

Nest Counts for Western Reef Heron *Egretta gularis* and Four *Sterna* species (*repressa*, *anaethetus*, *bergii*, *bengalensis*) on Nakhiloo Island in the Persian Gulf from 2005 to 2007

BEHROUZ BEHROUZI-RAD^{1*} & FARHAD HOSSEINI TAYFEH²

1. Department of Environmental Science, Science and Research Campus, IAU, Ahwaz, Iran.

2. Bushehr Provincial Office of the Department of the Environment (DOE), Bushehr, Iran.

* Correspondence Author. Email: bbehrouzirad@yahoo.com

Received 10 December 2007; accepted 18 November 2008

Abstract: This study was conducted on Nakhiloo Island in the Persian Gulf, part of Bushehr Province, from March 2005 to September 2007. The numbers of breeding pairs of Western Reef Heron *Egretta gularis* were 10 in 2005 and 44 in 2007. The maximum number of breeding pairs (16,124) of Lesser Crested Tern *Sterna bengalensis* in 2005 reduced to 15,650 in 2007 and the breeding population of Swift Tern *Sterna bergii* has increased from 254 to 1294 since 2005–2007. However, the Bridled Tern *Sterna anaethetus* breeding population reached 29,461 in 2007, its total population always being higher than the other tern species throughout the study period. Nakhiloo Island, a sensitive and brittle habitat for breeding species such as terns, although in a DOE protected area under Game Guard supervision, would benefit in conservation terms from a reduced level of human activity.

Keywords: Breeding Population, *Egretta gularis*, *Sterna repressa*, *S. anaethetus*, *S. bergii*, *S. bengalensis*, Nakhiloo Island, Persian Gulf.

INTRODUCTION

The total number of bird species that breed or pass through Bushehr Province remains uncertain, but surveys of the birds of the Province's islands have shown that there are at least 44 species, including waterbirds, nine of which bred in the 2005–2007 study period: six tern species (Lesser Crested Tern *Sterna bengalensis*, Swift Tern *S. bergii*, White-cheeked Tern *S. repressa*, Caspian Tern *S. caspia*, Bridled Tern *S. anaethetus* and Saunders's Terns *S. saundersi*), one heron species (Western Reef Heron *Egretta gularis*), Crab Plover *Dromas ardeola* and Greater Sand Plover *Charadrius leschenaultii* (Bushehr DOE 2002, 2006). Ticehurst *et al.* (1925) first established the status of seabirds of Persian Gulf islands (and islets), doing so individually for Great and Little Quoin, Henj(g)am, Tonb and Nabi-u-Tonb, Nabi-ul-Farur, Farsi; they did the same for Sir-Bu-Na' Air (part of the present-

day UAE), for Halul (Qatar), for Arabi (Saudi Arabia) and for Um-Al-Maradim, Qaru, Kubbar, and Auhah (Kuwait). Tuck (1974) gave the general status of seabirds of the Persian Gulf and the Gulf of Oman for the 1958–1973 period. Finally, Gallagher *et al.* (1984) summarised the status of seabirds breeding on the coasts and islands of Iran and Arabia and Scott (2007) did so for breeding waterbirds in the 1970s in Iran. There was no new information for many years on the breeding tern populations, however, and consequently we recognised the need to follow up the first (1975) survey of Nakhiloo island (D.A. Scott, unpubl. data, Gallagher *et al.* 1984); we began study in 2005. We also found unpublished data for 2004. We wanted to establish the degree of fluctuation in the breeding populations of seabirds on the islands off the coast of Bushehr. The weather pattern over the study period was consistent between years, summer temperatures reaching 45°C and winters moderate.








