

Rediscovering the Arabian sand cat (*Felis margarita harrisoni*) after a gap of 10 years using camera traps in the Western Region of Abu Dhabi, United Arab Emirates

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Abstract We provide confirmed sightings of the elusive Arabian sand cat (*Felis margarita harrisoni*) using trail camera traps in Baynouna Abu Dhabi, United Arab Emirates. A total of 46 photographs were obtained using five camera traps, during 278 trap nights, between March and December 2015. A total of three individuals were recorded of which one was confirmed as a male. About 80 % of the sightings were between 00:00 and 06:00 h, and 39 % were recorded during the full moon phase. These are the first confirmed sightings of the presence of Arabian sand cat in the Western Region of Abu Dhabi Emirate after an unconfirmed sighting reported in 2005.

Keywords Abu Dhabi · Camera traps · Arabia · *Felis margarita harrisoni* · Baynouna

Introduction

Sand cats are the only wild cats living primarily in sandy deserts, ranging from the Kyzylkum and Karakum deserts in Central Asia westwards to the Caspian Sea (Heptner and Sludskii 1972) and southwards to Iran and Baluchistan

(Firouz 2005; Roberts 1977). Westwards their range extends across the Arabian Peninsula to Northern Africa (Schauenberg 1974).

The Arabian sand cat (*Felis margarita harrisoni*) was first recorded in the Arabian Peninsula in 1950. It has been recorded widely but sparsely from Iraq, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Syria, the United Arab Emirate and Yemen, as well as the Sinai Peninsula of Egypt (Gasperetti et al. 1985; Goodman and Helmy 1986; Harrison and Bates 1991; Serra et al. 2007; Mohammad et al. 2013). In the UAE, there have been few confirmed records but some unconfirmed evidence from the Eastern Region of Abu Dhabi Emirate as well (Drew and Tourenq 2005).

The sand cat is a shy and secretive animal, preferring undisturbed and remote habitats; little is known about the status of the Arabian sand cat in the wild in UAE. The Arabian sand cat is strictly a nocturnal hunter and unlikely to be seen during the daytime. Perfectly adapted to the desert, it has hairs on its paws and inside its ears to keep sand out. It does not need to drink a lot of water, gaining liquid from their prey, which is mainly small birds, reptiles and small mammals (Nowell and Jackson 1996). Many aspects of their basic biology and ecology are also poorly known.

The Arabian sand cat is currently classified as near threatened on the IUCN Red List (Mallon et al. 2011). Regional Red Listing classified the Arabian sand cat as near threatened, but it is listed as endangered in the United Arab Emirates and Abu Dhabi Red Lists (Hornby 1996; Banfield et al. 2014). Based on the scarcity of records, Drew and Tourenq (2005) estimated that there were <250 mature individuals in the Emirate of Abu Dhabi. Arabian sand cat populations throughout their range are believed to be declining, due to habitat loss and reduced populations of their prey species. However, there has been lack of conclusive evidences about the total

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population of this species in UAE. One of the reasons for this lack of information might be that it is not easy to study such an elusive species with traditional field study techniques.

Camera traps provide an opportunity to study such an elusive species. It has the advantage of working independently of an observer once they have been set up—at least as long as their batteries and storage permit. Working day and night, camera traps are ideally suited for detecting rare and cryptic species an observer may rarely, if ever, encounter. For example, camera traps in Danum Valley Conservation Area, Sabah, Malaysia recorded the bay cat (*Catopuma badia*) seven times over 3520 trap nights—although the same species was never directly observed by the researchers in this area (Ancrenaz et al. 2012).

The Environment Agency–Abu Dhabi (EAD) is making use of camera trapping technology in Abu Dhabi Emirate to monitor the regionally important and threatened species of mammals and reptiles. The main objectives of our study are (i) to confirm the presence of sand cat in the Baynouna protected areas and (ii) to evaluate the factors particularly the moon nights that might be a relevant factor for the sightings of this species.

