Status, seasonality and distribution of the Clamorous Reed Warbler *Acrocephalus stentoreus* at Khafrah marsh, Eastern Province, Saudi Arabia

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The Clamorous Reed Warbler *Acrocephalus stentoreus* has over the past three decades colonized inland wetlands (many entirely or partially manmade) in the Eastern Province of Saudi Arabia, reaching as far north as Jubail from its original stronghold in the al-Hufuf area. Data from song plots obtained along two transects through a reed-swamp and general observations during a seven year investigation at one of the sites colonized during the 1990's showed a peak of singing activity in late February and March save for one year when singing was delayed until April and early May. The latter may have been linked to exceptionally low rainfall in January during that particular year. Birds were present in all months during the study period, indicating a negligible mobile component within the population.

The study site had a mosaic of open water and *Phragmites* but in one sector, which was heavily invaded by reeds during the monitoring period, there was a marked reduction in Clamorous Reed Warblers and a corresponding increase in the numbers of migrant Eastern Reed Warblers *Acrocephalus scirpaceus fuscus*. The former returned to the sector following reed clearance and indicates intensive management of such sites is needed if they are to be suitable for species that require the early stages of reed bed succession.

INTRODUCTION

The Clamorous Reed Warbler *Acrocephalus stentoreus* breeds from Egypt eastwards through the Middle East, much of central Asia, the Indian sub-continent to south China, south-east Asia and south to Australia. Most populations are essentially sedentary but breeding birds in central Asia (including Pakistan and northernmost India) are apparently entirely migratory, wintering in peninsular India and Sri Lanka, with possibly, as indicated by many records of apparent migrants along the Arabian gulf coast, some in Arabia also. The species forms a superspecies with the Great Reed Warbler *Acrocephalus arundinaceus* (Cramp 1992).

On the Arabian peninsula it is likely that until recently the species was restricted as a breeding species to mangrove stands around the coast. On the Arabian gulf, the northern limit for mangroves supporting breeding Clamorous Reed Warblers is *c*25° N. The extensive wetlands in the al-Hufuf oasis of the Eastern Province of Saudi Arabia, the largest natural oasis in the world, were apparently the first inland sites to be colonized, probably as recently as the mid-1970's (Bundy *et al* 1989). Subsequently, they spread north-east through the Abqaiq–Damman corridor and then north-west, parallel with the coast, along a chain of at least seven new or expanded man-made wetlands reaching as far north as Jubail (27° 01′ N, 49° 40′ E) by the 1990's. It had also occurred beyond Saudi Arabia during the same period, into nearby Qatar (*per* R & H Nation) and Kuwait. In Kuwait, however, breeding apparently has not been proven to date (Gregory 2005) and the origin of birds may differ from those occurring in Eastern Province, possibly from the Basra area where it is considered to be a relatively recent visitor (DA Scott & E Carp in Cramp 1992). Most of the sites in inland Saudi Arabia are relatively large areas of reed-swamp dominated by *Phragmites*. Clamorous Reed Warblers have been found to be absent in Eastern Province from small ponds with bulrushes *Typha* sp and along small isolated reed-fringed margins of water drainage channels (*contra* Cramp 1992). Surveys undertaken by the author between 1994–2004, of all stands of *Avicennia marina* mangroves and zones of coastal

marsh grass between al Khobar (26° 17′ N, 50° 12′ E) and Ras az-Zawr (27° 25′ N, 49° 04′ E) also proved to be negative.

In August 1997, I commenced monthly transects through a reed swamp at one of the recently colonized inland sites in the Eastern Province to determine the status and seasonality of the species. Monthly monitoring of Clamorous Reed Warblers continued until July 2004.

STUDY AREA

The study location comprised a 116 ha section of an extensive reed-swamp of *Phragmites australis*, known locally as Khafrah marsh (26° 48′ N, 49° 34′ E). Khafrah marsh covers an area of *c*300 ha and has a regular water supply, a combination of natural springs and irrigation run-off water, that merges into a playa lake fed mainly by winter rainfall. The water is eutrophic (nitrate 2 mg/l, Kjeddahl nitrogen 1.1 mg/l, total phosphorous 0.2 mg/l, oxygen that averages only around 50% of the saturation value as shown by portable meter readings, salinity 3.5 ppt). The wetland lies within a depression at the northern end of the al-Jafurah sand-desert, a northerly extension of the Empty Quarter (Rub al-Khali).