STUDY AREA

The four main offshore islands in the western Mond Protected Area visited were Khan (27°29'N, 51°16'E, 108 km SE of Bushehr), Tahmadon (27°51'N, 51°27'E, 130 km SE of Bushehr), Nakhiloo (the most important at 27°49'N, 51°28'E, 133 km SE of Bushehr, Fig.2) and Um-al-Gorm, (27°00'N, 51°33'E, 140 km SE of Bushehr) (Fig. 1). The largest, Khan, covers an area of 800–1000 ha and the smallest, Nakhiloo, only about 35 ha. Tahmadon's area is 700 ha and Um-al-Gorm 75 ha. These islands are warm in summer (45°C) and moderate in winter, and have very few man-made features worth nothing; their main inhabitants are the seabirds. On Nakhiloo and Um-al-Gorm, the most dominant plant species are *Cyperus*, *Halopyrum mucronatum*, *Lycium* and *Suaeda vermiculata*, which cover about 70%–90% of the islands' area. These islands have ample water; since natural and human

predation is absent, they are an ideal environment in which birds may breed or stop over during migration. Marine turtles are present annually in spring and summer. This study concentrates on the breeding seabirds on Nakhiloo Island.



Figure 1. Map showing Nakhiloo Island and adjacent topography.

-  Bridled Tern
-  Swift & Lesser Crested Terns
-  Saunders's Tern
-  White-cheeked Tern
-  Reef Heron
-  Crab Plover
-  Gabr-e Sheikh Karameh

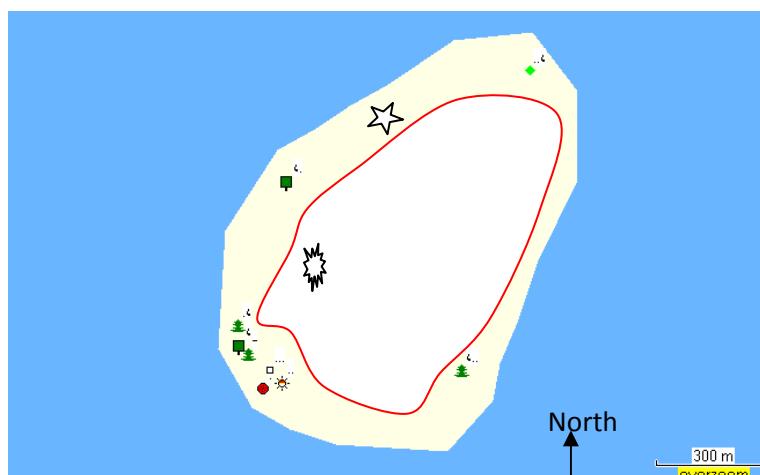


Figure 2. Bird breeding colonies and sites on Nakhiloo in 2006.

MATERIAL AND METHODS

The study period on Nakhiloo Island ran from March 2005 to September 2007 (on 15–20 days each year) in the nesting period. We used the Total Count method only to count the breeding population of Western Reef Heron and the small outlier colonies of terns. We used the Quadrat Sampling method for the main colonies of three species: Bridled Tern, Lesser Crested Tern and Swift Tern. We determined the clutch sizes in smaller colonies by examining every nest, but in larger colonies, we had to determine clutch sizes by the Quadrat Sampling method. To determine nest densities in larger colonies, we calculated the nesting area from GPS readings and then counted all nests in sufficient randomly-selected quadrats to obtain a representative average number of nests per quadrat. This is a straightforward technique for Lesser Crested and Swift Tern colonies, which are in sandy terrain, but more difficult to apply to Bridled Tern colonies, which are in plant-rich areas, typical of the breeding habitat selected in the Persian Gulf. The annual totals of nests included those counted in outlier colonies, which had been counted individually. Our study placed no emphasis on species year-to-year nest site selection; a worthwhile subject for a future study would be to establish the degree of site-faithfulness exhibited by the terns, for if it were significant, it might offer some additional explanation for the variation in numbers during our study on Nakhiloo Island.

RESULTS

The annual nest totals for waterbirds were 37,018, 36,892, and 46,536 for the 2005–2007 period on Nakhiloo Island. Bridled and Lesser Crested Terns were the dominant breeding species with 20,620–29,461 and 16,124–15,650 nests respectively. The somewhat smaller Swift Tern colony, 254–1294 nests, was nevertheless still sizeable, whereas White-cheeked Tern and Western Reef Heron had small colonies of only 10–14 and 44 nests respectively. The breeding effort of Western Reef Heron increased from 10 to 44 nests in 2005–2007 (Table 1). In 2005, this species bred on tall bushes in the southwest of the island while in 2006 and 2007, it bred in

similar habitat in the southwest. In 2006, at the time of the first egg-laying, there were five nests with clutches of 2–4 eggs (mean clutch size 2.4). After this brood had left, three pairs laid further eggs in these nests, the clutches being 3 or 4 eggs (mean clutch size 3.3). Most of the Nakhiloo Island Western Reef Herons are migrant breeders.

