 2009 and 10 January 2010, respectively (Table 1). The birds were roosting in five places.

Ecological condition of roosting places

Five nocturnal roosts of the House Crow were located in the study area (Fig. 2). The location of these roosting sites is given in Fig. 1. The relationship between the number of House Crows and the species of tree is shown in Figs. 3–4. The proportion of each type of tree used for roosting was similar in September, December and January. The whole population was roosting in 95 trees (32 *F. bengalensis*, 62 *Eucalyptus* and one *Ziziphus aucherii*; Figs. 3–4, Table 1). The height of the trees was 8–15 m. The tallest trees were *Eucalyptus* (15 m) and the shortest was *Ziziphus* (8 m), while the *F. bengalensis* trees were 10–12 m in height.

Roosting place A (Ershad Guest House):

This area has been planted with *Eucalyptus*, *F. bengalensis* and *Ziziphus aucherii*. The height of the *F. bengalensis* trees was about 12 m, *Eucalyptus* about 15 m and *Ziziphus aucherii* about 8 m. The roosting population ranged between 2,600 and 3,025 individuals and about 49% of the total population of House Crows on Kharg Island roosted at this site. The average number of House Crows roosting in each tree was 51.0 on 10 September, 51.4 on 20 December and 59.3 on 10 January 2010. The bulk of the population roosted in 10 *F. bengalensis* (1,500 on 10 September, 1,200 on 20 December 2009 and 1,600 on 10 January 2010), and 40 *Eucalyptus* trees, (1,056 on 10 September, 1,400 on 20 December 2009 and 1,400 on 10 January 2010).

Roosting place B (Falat-e Ghare): This place is a residential area and the margins of the main streets have been planted with *F.*

bengalensis. The House Crows roosted in 20 *F. bengalensis* trees at this site. The roosting population ranged between 1,843 and 2,040 individuals. About 40% of the total population of House Crows on Kharg Island roosted at this site (Table 1).

Roosting places C and D: Melli Bank and Sadaf cinema are located at the entrance to Kharg city. There is one *F. bengalensis* tree in front of Melli Bank and one in front of Sadaf cinema. The roosting population of House Crows on the first tree was 45–50 individuals. The roosting population on the second tree was 50 individuals on 10 September, 50 on 20 December and 40 on 10 January 2010. One percent of the total House Crow population roosted in each of these trees (Table 1).

Roosting place E (petrochemical site):

This place has been planted with *Eucalyptus*, and covers about one hectare. There were about 625 *Eucalyptus* trees, approximately 12 m in height. The House Crows roosted in 22 trees. The numbers of roosting birds ranged between 345 and 584 individuals (Table 1).

Breeding population

The House Crow has a single breeding season each year on Kharg Island, extending from late May to early September. On 10 January 2010, a total of 3,322 old nests (non-active nests) were located on trees, on oil and gas pipes, on window ledges of buildings, on poles, on TV antennae, in haylofts and in other suitable places. More than 80% of the nests counted were on oil pipes and poles, and there were more than 10 nests on some of the poles. Nests built in trees were 5–15 m or more above ground in tall *Eucalyptus* and *F. benghalensis* trees.

On 22 July 2010, a total of 1,451 active nests (with eggs or chicks) and 1,871 non-active nests were located. The number of non-breeding birds was estimated at 2,710 individuals (1,820 individuals in *Eucalyptus* trees at Ershad Guest House and 890 individuals in *F. bengalensis* trees at Falat-e Ghare). Comparing the breeding population (1,451 pairs) with the number of non-breeding birds (2,710 individuals) in July 2010 indicates that about 44% of the total population did not breed.

Table 1. Population of the House Crow on Kharg Island in 2009 and 2010.

Site name	Ershad Guest House (Site A)	Falat-e Ghare (Site B)	Melli Bank (Site C)	Sadaf Cinema (Site D)	Petrochemical Site (Site E)	Total
Tree species	<i>F. bengalensis</i> , <i>Eucalyptus</i> sp., <i>Ziziphus</i>	<i>F. bengalensis</i>	<i>F. bengalensis</i>	<i>F. bengalensis</i>	<i>Eucalyptus</i> sp.	92 trees
10 Sep. 2009	2,600 (49.84%)	1,928 (36.95%)	50 (1%)	50 (1%)	584 (11.21%)	5,212
20 Dec. 2009	2,622 (52.96%)	1,843 (37.23%)	45 (0.90%)	50 (1.01%)	390 (7.87%)	4,950
10 Jan. 2010	3,025 (55%)	2,040 (37%)	50 (0.90%)	40 (0.72%)	345 (6.27%)	5,500
Average	2,749 (52.66%)	1,937 (37.1%)	48 (0.91%)	46 (0.88%)	439 (8.4%)	5,220

