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Short Communication

Observations on the Nesting Ecology of Seabirds in Al –Daymaniat Islands, Sultanate of Oman

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ABSTRACT

Results of a survey on the nesting ecology of seabirds conducted in the summer of 2010 in one of the Al Daymaniat Islands, Oman is presented. Three species of terns, *Onychoprion anaethetus*, *Thalasseus bergiii* and *Sterna repressa* and one species of gull, *Ichthyaetus hemprichii* were nesting on this island. Nesting habitats of all four species were monitored from the beginning to the end of the breeding season. *Onychoprion anaethetus* was the most abundant species and its nests were mainly restricted to the vegetation. *Thallasseus bergiii* and *S. repressa* were represented by one and three colonies respectively. *Ichthyaetus hemprichii* nested all over the island. The nests of *O. anaethetus* was sheltered by the vegetation or rocks, while all other species built scrape nests on open ground. The egg laying and hatching periods, clutch size and egg morphometry have been reported for all four species. Nest dimensions, nesting success percentage and pattern of nest distribution within colonies have also been presented for *I. hemprichii* and *S. repressa*. Protection of this island from development of tourism and other activities within the Al Daymaniat Marine Nature Reserve is emphasized.

Key Words**:** Seabirds; Breeding; Nesting; Ecology; Northern Islands

INTRODUCTION

Studies on seabirds of the Arabian region are scarce. All countries in the Arabian Peninsula have offshore islands, where one or more species of seabirds breed. From the data compiled by LePage (2013a,b) for the Avibase, the numbers of seabird species known from Kuwait, Bahrain, Qatar, United Arab Emirates, Oman, Yemen and Saudi Arabia are 37, 34, 25, 56, 62, 53 and 51, respectively. Recently, four more species have been added to the list of Oman (Eriksen and Victor 2014).

A comprehensive report on the status of breeding seabirds in the Red Sea and Gulf of Aden has been compiled by PERSGA, the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (Shobrak et al. 2003). Seabird surveys have been conducted in Saudi Arabia since early 1980s and the results showed that this country is important for the breeding of terns and gulls (Ormond et al. 1984, Symens 1988a, b). The impact of extensive oil spills caused by the Gulf war in 1991on breeding ecology of seabirds in the Arabian Gulf, especially those of the Socotra Cormorant and terns were evaluated between 1991 and 1995 (Symens and Evens 1993, Symens and Al Suhaibany 1996, Symens and Werner 1996). Following the methodology used in the Arabian Gulf, Newton and Al Suhaibany (1996) completed a survey of all Saudi Arabian Red Sea Islands. Species-specific studies have also been conducted (e.g. Socotra Cormorant, Symens et al. 1993, Bridled Tern, Sweet 1994, White-Cheeked Tern, Simmons 1994).

Observations on the seabirds of the Red Sea and the breeding seabirds of the islands of Yemen have been reported by Brooks et al. (1987) and Evans (1989). Birds of the Socotra Islands have received better attention (Porter and Stone, 1996, Kirwan et al. 1996) and of the

185 species recorded, 12 are breeding seabirds (Al Sagheir 2002). In addition to the evidence on the breeding of Socotra Cormorant in the archipelago, Taleb (2002) discovered a breeding colony of Jouanin's Petrel, *Bulweria falax* in Socotra Islands..

In the United Arab Emirates (UAE), nest site selection by the Sooty Gull, *Ichthyaetus hemprichii* (= *Larus hemprichii*), was investigated by Javed et al. (2005) in Jarnein Island, Abu Dhabi, leading to the conclusion that this species shows a distinct preference for rocky substrates. Javed et al. (2008) evaluated the breeding status of the Red-billed Tropicbird, *Phaethon aethereus* on the same island and found a marked increase in the number of active nests when compared to previous estimates; this bird was considered as a priority species for conservation in the UAE.

Of the 66 species of seabirds recorded in Oman, 23 are vagrants, 39 are migrant visitors, two are resident/ migrants and two are residents. Thirteen species of seabirds breed in Oman, of which two are residents and the rest are migrant visitors (Eriksen and Victor 2014). In this paper, observations on the nesting ecology of four species of seabirds, one gull and three terns in one of the nine islands of Al-Daymaniat in the Sea of Oman are presented.