Although the breeding population of Lesser Crested Tern on Nakhiloo Island was 16,124 in 2005, it reduced to 12,345 in 2006 then increased to 15,650 in 2007 (Table 2), the prudent interpretation is that they appear dynamically stable. This species bred in large mixed colony with Swift Tern in the south of the island throughout the study period because they favour sandy places to nest, and this was the only such location. The occupied nesting area of the colony was about 1070 m². The clutch size was one egg for 98% of the pairs, the remainder being of two eggs (Table 2).

The breeding population of Swift Tern increased from 254 to 1300 nests over the period of this study (Table 3) in the large mixed colony with Lesser Crested Tern. In 2006 the average nest density of the Swift Tern reached 1.37/m². Clutch size was one egg (100%) (Table 3), only one nest being found with two. In 2007 the average nest density was 1.03/m². Clutch size was one egg (100%) again.

In 2005, White-cheeked Tern nested in limited numbers in the northwest of Nakhiloo near Sheikh Karamah, as well as in the southwest. A total of 56 nests was counted at the northwest and southwest colonies (10 in the southwest and 46 in the northwest; 35 nests had one egg and 17 nests had two). In 2006, this species bred only in the northwest of the island, when a total of 26 nests was counted. In 2007, of the 61 White-cheeked Tern nests in the west (Table 4), 40 nests were in a single colony near Gabr-e Sheikh Karamah and the remainder were in the southwest of the island.

The breeding population of Bridled Tern increased 20,620 to 29,461 pairs from 2005 to 2007. The nesting area covered about 23 ha, clutch size usually being one egg (95%–97%) (Table 5).

Table 1. Number of Western Reef Heron nests on Nakhiloo Island

Date of survey	Clutch size 1	Clutch size 2	Clutch size 3	Clutch size 4	Mean clutch size	Total nests
12 April 2005	3	2	3	2	2.4	10
First colony (16 April 2006)	3	7	8	2	2.4	20
Second colony (18 May 2006)	1	3	6	4	3	14
16 April 2007	2	4	23	11	2.8	44

Table 2. Number of nests of Lesser Crested Tern *Sterna bengalensis* on Nakhiloo Island.

Survey dates	Main nesting area (m ²)	No. of Quadrats (1X1 m)	Average nest density per m ²	No. of outlier nests counted	No. of main colony nests	Estimated total No. of nests	Sampled clutch size		
							Clutch size 1	Clutch size 2	Total
18 June 2005	1070	28	14.07	5955	10,169	16,124	374 (94%)	20 (6%)	394
10 June 2006	923.5	35	12.34	947	11,396	12,343	377 (98%)	7(2%)	432
12 June 2007	1252	50	11.5	1243	14,407	15,650	521 (97.4%)	14 (2.6%)	535

Table 3. Numbers of Swift Tern *Sterna bergii* nests in mixed colonies with Lesser Crested on Nakhiloo Island.

Survey dates	Main nesting area (m ²)	No. of quadrats (1x1 m)	Average nest density per m ²	Total No. of nests	Total outlier nests	Total No. of nests	Sampled clutch size		
							Clutch size 1	Clutch size 2	Total
18 June 2005	1070	50	0.2	214	40	254	203	1	204
10 June 2006	923.5	35	1.37	1265	35	1300	48	0	48
12 June 2007	1252	50	1.03	1289	5	1294	40	0	40

Table 4. Numbers of White-cheeked Tern *Sterna repressa* nests on Nakhiloo Island.

Survey dates▶	8 June 2005			10 June 2006	12 June 2007		
	Nests of clutch size 1	Nests of clutch size 2	Egg totals	No. of nests	Nests of clutch size 1	Nets of clutch size 2	Egg Totals
Southwest of Island	8	2	12	0	4	2	8
Northwest of Island	27	15	57	26	40	21	82
Totals	35	17	69	26	44	23	90

Table 5. Number of Bridled Tern *Sterna anaethetus* nests on Nakhiloo Island.

