

How an artificial island in a man-made inland wetland aided successful nesting of the greater flamingo in the desert ecosystem of Abu Dhabi Emirate, UAE

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Abstract

The greater flamingo (*Phoenicopterus roseus*) is a predominantly winter passage migrant to the United Arab Emirates (UAE), though a small proportion of resident birds is present at a few sites throughout the year. Some of these resident flamingos breed in early summer at Al Wathba Wetland Reserve, a man-made inland wetland in the predominant desert ecosystem of Abu Dhabi Emirate which is managed by Environment Agency- Abu Dhabi (EAD). Management actions included provision of an artificial nesting island in 2004 along with predator control and attempts at minimizing trespassing, which have contributed significantly to the successful breeding of Greater flamingo. Nesting and fledging of chicks have been recorded annually in the reserve since 2011. In 2014, as part of maintenance of the island, its area was increased from 1000m² to 2400m² and height from 80cm to 100cm, which significantly contributed to increased number of nests and increase in nesting success from 9.6% in 2011 to 83.5% in 2019--one of the highest in the world. The island proved vital for breeding of flamingos and provided safe refuge from ground predators such as dogs and foxes and fluctuations in water levels. All the breeding at the reserve has been recorded from the nesting island and during the last breeding season in 2019, 714 chicks fledged, which is the highest number so far.

Resumen

El flamenco común (*Phoenicopterus roseus*) es un migrante predominantemente de paso en invierno a los Emiratos Árabes Unidos (EAU), aunque una pequeña proporción de aves residentes está presente en algunos sitios durante todo el año. Algunos de estos flamencos residentes se reproducen a principios del verano en la Reserva de Humedales Al Wathba, un humedal interior artificial en el ecosistema desértico predominante del Emirato de Abu Dhabi, administrado por la Agencia de Medio Ambiente de Abu Dhabi (EAD). Las acciones de manejo incluyeron la provisión de una isla de anidación artificial en 2004 junto con el control de depredadores y la minimización de la perturbación, lo cual ha contribuido significativamente a la reproducción exitosa del Flamenco Común. La anidación y cría de polluelos se ha registrado anualmente en la reserva desde 2011. En 2014, como parte del mantenimiento de la isla, su área se incrementó de 1000 m² a 2400 m² y la altura de 80 cm a 100 cm, lo que contribuyó significativamente a un aumento en número de nidos y aumento en el éxito de anidación de 9.6% en 2011 a 83.5% en 2019, uno de los más altos del mundo. La isla demostró ser vital para la cría de flamencos y proporcionó un refugio seguro contra los depredadores terrestres como perros y zorros y las fluctuaciones en los niveles de agua. Toda la cría en la reserva se ha registrado en la isla de anidación y durante la última temporada de cría en 2019, se produjeron 714 polluelos, el número más alto hasta ahora.

Résumé

Le flamant rose (*Phoenicopterus roseus*) est un migrateur de passage en hiver aux Emirats Arabes Unis (EAU), une petite proportion d'oiseaux résidents étant présente dans quelques sites tout au long de l'année. Certains de ces flamants résidents se reproduisent au début de l'été dans la réserve de zones humides d'Al Wathba, une zone humide artificielle située à l'intérieur du principal écosystème désertique de l'émirat d'Abou Dhabi, gérée par l'Agence pour l'environnement d'Abou Dhabi (EAD). Les actions de gestion incluent la construction d'une île de nidification artificielle en 2004, le contrôle des prédateurs et la réduction des intrusions, qui ont largement contribué au succès de la reproduction du flamant rose. La nidification et l'envol des poussins sont enregistrés chaque année dans la réserve depuis 2011. En 2014, dans le cadre de l'entretien de l'île, sa superficie a été augmentée de 1 000 m² à 2 400 m² et sa hauteur de 80 cm à 100 cm, ce qui a considérablement contribué à augmenter le nombre de nids et le succès de nidification ont augmenté passant de 9,6% en 2011 à 83,5% en 2019, ce qui est l'un des plus élevés au monde. L'île s'avérait vitale pour la reproduction des flamants roses et offrait un refuge sûr contre les prédateurs terrestres tels que les chiens et les renards et les fluctuations du niveau de l'eau. Toute la reproduction dans la réserve a été enregistrée à partir de l'île de nidification et au cours de la dernière saison de reproduction en 2019, 714 poussins ont pris leur envol, ce qui est le nombre le plus élevé à ce jour.

