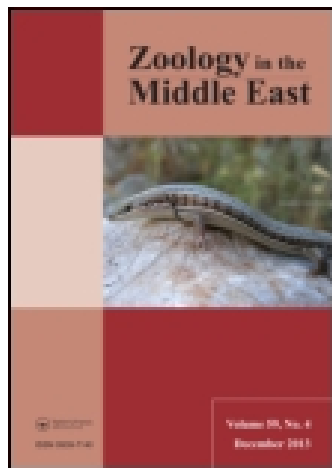


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Breeding distribution and conservation of the Crab Plover (*Dromas ardeola*) in Saudi Arabia (Aves: Charadriiformes)

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We surveyed the population of the Crab Plover, a species which is endemic to the Arabian Peninsula, in 2011, 2012 and 2013 in coastal and offshore areas of the Red Sea in Saudi Arabia, and compared the data with a survey carried out in 1996. We found two new colonies which comprise together about 539 pairs. Altogether 1380 pairs of Crab Plover breed in the Red Sea of Saudi Arabia in five colonies, representing approximately 35% of the Arabian breeding population. Major threats to the Crab Plover are human disturbance, egg collection, and introduced animals (e.g. cats, rats and snakes) that may feed upon eggs and chicks.

Keywords: Crab Plover, conservation status, threats, human disturbance, Saudi Arabia.

Introduction

Crab Plover breeding sites are restricted to islands around the Arabian Peninsula, although it probably also breeds in Western India, in the Laccadive Islands and the Maldives (Delany, Scott, Dodman, & Stroud, 2009). Jennings (2010) reports about 4000 pairs of Crab Plover breeding in approximately 20 colonies around the Arabian Peninsula, mostly in Kuwait, the United Arab Emirates, Oman, Yemen and Saudi Arabia. In recent years, 30 Crab Plover colonies have been discovered in Eritrea, comprising an estimated 5000–6000 pairs in total (De Marchi et al., 2006). In addition, four colonies of Crab Plover were reported from Iran in 2011, the largest of which, on Dara Island, had 3527 nests (Tayefeh, Zakaria, Amini, Ghasemi, & Ghasem, 2011). Breeding has also been recorded in Sudan and on islets off Northern Somalia (Shobrak, El-Jack, & Ash Sheikh, 2002; Delany et al., 2009).

We surveyed Crab Plovers in the Red Sea region of Saudi Arabia for two reasons. First, the latest comprehensive survey was in 1996, and these data required updating. Second, there is a gap between the estimated number of breeding pairs (14,000 – 15,000, Aspinall, 1996, as cited in Javed, Khan, Tourenq, Launay, & Merritt, 2012), and the estimated number of non-breeding birds (60,000–80,000 individuals, De Marchi et al., 2006), and thus earlier surveys may have overlooked some of the breeding sites in the Red Sea region.

Methods

The surveys were carried out between May and June 2011, in May and July 2012, and in May and June 2013, and covered 16 islands. Five of these islands belong to the Farasan Islands, two to the Albatrain Islands, seven are situated in Umluj and two in the Al Wajh Archipelago. The total length of the Red Sea coastline of Saudi Arabia is approximately 1840 km, of which about 1300

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km was covered by our survey (PERSGA/GEF, 2003). The climate is arid and hot, particularly during summer. Average rainfall is less than 70 mm per year (PERSGA/GEF, 2003). Boats were used to visit the islands, and the location of each colony was recorded using a handheld Global Positioning System (GPS) device. In each colony, the Crab Plover population was estimated from the number of active burrows. The presence or absence of fresh tracks at a burrow entrance was used to determine whether it was active (De Marchi et al., 2006). We also recorded the number of Crab Plover present in or around each colony (Table 1).

During our surveys we recorded evidence of predation, including egg harvesting by fishermen, broken eggs and dead chicks. To identify potential predators, a Bushnell Trophy Cam 270p HD (model 119466) camera was set up at 40 nests for 12 days on Humr Island, Farasan Islands (Table 1). The camera recorded one image every minute for 24 hours per day. The nest cameras recorded evidence of Sooty Gull inside the colony. We also recorded tracks of animals such as snakes and rats.

Results

Breeding population. We found Crab Plover colonies on four islands (Figure 1, Table 1). In addition, fishermen told us of a colony on Abu Tok Island (Farasan Islands) although we were unable to verify this. Crab Plovers usually establish new colonies around old colonies. However, on small islands with insufficient area for new colonies, such as the Albatain Islands, new colonies may be established on nearby islands. Based on the number of active burrows, we estimate the total number of Crab Plovers in the Red Sea of Saudi Arabia as 1380 pairs (Table 1).