Survey dates	Total nesting area (ha)	Nos. of quadrats (20x20 m)	Average No. nests/ quadrat	Average No. nests/ ha	Total No. of nests	No. of outlier nests	Total No. estimated nests	Sampled clutch size			
								Clutch Size 1	Clutch Size 2	Clutch Size 3	Total
19 June 2005	22.80	14	38	893.2	20,365	255	20,620	509 (94.9%)	26 (5.1%)	1	536
10 June 2006	23.21	15	39.6	990	22978	211	23189	594 (94.6%)	32 (5.4%)	0	562
12 June 2007	23.00	14	50.8	1270	29210	251	29461	693 (97.3%)	19 (2.7%)	0	712

DISCUSSION

Fluctuating breeding population numbers of birds on Nakhiloo Island

The breeding timescale of each study species is shown in Table 6. A probable population trend (over four years only) of breeding birds is shown in Fig 3 (data for 2004 comes from Department of Environment of Bushehr Province). The timing of the peak breeding period on Nakhiloo Island shifts by 5 to 15 days from one year to another. All forms of relationships amongst colonial breeding species are determined by the motivation level and physiological condition of the birds, their composition, number, time and sequence of polyspecific colony formation. Monospecific and polyspecific colonies are characteristic of terns in the Persian Gulf islands and colony formation is dependent on the ecological situation. The sequence of formation and occupancy of the colony is determined by the nest-building period (Table 6). The Bridled Tern is the first to form colonies. This species commences nest-building when vegetation is mature and coverage density is about 70–90%. This protective vegetation cover and its density are greatly significant for colony success. In the Bridled Tern's breeding habitat on Nakhiloo island, vegetation density cover was about 70–90%. In this early period, the colony is chiefly monospecific and nest site selection disputes result in movement to another nearby location for the nest. Polyspecific colonies evolve as soon as other species start breeding. There is no inter-specific hostility for individual nest site distribution within polyspecific colonies between Bridled Tern and Lesser Crested and Swift Terns. The Bridled Tern occupies most of Nakhiloo covered by vegetation, but the other two species occupy sandy areas in the southwest. The numbers of each breeding species in Nakhiloo tended to fluctuate. The study did not cover a long enough period to enable any trends to be calculated, but some of the increases we recorded in the breeding populations of Western Reef Heron, Bridled Tern, Swift Tern and Lesser Crested Tern may well be due to the increased security apparent on Nakhiloo Island over the three years. Local factors may have been predominant in any fluctuations observed, because regional weather patterns and the overall natural conditions on

Nakhiloo Island were stable. In the 1970s also, the Nakhiloo breeding population of terns was greater than on the other islands (Scott 2007), which suggests that even then it was the safest nesting site. However, when Nakhiloo suffers disturbance, then the birds may breed on other islands, which is very probably what happened when Golden Jackal managed to colonise Um-al-Gorm Island, and when fisherman with motor boats spent periods of time there in 2004. The islands of Khan and Tahmadon now lack the good vegetation cover necessary for Bridled Tern and Western Reef Heron to nest. We did not find any breeding population of terns on Khark and Kharku islands in the 2005–2007 study period, but Table 7 shows that there once were breeding populations in the 1970s (Scott 2007). Of our study area's four islands in the Mond Protected Area, Nakhiloo is the only one on which terns have bred over the entire period of 1970 to 2007. Nakhiloo therefore holds the prime habitat for breeding terns, and so it is vulnerable to any change, in that sense being sensitive (also for Reef Heron). For this reason, it should be even more protected against human activity. Perhaps surprisingly, there were no breeding gull species on Nakhiloo, Khan, Tahmadon or Um-al-Gorm during the study period of 2005–2007. There has not been any such report since 1980.

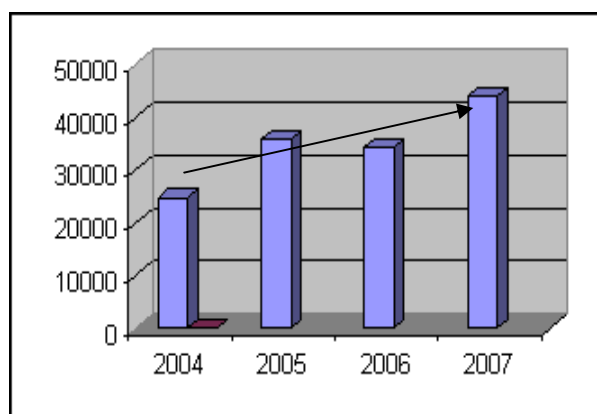


Figure 3. Likely trend of breeding population of birds 2004–2007.