STUDY AREA

Al Daymaniat Islands are a group of nine islands located in the Sea of Oman about 60 km northwest of Muscat (Lat. 23° 51´ N; Long. 58° 5´ E). These islands are predominantly made of coral crag and limestone. A good description of all these islands (Figure 1) has been given by Walter (1979). Al Daymaniat was declared as a Marine Nature Reserve in 1996 because of its importance for breeding seabirds, turtle nesting beaches and pristine coral reefs.

McGrady et al. (2007) designated these islands as D1 to D9 and islands 2-7 are shown in Figure 1. Because of logistic limitations, this study was conducted on one of the nine islands, Al Jabal al Kabeer (D4) (Figure 1). According to Hillman (personal communication) who produced the field maps, Al Jabal al Kabeer (D4) has a total area of about 0.37 km^2; 78% of this area is bare rock, 10% is beaches; 10% is covered with the salt tolerant *Suaeda aegyptiaca* (Amaranthaceae) and the rest with sedge and grass.

METHODS

Survey

Five fieldtrips were made to D4 during the period 9 April to 25 August 2010, the summer breeding season of seabirds in the area. All surveys were made on foot. A walking route was charted for D4 and this route covered the coastline and most of the open spaces including vantage points suitable for bird counting. The counting methods used were of Walsh et al. (1995). A pair of medium range binoculars (Zenith 8 x 40, 6.5°), a GPS (Etrex Garmin), a digital camera and measuring equipment for nests and eggs were used to collect data. Field identification of birds were made using Porter et al. (1996) and Eriksen et al. (2003).

Nesting Ecology

Nesting habitats of all seabird species were observed from the beginning to the end of the breeding season. The locations of colonies were recorded using GPS, and ArcGIS v.10 was used to produce the map. For the Swift tern or Greater crested tern, *Thalasseus bergii* (the geographical race *velox)* and White-cheeked tern, *Sterna repressa*, GPS readings were taken from the centers of colonies because the nests were close to each other. For the Sooty gull, *Ichthyaetus hemprichii*, whose nests were placed apart, GPS readings were taken at each active nest. Bridled tern, *Onychoprion anaethetus* was breeding under dense vegetation, and GPS readings were taken to demarcate the vegetation.

Clutch size was estimated by counting the number of eggs produced. The approximate breeding period was evaluated by monitoring. The recording started when the first egg was laid and continued till the hatching was completed in the respective colonies. At the end of the breeding season, the number of eggs that did not hatch was counted and was deducted from the total number of eggs to estimate the number of hatched eggs. The ratio of the number of hatched eggs to the number of total eggs was used to calculate the percentage of Nesting Success (NSP). This technique was used only for the Sooty gull and the White-cheeked tern. The nests of the Bridled tern under the vegetation could not be accessed. Transport related time constraints prevented the estimate for the Swift tern.

The spatial analysis of nests using the nearest neighbor method (Krebs 1999) was possible only for the Sooty gull and the White-cheeked tern. The mean distance to the nearest neighbor (r_A), the nest density (p), the expected distance to the nearest neighbor ($r_{E)}$ and the