Population development. Table 2 compares results of the current surveys with those of previous surveys. The comparison reveals that the numbers of Crab Plover tend to increase at each breeding site including Al Sheick Marbat (2011: 46 burrows; 2013: 79 burrows), Umm Ar Rak (2007: 140–150 burrows; 2011: 624 burrows) and Mandhar Island (2007: 50 burrows; 2012: 138 burrows).

Threats. Sooty Gulls, *Larus hemprichii*, large omnivorous gulls from the region, visit Crab Plover colonies, although we did not record them predated eggs, chicks or adults. Using nest cameras, we noted that Sooty Gulls visit Crab Plover colonies in the early morning and in the evening, although, surprisingly, Crab Plovers did not defend their colony from the gulls. In several cases when Sooty Gulls arrived at a colony, Crab Plovers left the colony and watched the gulls from a nearby location.

Snake tracks were seen on Mandhar and Humr Islands, and snakes may feed on Crab Plover eggs. Fishermen reported that they have found snakes inside Crab Plover burrows. Two broken eggs were found on Humr Island, and rat tracks were observed around one colony, suggesting that rats may impact on breeding success. We found six dead chicks, although none of these chicks showed visible signs of predation.

Local fishermen collect eggs, although there has been no attempt to quantify the magnitude of this threat. We found a tool that is used to gather eggs of the Crab Plover at the colony on Mandhar Island. According to the fishermen, at full moon the eggs are at the entrance of the burrows and are thus easy to collect.

Discussion

Data on breeding Crab Plovers have been collected inconsistently (Jennings, 2010). In the Red Sea of Saudi Arabia, a few surveys have been carried out to study the distribution and abundance of summer breeding seabirds and have discovered a number of Crab Plover colonies. For instance, Newton and al Suhaibany (1996) found only two colonies of Crab Plovers along the Red Sea coast of Saudi Arabia, Gregory and Goldspink

Table 1. The number of individuals and active burrows of Crab Plover on the Red Sea coastline of Saudi Arabia. No. (bur.) = number of burrows. 0 = site visited, but no Crab Plover or burrows were found.

	Coordinates	Date	No. (ind.)	No. (bur.)	Remarks
Al Sheick Marbat	25°52'N 36°36'E	18.v.2013	119	79	2 colony sites near the new colony
Birrim	25°39'N 36°30'E	18.v.2013	0	0	
Umm Sahar	24°56'N 37°10'E	14.v.2013	0	0	
Mulayhah	24°59'N 37°08'E	14.v.2013	0	0	
Al Munqalib	25°09'N 37°08'E	14.v.2013	0	0	
Attaweel (Al Fawaida)	25°11'N 37°10'E	14.v.2013	0	0	
Jizayah	25°12'N 37°10'E	14.v.2013	0	0	
Umm Al Malik	25°14'N 37°08'E	14.v.2013	0	0	
Umm Juluf	25°09'N 37°09'E	14.v.2013	0	0	
Albatain Islands: Umm Ar Rak	19°16'N 40°59'E	11.vii.2011	480	624	Colony on small island; new colony next to the old one.
Albatain Islands: Umm Al Quronatayn	19°15'N 40°58'E	21.v.2012	23	28	
Farasan Islands / Dushik	16° 39'N 41°52'E	14.v.2011	0	0	
Farasan Islands / Mandhar (2 colonies)	16°57'N 41°48'E	15.v.2011	14	10	Colony next to an abandoned colony site
	16°57'N 41°48'E	24.v.2012	198	138	Two abandoned colonies near the new colony
Farasan Islands / Abu Shawk	17°00'N 41°46'E	25.v.2012	0	0	
Farasan Islands / Ar Rasib	17°00'N 41°47'E	25.v.2012	0	0	
Farasan Islands / Humr: Colony 1	16°47'N 42°00'E	26.v.2012	174	265	Five abandoned colonies
Farasan Islands / Humr: Colony 2	16°46'N 42°00'E	26.v.2012	0	13	Abandoned
Farasan Islands / Humr: Colony 3	16°47'N 42°00'E	31.v.2012	166	274	One abandoned colony
Total			1174	1431	