Western Reef Heron

Western Reef Heron eggs hatched earlier than any other species on Nakhiloo Island, on 1 May. Due to the site remaining undisturbed, the breeding population of Western Reef Heron on Nakhiloo reached a maximum of 44 pairs in 2007 (**NB** our 2008 count revealed 92 nests) from only 10 in 2005 (Table 1). In 2005, this species bred on tall bushes in the southwest of the island while in 2006 and 2007, it bred in similar habitat in the southwest of Nakhiloo, the only part of island where tall (*c.* 100 cm) bushes of *Suaeda*, which have grown around a small wetland of about 200m² in area.

Bridled Tern

The Bridled Tern likes to breed in huge colonies. In 2005, Bridled Tern chicks hatched between 10 and 15 August, fledging a month later. Although that year the species did breed on Nakhiloo, it delayed the start of breeding by 15 days. They had earlier begun to breed on Um-al Gorm, but probably because of disturbance by Golden Jackal *Canis aureus* and by fishermen, they decamped to Nakhiloo Island to nest (Table 6). Back in 2004 (F. Tayfeh, pers. obs.), Bridled Tern had 24,873 pairs on Nakhiloo Island but later that year, the area suitable for it nesting was reduced by 9% in the south of the island, because bushes had been removed and plant cover destroyed by fishermen. It is likely that the overall effect was the reduction in 2005 of the breeding population of Bridled Tern by 17%. Nest density could not increase because nest separation distances were already at a minimum. A few pairs nested in unusual places or laid eggs in artificial nests or in the shadow of the study team's tents. However, since then, the breeding population has shown a slight (7%) but steady increase (Table 5), from 20,620 in 2005 to 29,461 in 2007. For the 2005–2007 period, this species was the dominant breeding species on Nakhiloo Island, nesting beneath short but broad *Suaeda* bushes that cover much of Nakhiloo island (Fig 2), a significant factor for the tern's success. These broad bushes could accommodate up to four nests in their shade, essential security for chicks and eggs. A Bridled Tern would nest even in the shade of an artificially-placed rock. In the Persian Gulf, the islands with good *Suaeda* cover are Nakhiloo,

Shidvar and Tonb-e Kuchak, where most of the Bridled Tern colonies are. (**NB** In 2008, the Bridled Tern breeding population on Shidvar was 25000 pairs and on Tonb-e Kuchak was 35,000 pairs (Behrouzi-Rad 2008, pers. obs).

White-cheeked Tern

The numbers of colonies and the numbers of nests within each varied between the southwest and northwest of Nakhiloo Island, presumably determined by the prevailing local conditions. The first egg-laying by White-cheeked Tern on Nakhiloo was on 08 June 2005, laying continuing until the end of June. Generally, the laying period occurs in May, although occasionally early laying may occur in late April). Chick-rearing is from late May to early July. They can fly less than two months after hatching. White-cheeked Tern bred both in northwest and southwest Nakhiloo Island in 2005 and 2007 (Table 4 and Fig 2), but in 2006 bred only in the southwest, in the lowest numbers recorded in the study. The reason was unclear, but may be related to the presence of a few fishermen for a few days in 2006 when nest-building was beginning. The siting of the colonies presumably is determined by the extent of human disturbance at the colony sites. The species needs short grassy vegetation (halophytes or psammophiles or both), but featuring open sandy ground, shallow slopes and soft sand. On the island coast, such a combination is ideal for fisherman to stay for a few days, and their presence at a crucial period of nest-site selection could well affect nest-building or egg-laying. It would be interesting to document shifts of colony sites in relation to changes in the foraging habitats or in the level of disturbance.

Swift and Lesser Crested Terns

In 2007, very small numbers of Swift and Lesser Crested Terns laid their eggs later than usual in the breeding period (perhaps due to competition for nest place) along the colony margins, some 5–10 metres from the main colony. The four small sub-colonies each had 15–30 nests, some 75 nests in total, 40 for Lesser Crested Tern, 35 for Swift Tern. The first eggs were observed on 10 May 2006; egg-laying lasted until the end of July.