Introduction

Greater flamingos (*Phoenicopterus roseus*) are winter/ passage migrants in the United Arab Emirates (UAE) and this species is recorded in large numbers along coastal mudflats, creeks, lagoons and inland wetlands (Khan et al., 2017). A small proportion of these birds are resident at a few sites such as Al Wathba Wetland Reserve (AWWR), a man-made wetland which is an important wintering and breeding site for greater flamingos (Khan et al., 2017, 2019 – *in press*) and many other resident and migratory species (Soorae *et al.*, 2019). The reserve was established as a protected area following successful breeding of flamingos. The first records of greater

flamingos breeding at Al Wathba were from an unsuccessful attempt in 1993- trespassing, disturbance and approaching the nests were the main reason for nesting failure (Aspinall & Herschfeld 1993); this was later followed by a successful attempt after six years in 1998-99. This prompted the local authorities to declare this low-lying area as protected in 1999 (Aspinall and Hellyer 1999). It is now a Ramsar site and an Important Bird Area managed by Environment Agency- Abu Dhabi (EAD) (Figure 1). Greater flamingos breed at the reserve in early summer before the hottest part of the year (Khan et al., 2017).

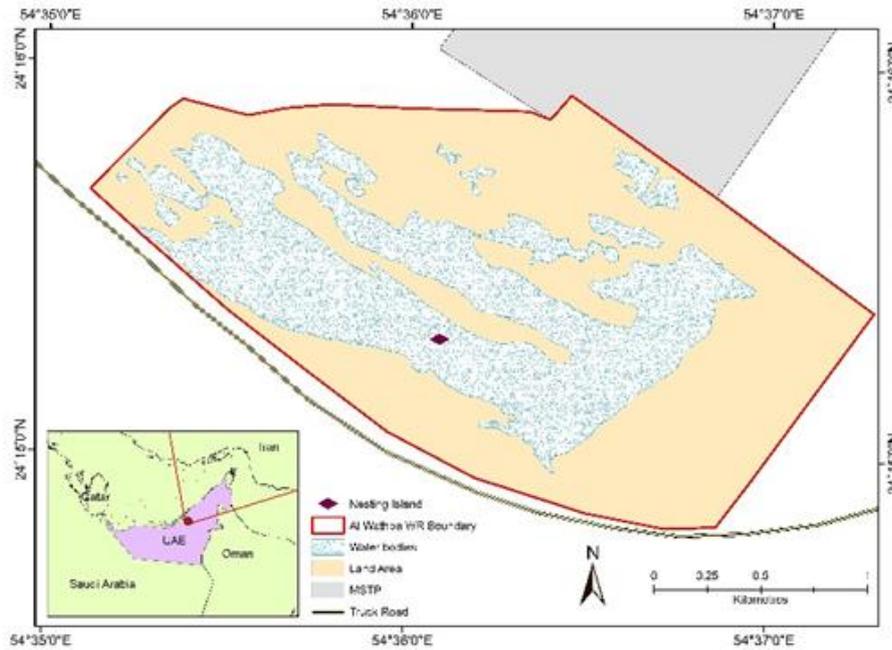


Figure 1 Map showing the location of Al Wathba Wetland Reserve and the nesting island (marked at a purple diamond in the lagoon).

Most of the management efforts were adopted to maintain the area for greater flamingo nesting. This included perimeter fencing to control access and regular trapping and removal of predators. AWWR being an inland wetland, to maintain the natural water regime and appropriate water levels, the area needs to be flooded at the start of winter. The

water used is treated sewage from the nearby Mafraq sewage treatment plant (MSTP). Occasional unprecedented rainfall results in high water levels as there are no systems in place to drain out access water. Also, very high rates of evaporation during hot summer months significantly reduce the water depth and most of the shallow pools become dry.



Figure 2 Nesting island with incubating birds in June 2013. Photo credit: S. Khan/S. Javed.