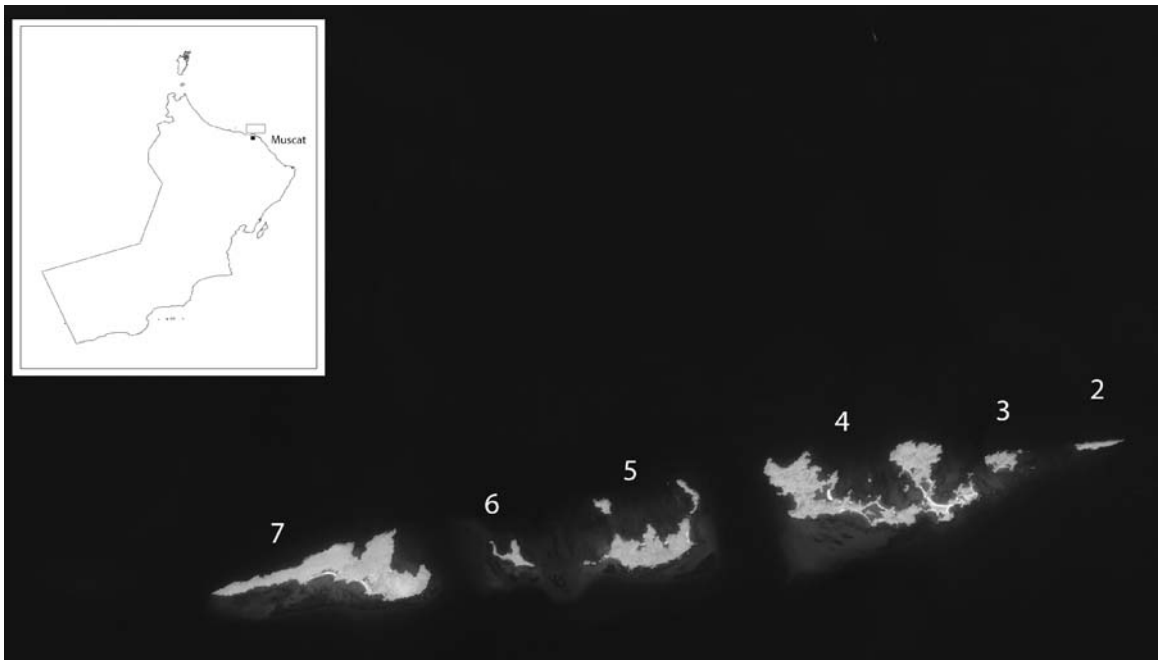

Figure 1. Study area - An index map of the Sultanate of Oman showing the location of Al Daymaniat Islands with reference to Muscat as inset and satellite imagery of Al Daymaniat island chain showing islands 2 – 7.

index of aggregation (*R*) were calculated for both species. For all seabird species studied, the mean width, length (mm) and weights of eggs (g) were measured using a pair of calipers and a small spring loaded balance, respectively. A ruler was used to measure nest diameter in cm.

RESULTS AND DISCUSSION

Figure 2 shows the location of the colonies of the four species of breeding seabirds in D4 from April to August 2010 and Table 1 summarizes the data on their nesting ecology.

The Bridled tern, *O. anaethetus* was mainly restricted to the vegetation (75%) and the rest under ledges and in rock crevices (25%). In New Caledonia, the nests of this species were mostly under rocks (85%) and some (15%) were under vegetation (Villard and Bretagnolle 2010). *Onychoprion anaethetus* was the most dominant species seen in D4 with 3392 individuals and its nest is a ground scrape or at best, a hole under rock or vegetation. The vegetation cover, however, seems to be the major factor offering greater protection from predators and inclement physical factors like wind, thus influencing the nesting success of this species in D4. However, nests were not easily accessible for spatial mapping using nearest neighbor analysis. From the limited number of nests accessible, the clutch size of one egg/nest was recorded. The length and the maximum width of eggs (n=20) were 43.0 ± 1.8 and 30.7 ± 0.9 mm, respectively. The weight of eggs had higher variability (26.7 ± 5.1g) and this should have been related to the developing stage of the eggs. The nesting habitats and habits of this species were not very different from those reported elsewhere (Higgins and Davies 1996, Chatto 2001). The egg laying and hatching period overlaps with that of *I. hemprichii* and *S. repressa* (Table 1). Fidelity to breeding islands is very high in Bridled tern and birds have been known to return to their natal colonies year after year (Dunlop and Jenkins 1992). Further monitoring is necessary to establish whether this is the case in D4 and even if this species is listed as least concern in the IUCN Red List category, conservation of their breeding habitats should be a priority.

The next highest number of individuals (488) recorded in D4 was that of the Swift tern or Greater crested tern, *T. bergii*. Its nesting site was in one location on the northwest corner of the island (Figure 2). The nests were very close to each other and were away from the colonies of other species except for a single colony of Sooty gull, *I. hemprichii*. The nesting site in D4 was bare rock in an open area, although this species has been known to scrape nests on sand and on top of buildings

Figure 2. Nesting locations of seabirds in the study island; Gray circles and black dots show the numbered colonies and the location of active nests of *I. hemprichii* respectively; Square, the location *T. bergii* colony; Stars, the location of *O. anathetus* colonies as indicated by the distribution of vegetation; Diamonds, the location of *S .repressa*.

(Crawford and Dyer 2000). Egg laying and hatching period of this species did not overlap with that of the other three species studied (Table 1). The clutch size was one egg/nest based on 30 nests examined in the field, but two eggs/nest have been known elsewhere (Cooper 2006). The length and maximum width of eggs (n=30) were 62.9 ± 2.9 and 42.9 ± 2.9 mm, respectively. The egg laying seemed synchronous within the colony. This large tern is very common in the Middle East and 4000 pairs have been recorded in Oman (Del Hoyo et al. 1996). Its occurrence throughout the year in Oman suggests that it is a breeding resident (Eriksen and Victor, 2014), whose movements are rather nomadic than migratory.