Table 6. Breeding species of waterbirds on Nakhiloo Island (Behrouzi-Rad 2006, 2007, unpubl. data).

Species	Outward migration starts	Returning migrants arrive	Egg laying date	Hatching date	Date young leave nest
Reef Heron	Late Aug	Late March	Mid-March	01 May	Late May
Lesser Crested Tern	01 Sep	01 May	Mid-May	End of May	Hatching + a few days
Swift Tern	01 Sep	01 May	Mid-May	End of May	Hatching + a few days
White-cheeked Tern	Late Aug	Late April	08 May	End of May	Hatching + a few days
Bridled Tern	01 Sep	Mid-April	Mid May	Mid August	Hatching + a few days

Table 7. Numbers of breeding pairs of the four tern study species as given in references from the 1970s for the Bushehr islands (Gallagher *et al.* 1984, Scott 2007, F.H. Tayefeh, pers. obs.). (np = nesting pairs, ad = adults)

Island► Species▼	Kharku, May/Jun 74 (Scott 2007)	Nakhiloo Jun 75 (Scott 2007)	Morghu Jun 75 (Scott 2007)	Um-al- Gorm Jun 75 (Scott 2007)	Khark May 2007 Behrouzi- Rad (2005- 2007)	Khan May 2007 Behrouzi- Rad (2005- 2007)	Tahmadon May 2007 Behrouzi-Rad (2005-2007)	Bushehr Bay 1970s (Scott 2007)
Lesser Crested Tern	1500np	1000np	300ad	1000ad	0	1450np	0	0
Swift Tern	6ad	40np	40ad	100+ad	0	374np	0	0
White- cheeked Tern	1500np	170np	65np	300np	0	0	0	50np
Bridled Tern	250-300np	15000np	5500np	1000np	0	0	0	0

Generally the laying period occurs in mid-may (occasionally, laying may begin as early as 1 May). The chicks began to hatch in late May, leaving the nest after a few days, but are unable to fly until late August. In 2007, Lesser Crested Tern and Swift Tern bred in a large mixed colony near Ghabr-e Shiekh Karameh in the northwest of Nakhiloo Island. The selection of sites suitable for establishing colonies is subject to pressure by human disturbance and typically needs presence of soft sandy ground. Consequently Lesser Crested and Swift Terns tend to restrict their nesting to close to the sea on Nakhiloo, where soft sandy ground lacks vegetation. In the southwest of Nakhiloo, there is some 2000 m² of sandy open ground lacking vegetation, perfect for the Lesser Crested and Swift Terns that breed there. However, there is another basic requirement for these two species to breed successfully – they must find predator-free and human undisturbed islets in an island system, where they form generally very compact colonies with small nest-separation distances. (on Nakhiloo island, only 35–45 cm; Behrouzi-Rad 2006, unpubl. data). Companion species on Nakhiloo are Bridled Tern (where suitable vegetation cover exists) and White-cheeked Tern (Fig. 2).

Other breeding birds on Nakhiloo and adjacent islands

The breeding population of Crab Plover *Dromas ardeola* on Nakhiloo Island were 2500, 3500, 4100 and 2266 pairs in 2005, 2006, 2007 and 2008 (B. Behrouzi-Rad, pers. obs.) respectively. By 2008, when 481 pairs of Crab Plover *Dromas ardeola* bred successfully on Um-al-Gorm, Golden Jackal was extinct there and had not been superseded by other predators. In 2007, 2266 pairs of Crab Plover bred on Nakhiloo. In 1970s four species of terns (Table 7) bred on Kharku Island (Scott 2007). On Nakhiloo Island three pairs of Saunders's Terns *Sterna saundersi* arrived in late April 2005, laying eggs in early May. Some 500 pairs of Caspian Tern *S. caspia* bred in 2006 on Khan Island. On 30 May 2008, 5 nests of Gull-billed Tern *S. nilotica*, each with two eggs, were observed on Khan Island (53°11'45"E, 30°99'53"N), the first recorded breeding of this species on Khan island. Although Nakhiloo island is a sensitive habitat for breeding species, the adjacent islands (*e.g.* Khan, Tahmadon and Um-al-Gorm) support the same populations during resting or feeding periods.