Part of the marsh normally dries out completely during the summer but the sectors surveyed retained water throughout the year with a maximum depth of around 0.5 m remaining at the centre. Along the immediate fringe of the wetland there is a narrow *Juncus* zone behind which are tamarisk shrubs and low sand dunes containing some isolated small palms, salt-bushes and clumps of *Panicum* grass.

METHODS

Song plots were recorded each side along two parallel line transects, which allowed the study area to be subdivided into four sectors through the reed-swamp, each transect covering a distance of 800 m and consisting solely of stands of *Phragmites* with varying areas of open water. Each of the two transects were in different areas of the reed-swamp to avoid repetition. Movement by the author through the reedbeds was possible via gravel paths, which had been constructed to allow access to service the Trans-Arabian Oil Pipeline that crosses the marsh. Both transects were walked slowly at a rate equivalent to *c*1 km an hour at least monthly during the study period. The number of all species of *Acrocephalus* warblers heard singing within *c*36 m each side of a transect was recorded. The *Phragmites* zones and approximate distribution of open water were noted on a base map before and on completion of the study. Transects were normally walked between sunrise and 09.00 h. Clamorous Reed Warblers sing loudly, often in the open on tops of reeds, and constantly throughout most of the day and their song is sufficiently loud to be detectable at a distance of at least 36 m. For the species in question and considering the uniformity of the habitat, the use of the line transect method seems justified (Bibby *et al* 1992). No attempt was made to record any song variations, such as singing intensity by individual birds. If more than one count was made in a month, for recording purposes, the maximum number of singing birds for the month was used. On mornings when a strong wind was blowing no survey was conducted. Rainfall and temperature data for the years 1997–2003 were extracted from annual monitoring reports of a meteorological network at the industrial city of Jubail, Jubail Project, *c*25 km from Khafrah marsh. In the autumn of 2003 all reeds were cut from the westernmost sector.

RESULTS

Combined song plot data for Clamorous Reed Warblers from both transects for the complete years 1998–2003, is presented in Figure 1. Over this period, although some song was heard in all months except August, most song was heard either in February (in 3 years)

or March (in 2 years) except in 2000 when peak singing did not occur until May. Rainfall in 2000 was negligible during January compared with other years (Table 1) and a plot of linear regression of rainfall showed a correlation between rainfall and commencement of singing.

Total numbers of Clamorous Reed Warblers in the study area remained relatively constant over the study period, but in the westernmost strip of the marsh they almost disappeared as reed colonization completely eliminated areas of open water. The overall population, however, did not decline and actually rose as remaining areas became more favourable to the species, with reed succession increasing the ratio of reeds to open water and providing a more suitable habitat. Table 2 gives the distribution of peak singing birds in each strip area 1998–2003, and Table 3 shows approximate percentages of open water at the start of the investigation in July 1997 and the situation in July 2003.