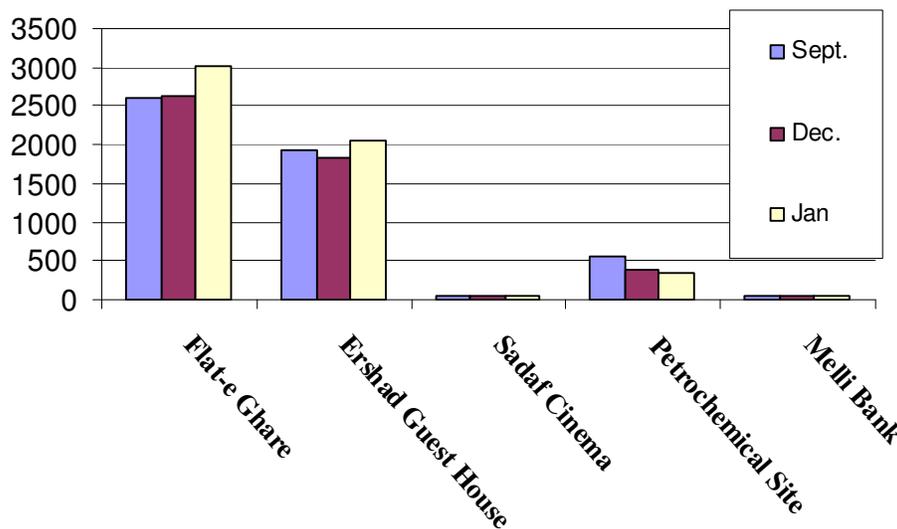


Figure 2. The non-breeding populations of the House Crow at five roosting sites on Kharg Island on 10 September 2009, 20 December 2009 and 10 January 2010.

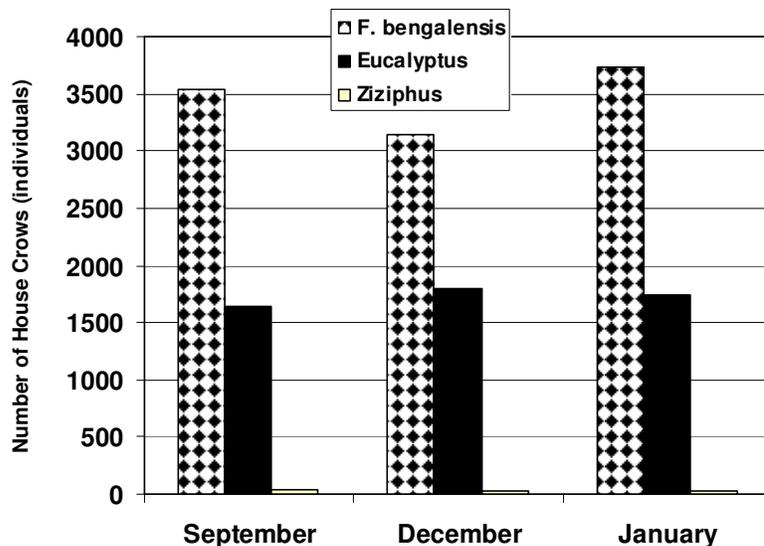


Figure 3. The numbers of House Crows roosting in three species on Kharg Island on 10 September 2009, 20 December 2009 and 10 January 2010.

At some nesting sites such as poles, there were 10 or more nests but only one of them was active and being used for breeding by House Crows in July 2010 (Fig. 1). The nests were close to each other, and thus it seems likely that all of the nests had been made by one pair in successive years. In some *F. bengalensis* trees, there were more than five nests with eggs and chicks, spaced about 4 m apart in the canopy, whereas there was never more than one nest in a *Eucalyptus* tree, because the canopy of the *Eucalyptus* trees was smaller than that of *F. bengalensis*.

Nest structure

The nests were composed mainly of two types of material, wood and metal. Metallic materials included pieces of wire which were used to hold twigs firmly together. The nest cup is lined with soft materials such as grass, roots, soft plant material, hair and thread (Fig. 5). At the end of the breeding season, 39 nests were collected from three sites in the study area (15 from tall trees, 29 from pipes and poles and 3 from other sites). Table 2 gives information on some measurements of typical House Crow nests on Kharg Island. The House Crow makes a new nest or repairs an old nest every year. Both forms of behavior were observed on Kharg Island on 22 July 2010 (65% of nests were old nests that had been repaired and 35% were new nests). There were no old or active nests in any of the trees used for roosting. These roosting sites were situated in the middle of the island, but most of the nests were located at sites in the northern and southern parts of the island.

Clutch size

The clutch size was 3–5, 75% of the nests contained 4 eggs (Table 3). The mean clutch size was 3.8. Of the 80 nests studied, 15 clutches contained 3 eggs, 60 had 4 eggs and 5 eggs were present in 5 clutches (Table 3). The mean weight of the House Crow egg was 12.6 ± 1.2 . The mean length and width of the eggs were 39 ± 1.4 and 27.6 ± 1.1 mm, respectively (Table 3).