Threats and conservation

The conservation state of Nakhiloo is vulnerable to specific threats, such as unregulated human activities, which include fishing, research fieldwork and accommodation

and visitors, even ecotourists. Many tern chicks become tangled in nets abandoned on the island. Local tourists sometimes visit, but sport-fishing is becoming increasingly popular, especially with people from distant parts of Bushehr province staying over for a few days. We have noted that such people cut down vegetation to use as cooking fuel. Locally, chicks represent an occasional food source for fishermen, or are captured as pets or playthings by children. Sometimes children may collect tern eggs, especially those of Lesser Crested and Swift Terns, because the colony size is prominent as is the volume of noise it generates. We believe that some small colonies have been deserted in the past due to continuous disturbance at the breeding site from tourism and sport-fishing during the breeding period.

Lesser Crested and Swift Terns had not bred on Nakhiloo Island prior to 2003, but most probably they had to seek refuge to do so because of excessive disturbance on Um-al-Gorm. Since 2004, a large number of Bridled Tern have failed to breed because the potential breeding population is too large for the usable breeding area, making competition very intense for suitable nesting places where broad short bushes can provide shade. The shortage probably is due to many bushes having been cut down to use as cooking fuel. Casualties from the intense competition are evident.

Another natural predator of tern eggs was Ruddy Turnstone *Arenaria interpres* during its migration. It has often been recorded feeding on eggs, and in 2006, it fed on eggs of Bridled Tern. However, that year Crab Plover, Ruddy Turnstone and resident small rodents (subfamily Murinae) also preyed on Bridled Tern eggs on the margins of the colonies, despite vigorous defence mounted by the parent birds.

The data show that in the Bushehr islands, Nakhiloo, Um-al-Gorm and Khan have the better quality and quantity of habitat to attract nesting seabirds. However, these habitats are vulnerable to destruction by man and the bird colonies are at risk from disturbance during the nesting season to both live for birds and maintain their marine or aqueous breeding birds. Our study happened to be the first since 1975. Much has changed in the 30-year gap, but these have been little documented. It is

therefore important that the Bushehr island system be regularly surveyed to count the breeding birds, so that robust and current data are available to help devise the best way of managing this important but fragile island ecosystem. There is clear potential for making these islands a viable ecotourism attraction in ways that would not disturb the colonial bird species.

We also suggest that:

- Human hunting and fishing activities be prevented during the breeding season.
- The predation rates of natural predators (e.g. rats, Ruddy Turnstone and Crab Plover) be established for their significance and monitored in case of change.
- On the precautionary principle, further studies should be made to collect data on seabird species of the Bushehr islands with the aims of:
 1. Obtaining sufficient data to allow valid breeding trends to be calculated so that reliable conservation management policies can be formulated.
 2. The present lack of year-round data being remedied.

REFERENCES

- Gallagher M.D., Scott D.A., Ormond R.F.C., Connor R.J. & Jennings M.C. 1984. The Distribution and Conservation of Seabirds Breeding on the Coasts and Islands of Iran and Arabia. *In*: Croxall J.P., Evans P.G.H. & Schreiber R.W. (Eds), *Status and Conservation of the World's Seabirds. ICBP Technical Publication 2*: 421–456. International Council for Bird Preservation (ICBP), Cambridge, UK.
- Mansoori J. 1987. An ecological survey of seabirds in Sheedvar Island. *Journal of Environmental Studies 14*: 41–66 [In Persian].
- Scott D.A. 2007. A review of the status of the breeding waterbirds in Iran in the 1970s. *Podoces 2(1)*: 1–21.
- Scott D.A. & Adhami A. 2006. An updated checklist of the birds of Iran. *Podoces 1(1/2)*: 1–16.
- Ticehurst C.B., Cox P.Z. & Cheesman R.E. 1925. Birds of the Persian Gulf Islands. *Journal of the Bombay Natural History Society XXX*: [December 1925]: 725–33.
- Tuck G.S. 1974. Seabirds of the Persian Gulf (The Gulf) and Gulf of Oman.-A Survey (1958–1973). *Sea Swallow 23*: 7–21.