Methods

The EAD's Wildlife Assessment and Monitoring team conducted a preliminary assessment of the status of wild animals and plants in the Baynouna protected area (23°58'23 N, 53°18'17 E) between March and December 2015. The total area of the protected area is 776 km²; sand sheets and dunes with dwarf shrub cover comprise 35 % of the total habitat types of the protected area, followed by gravel plains with dwarf shrub vegetation 21 % and forestry plantations 11 %. Moreover, mesas and burqas that have cultural importance encompass 1.3 % of the total habitat types in the protected area. Camera traps deployment was carried out in sparsely vegetated sand sheets and dunes with dwarf shrubs (Fig. 1).

Trail camera traps were used as a tool to record the presence and absence of some of the elusive and nocturnal species of mammals. Camera trap locations were selected within the protected area to record all the nocturnal and crepuscular species of mammals, reptiles and darkling beetles using Reconyx Inc. hyperfire (HC500, HC600 and PC800) camera traps. These cameras run on 12 AA-cell batteries; both Alkaline Energizer and Ultimate Lithium batteries were used together with 8 GB-SD cards for each camera trap. Furthermore, Sherman's live traps (23 × 7.5 × 9 cm) were also used within the study area to assess the abundance of small mammal communities. Sherman trapping is an effective method to detect most small mammal species (Manley et al. 2011).

The cameras were placed with the following settings: (1) advance setting, continuous high-quality images, (2) high

sensitivity, (3) three pictures per trigger and (4) infrared illuminator for nocturnal pictures. All the camera traps were checked periodically for battery level, positioning and to replace memory (SD) cards. The camera traps were mounted on tripods as well as on the sandy ground to capture small mammalian species. Moreover, all the camera traps were baited using tinned cat food to attract the targeted species. Each and every photograph was manually checked to identify the species. Date, time, temperature and lunar phases were assigned to each identified species. To assess the contribution of moon light in sightings of sand cat, we applied linear regression analysis. We used sand cat sightings as a response variable and added the moon light, time and temperature as predictor variables. All the analyses were carried out on MS Excel.

Results and discussion

A total of nine camera traps covering an area of approximately 1990 m², during 278 trap nights, revealed the occurrence of Arabian sand cats in the study area. This is the first confirmed record of the species in Baynouna. A total of 46 sightings were photo-captured during the study period with 16.5 photographs captured per 100 trapping nights. Comparing general body build and size, pelage colour, size and position of ears and black bands around the legs, we conclude that three individuals of sand cat were photo-captured by our camera traps in the study area. The first photo was captured by camera number 2 on 18 April at 4:47 h followed by camera trap number 3 on 7 June 2015 at 05:05 h. Furthermore, camera trap number 4 captured a photograph on 30 June 2015 at 01:31 h and again camera trap number 3 on 24 September 2015 at 01:22 h.

Moreover, a sand cat was photo-captured three times by camera trap number 1 on 29 September 2015 at 02:42 h. Furthermore, a male was recorded by camera trap number 2 on 13 October at 8:06 h. The latest was captured on 15 December 2015 at 21:09 h (Fig. 2). Arabian sand cats were photo-captured several times at camera trap number 3. Following the second sighting at camera trap number 3 on 7 June 2015, efforts were made to increase the number of camera traps from four to nine. Moreover, different flavours of cat food were used to lure the sand cat including tinned fish and chicken. Several trapping projects in Saudi Arabia have successfully used chicken as bait (Abbadi 1992; Ostrowski et al. 2003; Strauss et al. 2007).

Arabian sand cats were observed only on 12 occasions, with most captures ($n = 3$) in the months of June and December 2015 followed by the months of September and November 2015 with two captures in each month.