Table 2. Weight and dimensions of House Crow nests on Kharg Island.

Nest site	No. of nests	Weight	Nest height	Nest-cup depth
On <i>Ficus</i> and <i>Eucalyptus</i> trees	15	800–1,260 g (average $1,120 \pm 235.6$)	18–30 cm	8–12 cm
On pipes, pole and antennae	21	920–2,340 g (average $1,530 \pm 342.8$)	16–28 cm	6–17 cm
Other sites	3	880–1340 g (average $1,110 \pm 131.5$)	18–23 cm	7–14 cm

Table 3. Egg measurements in relation to clutch size in the House Crow on Kharg Island in July 2010 compared with data from Islamabad-Rawalpindi (Habib Ali 2008).

Site name	Clutch size	N (nests)	N (eggs)	Mean weight (g)	Mean length of egg (cm)	Mean width of egg (cm)
Kharg Island (the present study)	3	15 (18.7%)	45 (13.5%)	12.95	4.02	2.95
	4	60 (75%)	240 (77.4%)	12.86	3.95	2.75
	5	5 (6.3%)	25 (9.1%)	12.04	3.86	2.42
Mean	3.8	80 (100%)	310 (100%)	12.6	3.9	2.76
Islamabad,	1	2	2	12.45	3.91	2.58
Rawalpindi	2	3	6	13.72	3.84	2.60
(Habib Ali 2008)	3	8	24	12.16	3.69	2.63
	4	4	16	13.68	3.81	2.67
	5	8	40	12.90	3.75	2.63
	6	5	30	12.05	3.68	2.62
	7	1	7	15.84	3.92	2.75
Mean	4.1	31	125	12.85	3.75	2.64

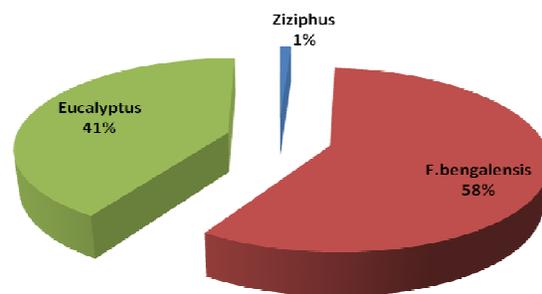


Figure 4. The percentage of House Crows roosting in three species of tree on Kharg Island.



Figure 5. A nest of the House Crow with five eggs, 22 July 2010 © B. Behrouzi-Rad.

DISCUSSION

There is no record of the occurrence of the House Crow in Iran before 1911 (Zarudny 1911), but in recent years, the species has been found at many sites along the Persian Gulf coast from Chahbahar to Bandar Genaveh. The first report of the occurrence of the species on Kharg Island was in the 1970s (Scott 2008), but according to local people, House Crows had appeared occasionally on Kharg Island before then. Since the early 1970s, the species has been a permanent breeding resident on Kharg Island. The population of this species on Kharg Island increased from about 10 pairs in 1970 (Scott 2008) to about 500 individuals in 1977 (Argyle 1977) and 700 individuals in the 1980s (Behrouzi-Rad 1980). By 2010, the population had increased to 5,500 in 2010 (Table 1). A similar phenomenon has been observed in Mauritius where a rate of increase of 20% per annum was recorded over a period of 12 years (Feare & Mungroo 1990). In the 1980s, the only roosting site on Kharg Island was at Ershad Guest House (roosting place A, Fig. 1). Numbers have increased considerably since the 1980s, and the species has now reached pest status on Kharg Island. It seems that the birds have spread from Kharg Island along the coastal strip to many of the coastal towns of the Persian Gulf from Bandar Genaveh to Chahbahar in the southeast of Iran (more than 1,500 km away), in particular Bandar Abbas, Bandar-e Lengeh, Bandar-e Charak and Minab. On 15 December 2008, 3 were observed on the coast in Bandar Abbas city and 16 were observed in Bandar-e Charak; on 20 August

2009, 15 were observed in a park in Bushehr city and 12 were observed in Bandar Genaveh (Behrouzi-Rad 2009). The populations of House Crows on islands other than Kharg are small (a few individuals) and the breeding places and roosting sites are not known. In Bushehr, the city park is a roosting site for the species (Behrouzi-Rad 2008).