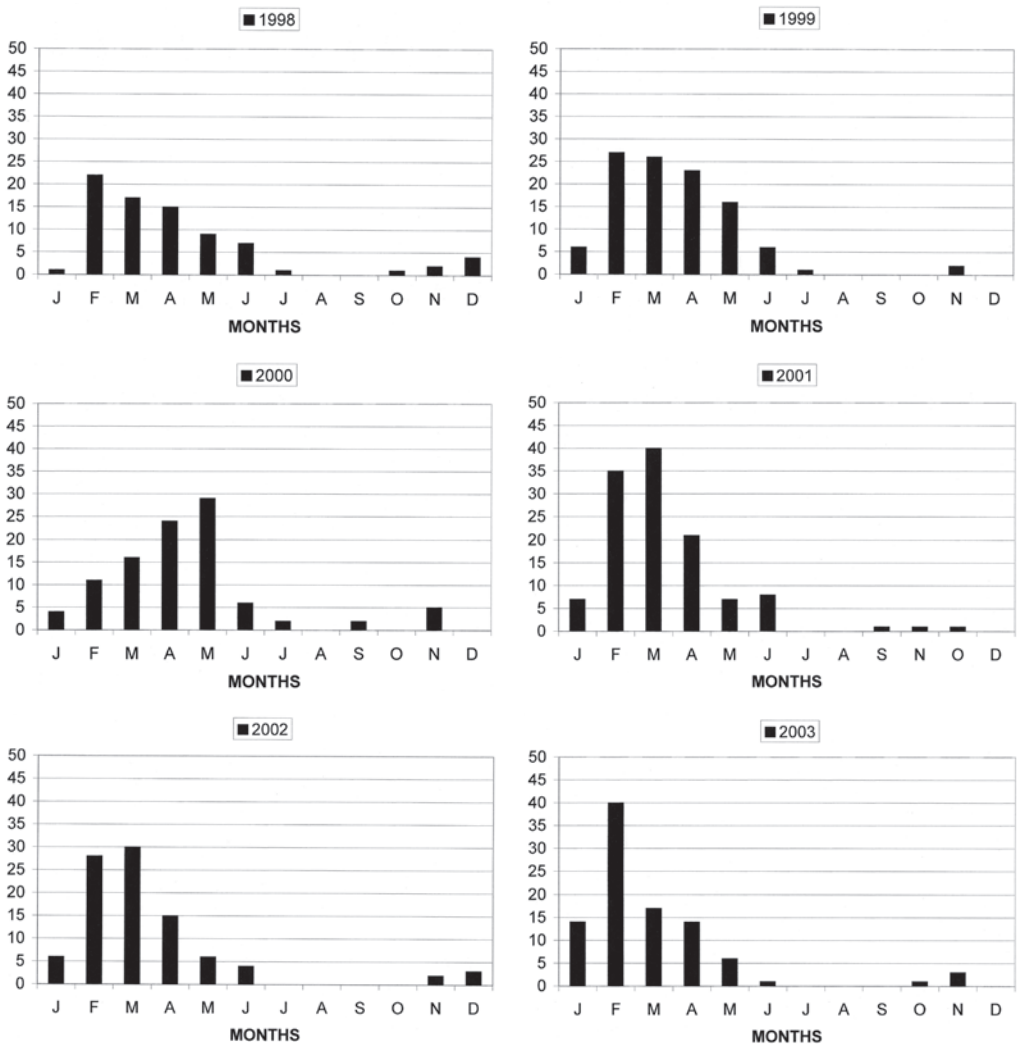

Figure 1. Combined song plot data from both transects for the complete years 1998–2003, Khafrah marsh, Eastern Province, Saudi Arabia. Vertical axis: number of singing birds.

Table 1. Mean monthly precipitation (mm, no rain June–September) 1997–2003, Jubail Project meteorological network, Jubail, Eastern Province, Saudi Arabia.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
97–98	8.6	82.5	11.1	62.3	9.4	24.2	1.9	0.3
98–99	0.0	0.0	0.0	20.7	21.0	0.0	0.0	0.0
99–00	0.0	0.0	1.9	1.0	0.0	0.0	0.3	0.0
00–01	0.0	61.0	5.5	33.6	0.0	1.6	0.0	0.3
01–02	0.0	0.0	5.1	52.1	1.2	0.9	0.1	0.0
02–03	0.0	26.5	23.7	13.5	13.7	2.6	14.7	0.0

Table 2. Number of singing Clamorous Reed Warblers *Acrocephalus stentoreus* counted in the month of maximum singing in the four strip areas (A–D) adjacent to east and west line transects over six years, Khafrah marsh, Eastern Province, Saudi Arabia.

	A	B	C	D
Feb 1998	5	2	0	15
Feb 1999	7	10	2	8
May 2000	6	11	7	5
Mar 2001	6	17	14	3
Mar 2002	6	15	8	1
Feb 2003	10	15	15	0

Table 3. Approximate percentage of open water in the four strip areas (A–D) adjacent to east and west line transects, Khafrah marsh, Eastern Province, Saudi Arabia.