The Sooty gull was nesting all over D4 and 11 colonies were loosely organized (Figure 2). The number of individuals counted during the study period was 280. The nests were scrapes on bare rock as seen elsewhere by Javed et al. (2005) and the mean diameter of the nests (n=24) was 19.2 ± 0.9 cm. Based on seven active nests located in the area of 1928.5 m^2 at Colony number 9 (Figure 2), the mean distance to the nearest neighbor (r_A) was 9.8 m while the expected distance (r_E) was 8.2 m; the nest density (*p*) was 3.63 $x10^{-3}$ and the index of aggregation (*R*) was 1.2. All these parameters indicate that the distribution of nests within the colony was random. Egg laying and hatching period of this species was the same as that of the White-cheeked tern (Table 1). The clutch size based on 24 nests was 2.2/nest and the NSP was 85%, which was less compared to *S. repressa* (97%). Despite being a predator and scavenger, the relatively sparse distribution of nests on open ground offers this species less protection from other predators. The length and maximum width of eggs (n=52) were 60.8 ± 1.6 and 43.1 ± 1.6 mm, respectively. The weight of eggs had higher variability as in *O. anaethetus* (59.4 ± 5.0g) and the varying stages of egg development probably account for this. This is the most common gull native to Arabian Gulf and Sea of Oman regions. It is a breeding resident seen throughout the year in Oman (Eriksen and Victor 2014).

Only three colonies of the White-cheeked tern were recorded in D4 (Figure 2). The number of individuals found during the study period was 190. The nests were scrapes both on bare rocks (65%) like in *I. hemprichii* and *T. bergii* and sandy beach (35%), which may offer competitive advantage to reduce habitat overlap. The mean diameter of the nests (n=56) was 12.5 ± 0.5 cm. The mean distance to the nearest neighbor (r_A) using 17 nests located in an area of 18.2 m^2 was 0.7 m while the expected distance (r_E) was 0.5 m; the nest density (*p*) was 0.94 and the index of aggregation (*R*) was 1.3 indicating the distribution of nests within the colony as random. Egg laying and hatching period of this species completely overlaps with that of the Sooty gull (Table 1). The clutch size based on 56 nests was 1.2 eggs/nest and the NSP was 97%. Despite being on open ground, the relatively close placement of nests seems to offer better protection from predators. Despite its smaller size, *S. repressa* is highly aggressive in confronting predators approaching colony boundaries. The length and maximum width of eggs (n = 66) were 40.0 ± 2.0 and 28.6 ±

Table 1. Data on the nesting ecology of seabirds in Al Daymaniat island (D4), April – August 2010

Common name	Scientific name	Maximum Numbers	Nesting habitat	Type of nesting	Breeding Season		Clutch Size Analysis		
					Egg laying	Egg hatching	Total number of active nests	Total number of eggs	Average clutch size
Sooty Gull	*Ichthyaetus hemprichii*	280	Bare rocks	Loose Colony	Late June	Late July	24	52	2.2
White-cheeked Tern	*Sterna repressa*	190	Bare rocks (65%) sandy beach (35%)	Colony	Late June	Late July	56	66	1.2
Bridled Tern	*Onychoprion anaethetus*	3392	Under vegetation (75%), under rocks, ledges & holes (25%)	Colony	Late May	Mid-Late July	20	20	1
Swift Tern	*Thalasseus bergii*	488	Bare rocks	Colony	Late July	Mid- August	30	30	1

1.3 mm, respectively. The mean weight of eggs was 16.7 ± 3.2g and as in other species reported here, the varying stages of egg development account for this variability. This tern is a common breeding visitor in summer, especially in the offshore islands of Oman and they are not usually seen between mid-November to early March (Eriksen and Victor 2014).

Although Al Daymaniat Islands have been known as breeding grounds, migration stopping points and home for a variety of bird species, this study on D4 seems to be the first on the nesting ecology of seabirds. It is an important breeding ground for three terns, *O. anaethetus*, *T. bergii*, *S. repressa* and one gull, *I. hemprichii*. In addition, the near-threatened Sooty falcon, *Falco concolor* nests on D4. As this is one of the large islands (area 0.37 km^2) in the Al Daymaniat chain, it may be targeted for infrastructure developments to promote tourism in the present marine nature reserve. There is already a Ranger Station in D4 and any additional development, especially those involving the clearing of *Suaeda aegyptiaca* will be detrimental to the breeding of all species of terns and the Sooty falcon. All tourism activities in the area should therefore be tent-based and temporary with severe restrictions on the number of visitors.

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