The House Crow is a tree nester (Ryall 1990) and ledges on buildings are rarely selected for this purpose (Roberts 1992). In Mauritius, nests were generally placed at least 10 m above the ground in tall trees (Feare & Mungroo 1989), while in Kenya nests were situated at average heights of 7.3 m and 6.4 m (Ryall 1990). However, on Kharg Island, the height of roosting trees was 8–15 m. The roosting sites of the House Crow are often close to urban areas (Feare & Mungroo 1990). On Kharg Island, four of the sites are close to human residential areas, but the roosting site near the petrochemical site is uninhabited and has been afforested with *Eucalyptus* trees as green space. House Crows roost on branches near the top of tall trees or in the outermost branches, often in Banyan trees *F. bengalensis* or mango *Mangifera indica* (Lamba 1977, Feare & Mungroo 1989), and in Oman in mangrove swamp (Gallagher & Woodcock 1980). On Kharg Island, non-breeding birds roost on branches near the top of tall trees of *F. bengalensis*, *Eucalyptus* and *Ziziphus*. There were other trees on Kharg Island (*Tamarix*, *Prosopis*, *Phoenix*, etc.) but House Crows did not roost in these. The canopy of *F. bengalensis* was larger than that of the *Eucalyptus* and *Ziziphus*, but the height of the *Eucalyptus* was higher than the two other trees. Outside the breeding season, about 58% of the population roosts on *F. bengalensis*, 1% on *Ziziphus* and 41% on *Eucalyptus* (Fig. 4). There were no nests in the roosting trees, the nearest active nests being about 150 m from roosting site A and 10 m from roosting site E.

The nest is a bulky platform of sticks and twigs frequently intermixed with metal wires, with a cup-like depression lined with soft materials such as grass, vegetable fiber, animal hair, tow, coir, wool and feather, rag/textile and similar miscellaneous substances (Habib Ali 2008). A comparison of the data from Islamabad (Habib Ali 2008) with those from Kharg Island has revealed that there is no

significant difference between the clutch size and the average weight, length and width of eggs in the two study sites ($P=0.5$). The House Crow is monogamous and the pair-bond remains for consecutive seasons (Archer 1998). Even in the non-breeding season, pairs often sit on a shady branch during the daytime snuggled lovingly together (Habib Ali 2008). This behavior has not been seen on Kharg Island. During the non-breeding season the birds spread out during the daytime to all parts of the island. On this island, the usual clutch is 4 eggs, ranging from 3 to 5 (Table 3), but clutch sizes of 6–7 have occasionally been seen elsewhere (Whistler 1986, Habib Ali 2008). The eggs are varying shades of bluish green in ground color, blotched and speckled with red and sepia brown, with grey under-markings (Robert 1992). According to Grimmett *et al.* (1998), the breeding season extends from January to September with local variations. On Kharg Island, the breeding season was within this range and extended from late May to early September.

The House Crow is considered to be a species that could constitute a public health hazard (Archer 2001), as the birds may carry disease organisms passively on their feet and bill, picked up through their association with human excreta, refuse, decomposing carcasses and discarded clothes (Ryall 2002). House Crows suffer from brood parasitism in regions where the Asian Koel *Eudynamis scolopacea* is common (Woodcock 1980), but this species does not occur on Kharg Island.

House Crows show a remarkable level of co-operation and communication, maintaining constant vocal contacts with each other (Ryall & Reid 1987). When one of them or their nest is in danger or a bird has been killed, an alarm call is relayed over a wide area and crows arrive on the scene from every direction. This behaviour was observed when we were counting active nests. The crows dive at the source of the threat and a group of birds moves in to mob the offender. The House Crow is widely recognised as a pest. The crows chase other birds (and even eat their eggs and nestlings) and other fauna, both in urban areas and in the surrounding countryside, and may constitute yet another pressure to species already threatened by habitat destruction (Woldu 1988). For example, no terns have bred

on Kharku Island (3 km away from Kharg) since 2005, although before the increase in the population of House Crows, Kharku Island was an important breeding site for terns. Surveys in 1974 and 1977 indicated that *c.* 5 pairs of Swift Tern *Sterna bergii*, 600 pairs of Lesser Crested Tern *Sterna bengalensis*, 2,500 pairs of White-cheeked Tern *Sterna repressa* and 250–300 pairs of Bridled Tern *Sterna anaethetus* were frequenting the island (Argyle 1977), but these species have not bred during the past five years (2006–2010). House Crows move back and forth between Kharg and Kharku islands. House Crows were observed eating the eggs of terns on Kharku Island in the 1980s (B. Behrouzi-Rad, pers. obs.). In several parts of their range, House Crows have reached pest status and attempts have been made or are being made to reduce their numbers (Jennings 1992, Ryall 2002). The House Crow is a serious pest in agriculture and causes significant economic losses (Ryall 2002). It has adapted to exploit anthropogenic activities and has become a nuisance in many areas. Excessive noise from communal roosts has caused annoyance at some sites (Howard 2003). In Iran, the House Crow can be considered a great threat to birds and other fauna on Kharg and Kharku islands, and could pose a threat on other islands in the Persian Gulf and in the coastal habitats of southern Iran in the future.

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