(1996) documented two active colonies, AlRashidi (2007) reported three colonies, and Shobrak and Aloufi (in press) found two colonies. AlRashidi (2007) documented a colony of Crab Plover on Dushik Island (Farasan), but the current study did not find any colony on this island. Here we report colonies from five islands with 1,380 pairs in the

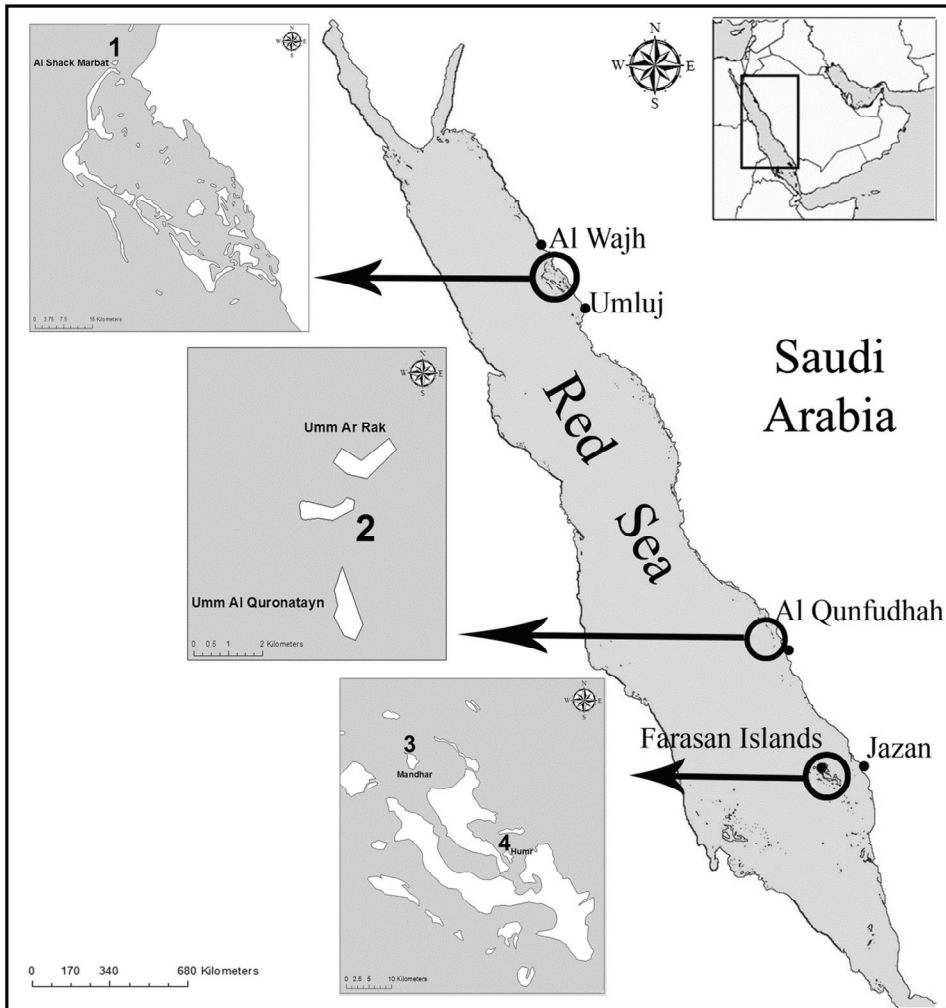


Figure 1. Breeding colonies of Crab Plover in the Red Sea region of Saudi Arabia.

area our surveys covered, representing about 35% of the known Arabian breeding population.

Our population estimates are based on the numbers of active nests. Nest cameras noted that the male and female rarely remain inside the nest at the same time. Therefore, the number of birds observed in and around the colony may not reflect real population size. This finding is supported by the conclusion of De Marchi et al. (2006), who suggest that population estimates based on active nests provides a more reliable number than counting the Crab Plovers around the colony.

Principal requirements for a successful establishment of colonies are sandy islands suitable for burrowing, a predator-free nesting area and abundant food (Aspinall & Hockey, 1997). Newton & al Suhaibany (1996) reported colony extinctions on some Farasan Islands, thought to be driven by human disturbance and/or predators. The survey of Dushik Island in 2011 found snake and cat tracks, and one proposition is that

Table 2. Population assessment of the Crab Plover in Saudi Arabia: Comparison between the current study and previous surveys. Sources: 1995: Gregory and Goldspink (1996); 1996: Newton and al Suhaitany (1996); 2007: AlRashidi (2007); 2010-2011: Shobrak and Aloufi (in press); 2011-2013: this study. (0) = not visited or no birds/colonies found; (?) = visited in May 1996, but no indication of breeding activity; NoC = number of colonies; NoN = number of nests; * = deserted.