	A	B	C	D
1997	95	80	80	50
2003	50	20	15	0

Table 4. Song plots of Eastern Reed Warbler *Acrocephalus scirpaceus fuscus* and Clamorous Reed Warbler *A. stentoreus* in the westernmost strip area (D) of Khafrah marsh in 2002 (see text), Eastern Province, Saudi Arabia.

	fuscus	*stentoreus*
March	12	1
April	6	0
May	8	0

During the study period, the population of migrant Eastern Reed Warblers *Acrocephalus scirpaceus fuscus* increased from two song plots in 1998 to seventy-three by 2002 and the species had virtually replaced (Student t: P = 0.029) the Clamorous Reed Warbler in the

westernmost strip area sector by 2002 (Table 4) but by the following year both species deserted this sector as reed density increased further. However, as in the case of the larger species a significant number of song plots continued to be recorded in the remaining sectors.

DISCUSSION

Clamorous Reed Warblers now breeding on the Arabian peninsula are resident or presumed to be essentially resident (Jennings 1995). Statements that this species is only a summer visitor to mangroves in Oman and only occur in winter along the Red Sea coast in northern Yemen may need to be revised (Brooks *et al* 1987, Cramp 1992). There are no known recoveries from the few birds ringed in Arabia.

Observations at Khafrah marsh showed that birds were present each month of the year during the study period even at times when no song plots were registered. Any emigration of the breeding population or dispersal of juveniles that did occur is likely to have been only very short-distance as found, for example, in the isolated population at a similar latitude, south, in Western Australia that breeds mainly on farm dams (RJ Brown & MN Brown in Cramp 1992). Occurrence tables in Baldwin & Meadows (1988) indicate that Clamorous Reed Warblers at Yanbu al-Sinaiyah, Saudi Arabia, which nest in mangroves on the Red Sea, moved out of the Yanbu area during August when temperatures can regularly exceed 40°C. Subsequent observations (pers obs) showed, though, that during this hot period birds simply moved inland to the adjacent Tihama (maximum distance 5 km) where they managed to feed within woody *Halocnemum* bushes and other halophytic vegetation. However, during ten years residence in Eastern Province, the author only observed the Clamorous Reed Warbler away from reed-swamp habitat on one occasion.

The race breeding at both coastal mangroves and inland reed-swamps on the Arabian peninsula, *brunnescens*, has apparently been recorded once in Israel (Shirihai 1996), which perhaps indicates some vagrancy. However, during and before my study period, Clamorous Reed Warblers were never recorded from central Arabia despite the existence of suitable habitat particularly along the course of the al-Hair or Riyadh river and only 260 km from al-Hufuf (Jennings 1999, Nikolaus & Ash 1997, Stagg 1991 & pers obs 2000–2004).

Peak song activity of the Clamorous Reed Warbler over the study period occurred late February to March, except in 2000. This peak coincided with a lengthening of daylight hours plus increasing temperatures. Monthly mean temperature 1997–2003 in March ranged from 17.9°C to 21.6°C with an overall mean of 20.3°C. The main song period also ties in with the establishment of breeding territories elsewhere in the Eastern Province, which commences at least one month earlier than reported for the nominate race in reed-swamps in Israel (Shirihai 1996) but is similar to birds nesting in papyrus swamps in Egypt (Meininger *et al* 1986, pers obs). The late start to commencement of peak singing that occurred in 2000, correlated with a lack of rainfall during January, is likely to have affected food availability and hence song output.

It was assumed that many birds nesting at Khafrah marsh were double-brooded with a complete moult occurring in late summer or early autumn; birds were seen in moult at the marsh in August, September and October. Although no attempt was made to specifically search for nests or obtain data on breeding success over the nesting period, ad hoc observations of recently-fledged juveniles indicated breeding extended into July, at least for part of the population. Predation of young birds, particularly by Little Bitterns *Ixobrychus minutus* (several pairs breeding at Khafrah marsh), rails and Red-backed Shrikes *Lanius collurio,* which were often abundant on passage during May in the reed-swamp, was likely.