In Fig. 3, the time and date stamps on the photographs of the Arabian sand cats taken indicate a pattern of nocturnal activity as most pictures ($n = 4$) were taken between 01:00

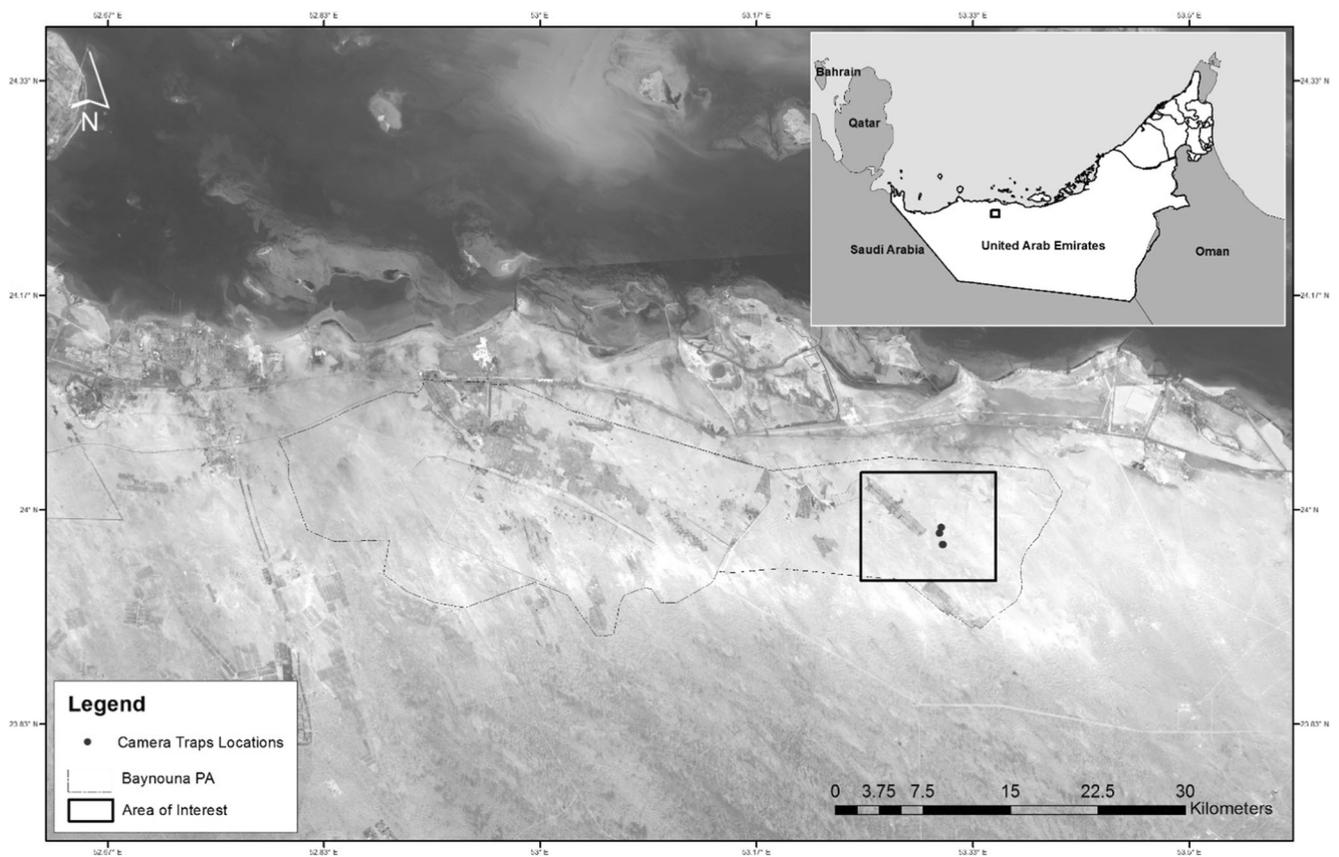


Fig. 1 Map showing area of interest and camera trap locations in Baynouna protected area in Abu Dhabi Emirate

and 02:00 h. In terms of the timing of sand cats sightings, the most photos 80 % were taken between 00:00 and 06:00 h followed by (20 %) taken between 18:00 and 24:00 h.