Sites	Coordinates	1995		1996		2007		2010-2011		2011-2013	
		NoC	NoN	NoC	NoN	NoC	NoN	NoC	NoN	NoC	NoN
Al Sherck Marbat	25°52'N 36 36'E	0	0	0	0	0	0	1	46	1	79
Madarah	25°36'N 36°55'E	0	0	1	100	0	0	0	0	0	0
Attaweel	25°11'N 37°10'E	0	0	0	0	0	0	1	26	0	0
Umm Ar Rak	19°16'N 40°59'E	0	0	0	0	1	140-150	0	0	1	624
Dushik	16°39' N 41°52'E	0	0	0	0	1	40	0	0	0	0
Mandar	16°57'N 41°48'E	1	?	0	0	1	50	0	0	1	138
Murain	16°22'N 42°17'E	1	180	1	0*	0	0	0	0	0	0
Humr	16°47'N 42°00'E	0	0	0	0	0	0	0	0	3	552

Crab Plovers have deserted this island as a consequence of snake and cat presence. Newton and al Suhaibany (1996) reported that cats caused Crab Plover colony desertion on Murain Island.

Implications for conservation. Although the distribution of the Crab Plover is restricted to islands around the Arabian Peninsula, it is currently not listed as threatened (IUCN 2013). However, potential threats include predation, human exploitation, egg collection, tourism activities, oil pollution and habitat loss (Del Hoyo, Elliott, & Sargatal, 1996; Hockey & Aspinall, 1996; De Marchi et al., 2006). Further field assessments are urgently needed on other islands in the Red Sea region which we were not able to survey. Detailed monitoring of several islands is also needed to provide vital data about whether predation and disturbance reduce reproductive success. Presumably Crab Plovers are long-living birds, and thus demographic consequences of breeding failures would go unnoticed for several years. Therefore, establishing key aspects of their demography (e.g., reproductive success, maturation, juvenile and adult survival) and the causes of these demographic components is long overdue.

Introduced mammals are one of the most serious problems threatening bird populations on islands (Courchamp, Chapuis, & Pascal, 2003; Russell & Le Corre, 2009). In Abu Tok Island the fisherman do not collect Crab Plover eggs because they fear the snakes that live in Crab Plover burrows. We were unable to identify the snake species, but it should be either the Farasan Island Racer (*Coluber insulanus*), Burton's Carpet Viper (*Echis coloratus*) or the Arabian Horned Viper (*Cerastes gasperettii*). White-tailed Mongooses (*Ichneumia albicauda*) are native mammalian predators in the Farasan Islands; although no mongoose tracks were recorded at Crab Plover colonies. Mongoose can swim and if they reach islands a short distance from mainland, e.g. Humr Island, they can quickly wipe out entire colonies. Therefore, there is an urgent need to monitor mongoose, rats and snakes on islands that are important breeding sites for Crab Plover and other waterbirds, seabirds and shorebirds.

Egg collection is a traditional activity in the Red Sea region, and is still practised despite its known negative impact on the bird populations (PERSGA/GEF 2003). Egg collection is illegal according to the Saudi legislation. The effect of egg collections on Crab Plovers and other island nesting birds (e.g. White-cheeked Tern, *Sterna repressa*, Saunders's Tern, *Sterna saundersi*, and White-eyed Gull, *Larus leucophthalmus*) warrants attention. The fishermen interviewed were knowledgeable about the location of colonies and the laying period of the Crab Plover. They collect fresh eggs early in the breeding season, which are boiled. Whilst checking the burrows and collecting eggs, many burrows are destroyed potentially smashing eggs. Egg collection appears to be common in the Farasan Islands, but not so much in the Albatian Islands and Al Wajh Archipelago. The impact of egg collection on the population trend has not been assessed.

Recently, tourism and recreational activities have become increasingly widespread along the Red Sea coast of Saudi Arabia. Crab Plovers are easily disturbed; the birds leave the colony when people walk near the colony, and the birds only come back after the people have left the vicinity of the colony. Therefore, regular visits during the breeding season, whether by fishermen or passers-by, may lead to colony desertion, and immense loss of reproductive effort. Therefore, the disturbance accompanying increasing tourism in Saudi Arabia may pose a serious threat to shy birds such as the Crab Plover.

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