Over the study period, it was observed that without any management the reed-swamp was gradually invaded by *Phragmites*. Open water areas were reduced significantly and

this was most marked along the western line transect with the sector closest to the inflow eventually becoming a dense stand of reeds without any open water. This caused the decline in the Clamorous Reed Warbler population and an initial replacement with Eastern Reed Warblers (Table 4). This was not surprising in view of the known differences in feeding behaviour between the two species with the former collecting a considerably higher proportion of its food from or close to the water surface, with small frogs being a particularly common prey item observed at the study site, and with a greater preference to nest on edges of emergent vegetation with closer access to feeding grounds (Cramp 1992, pers obs).

Replacement of Clamorous Reed Warblers by Eastern Reed Warblers also took place at another inland wetland (Sabkha al Fasl 27° 03′ N, 49° 29′ E) in Eastern Province, which has been proposed as a nature reserve (Symens & al-Suhaibani 1996). As in the case of Khafrah marsh, the decline in the Clamorous Reed Warbler population at Sabkha al Fasl was attributed to a loss of a mosaic of reeds and open water following succession by *Phragmites* (Meadows 2004a). At another site, 50 km southwest of Jubail, an agricultural project (Al Sharkiyah development area) created numerous pools, covering a total area of *c*20 ha, that received run-off from irrigated fields. Until the reeds became dense and completely covered the water surface, there was a very high density of Clamorous Reed Warblers with a minimum population, in 2002, estimated at 90 singing birds (pers obs).

In the al-Hufuf wetlands I noticed that, at least up to 2002, local people annually cut down the reeds for animal fodder, thatch and bedding so that open water was always present. Elsewhere within the al-Hufuf area a few entirely natural and isolated sites with surface water low in suspended solids such as deep pools behind large barchan dunes or rocky hills, remained relatively reed free except around their fringes and these sites also retained Clamorous Reed Warblers for over two decades.

At Khafrah marsh an opportunity to monitor the return of the Clamorous Reed Warbler occurred when all standing reeds were removed from the westernmost sector by a combination of burning and cutting during the autumn of 2003 (Table 3). In January 2003, reed-bed succession in this sector of Khafrah marsh was virtually 100% complete with no significant areas of open water remaining and a complete disappearance of Clamorous Reed Warblers. However, numbers elsewhere on the marsh, where open water remained, did not decline and neither did population densities at other sites in the Eastern Province (pers obs), indicating that the extinction was probably due to a localized population crash responding to habitat change. Following the removal of emergent vegetation later in the year and return of open water plus some limited reed regrowth, within a period of only three months, Clamorous Reed Warblers had recolonized the sector (five birds singing in March 2004). Reed-bed management is clearly needed to encourage optimal habitat for Clamorous Reed Warblers and certain other wetland species; the Great Bittern *Botaurus stellaris*, which was present during the spring of 1998 at Khafrah marsh, being a particular case in point in view of its requirements for reedbeds at an *early* stage of succession (Gilbert *et al* 2005).

In mangroves along the Red Sea coast north of Jedda, where the Clamorous Reed Warbler breeds sympatrically with the Red Sea Reed Warbler *Acrocephalus avicennia*, it has been noticed that there are clear differences in habitat selection with the latter preferring denser stands of younger mangroves, always *Avicennia marina*, and with Clamorous Reed Warblers being attracted to more mature groves of either *Avicennia marina* and/or *Rhizopora mucronata* with adjacent open water (pers obs). In Jubail, Eastern Reed Warblers are essentially summer visitors and have to establish territories later than Clamorous Reed Warblers, but at a Red Sea Reed Warbler site studied in detail at Yanbu al-Sinaiyah (Meadows 1999) the latter were, as is the case of Clamorous Reed Warblers at Khafrah,

resident which suggests that the earlier timing for establishing breeding territories by Clamorous Reed Warblers at Khafrah marsh is not important, and that there is minimal competition between the larger and smaller species. Apart from Eastern Reed Warblers the only other *Acrocephalus* warbler that was known to be breeding at Khafrah marsh during the study period was the Moustached Warbler *Acrocephalus melanopogon*. This species is unlikely to be in competition with Clamorous Reed Warblers as, although it also feeds close to the water surface, it selects different prey items and it also appeared to be present at a low density albeit, with its regular breaks in singing, actual numbers proved extremely difficult to estimate (Meadows 2004b).

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