Figure 3 Nesting island with incubating birds in May 2019. Photo credit: S. Khan / S. Javed.

Methods

Need for a nesting island

To ensure greater flamingo breeding, water levels in AWWR need to be appropriate, low levels would expose the nests to predators and any rise in water levels would inundate them. Thus, the main management activity to ensure successful nesting involved the provision of an artificial island, it was the key management action recommended by EAD (2004). Such islands are known to aid Greater Flamingo nesting and have been used successfully in the past (Rendón and Johnson 1996; Johnson and Cézilli 2007; Baaziz et al., 2010). Four small artificial islands were provided in AWWR in 1995, which remained unutilized (Aspinall and Hellyer 1999) and disintegrated over time.

In 2004, an island of nearly 1000 m² and 80 cm in height was made in one of the waterbodies during summer when the waterbody was dry, it was made in between two sand dunes to provide visual cover to breeding birds and minimize disturbance. Material available inside the reserve was scooped using an earthmover to make a mound, which was flattened and lightly compacted keeping a soft incline on the sides to provide an ideal approach and elevated place for mound building. No stones or gravel was used in making of the island and no artificial nest mounds were placed. We also set a measuring

gauge near to the island to record the depth of water. At the time of annual post summer water release, level of up to 40 cm were reached near the nesting island, a provision of another nearly 10 cm was adjusted for winter precipitation. This left nearly 30 cm of the island exposed and available for nesting when the water levels were highest. Water levels recede due to evaporation in summer, and the entire island is fully exposed from July onwards.

Results

Greater flamingos nesting on the island

After being declared a protected area, birds frequently made nests at suitable places mostly along the shore where mounds were made using the wet sandy substrate. None of these attempts were successful and no chicks hatched. After the provision of the island in 2004, nests were made on it for the first time after six years in 2010 but breeding was not successful. Interestingly, in all the later breeding attempts, mounds were made only on the island. The first successful breeding occurred in 2011 when 18 chicks hatched followed by 17 chicks in 2012. Nesting success (number of chicks fledged to the number of mounds- number of mounds is considered to be equal to the number of eggs- multiplied by 100) increased in subsequent attempts (Table 1).

Table 1: Number of mounds made (number of eggs), chicks fledged and % nesting success at the nesting island from 2011 to 2019

Year (season)	Number of nest mounds	Number of chicks fledged	Success (%)
2011 (summer)	187	18	9.6
2012 (summer)	151	17	11.2
2012-13 (winter)	112	41	36.6
2013 (summer)	369	201	54.5
2014 (summer)*	559	110	19.6
2015 (summer)	704	420	59.7
2016 (summer)	350	24	6.8
2017 (summer)	611	448	73.3
2018 (summer)	818	601	73.4
2019 (summer)	855	714	83.5

*two colonies were made, one away from the nesting island

Discussion

Maintenance of the island

With the onset of summer, potential breeding birds start flocking the island engaging in breeding rituals. Copulation is followed by mound building. Nests are added to the colony in batches with some mounds made after a month from the first mounds. With increasing temperature and evaporation, water levels progressively decrease; new nests are made on freshly exposed substrate away from the first mounds. When the maximum temperature reaches above 45°C, water levels recede to almost zero and the colony is abandoned.

Gradual erosion over a period of nearly one decade considerably reduced the height and area of the island, being unable to accommodate increasing number of nesting greater flamingos, with the result, during 2014, two nest colonies were made in the reserve, the one on the island was made very late in the season, with the result nesting success dropped significantly compared to previous years. In 2014, after breeding was

over, as part of maintenance, the area and height of the island was increased to 2400 m² and 100 cm respectively. The same method of scooping was employed using material available near and around the island. Since then, the number of chicks hatched reached 714 in 2019 (the highest in AWWR so far) and the nesting success reached 83.5% (Table 1), which is among the highest success rate in the world.

Conclusions

The island has been vital for greater flamingo breeding as all nesting efforts are concentrated there, with no nests made anywhere else in the reserve. The island has aided flamingo nesting by providing an elevated area safe from inundation and disturbance from predators.

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