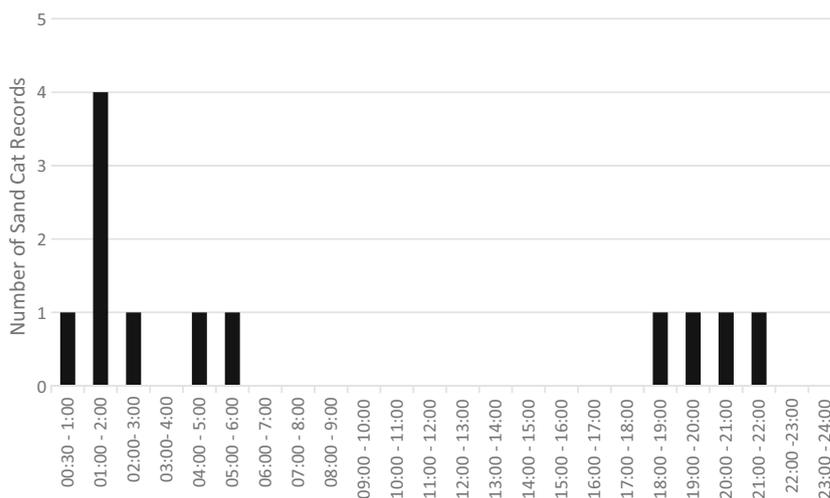
A linear regression analysis was undertaken with the number of photographs of the sand cat taken, and the moon phase divided into five categories (0, 25, 50, 75 and 100) representing no moon, quarter moon, half moon and three-quarter to full moon night. The full moon phase explained about 39 % of the photographic captures of the

sand cat (Fig. 4). The sand cat sightings were found highest during the full moon phase that accounted for 39 %, followed by the first quarter phase with 28 % of the sighting, whereas the lowest sightings (7 %) were recorded during half moon phase. But lunar phases and sand cat recording were not statistically significant. During the course of study, the temperature stamped on the photographs ranged between 11 and 28 °C with an average 19.09 ± 0.90 °C (mean \pm SE) between June and

Fig. 2 Image of sand cat captured in Baynouna protected area by camera trap number 1 on 27 November 2015



Fig. 3 Frequency of sand cat recorded in camera trap along 24 h cycle between March and December 2015



December 2015. Our findings indicate that the Arabian sand cats prefers medium to low temperature for foraging.

The sighting of this secretive animal in the Western Region is highly significant in terms of finding an opportunity to conduct the phylogenetic studies in collaboration with neighbouring countries such as Oman and Saudi Arabia. In the UAE, sand cats have been recorded from inter-dune gravel flats with scattered calcrete hills bordered by sparsely vegetated sand dunes, *Haloxylon salicornicum* shrubs and *Pennisetum divisum* dominated the gravel flats (Cunningham 2002). The study area where the sand cats were photo-captured has sparsely vegetated sand sheets and dunes with dwarf shrubs.

The first live sighting of the Arabian sand cat occurred in 2001 around 35 km northwest of Al Ain (Cunningham 2002). Moreover, there were only four authenticated records documented from 1995 to 2005 despite intensive surveys and

trapping in different habitats between 2002 and 2005 (Drew and Tourenq 2005). Furthermore, skulls, carcasses, tracks, dens and trapping of live animals were also reported from Sweihan, Ghayathi, Near Liwa oasis and Sulayf/Wutayd northwest of Liwa between 1989 and 2005 (Osborne 1992 (cited in Cunningham 2002), Drew and Tourenq 2005). The latest confirmed sightings were reported from Sweihan, Abu Dhabi in November 2012 where a live specimen in poor condition was captured and given to Al Ain Zoo, Abu Dhabi Emirate (Soorae et al. 2012).

During the study period, results from the Sherman trapping near the camera trap locations revealed the presence of a number of small mammals such as Cheesman's gerbil (*Gerbilus cheesmani*) and lesser Jerboa (*Jaculus jaculus*). Moreover, insects such as urchin beetle (*Prionothea cornata*) and various reptile such as Arabian sand skink (*Scincus mitranus*) and gecko species were also photo-captured which apparently indicates plenty of food availability for the sand cat in this protected area. Gerbils (*Gerbillus* spp.), jerboas (*Jaculus* spp.) and hamsters (*Mesocricetus* spp.) and various reptiles and arthropods were found to be the major prey items of sand cats in the Central Asian states (Heptner and Sludskii 1972). Currently, the largest captive group of Arabian sand cats is held at Al Ain Zoo in the UAE. Al Ain Zoo has made the Arabian sand cat one of its conservation focus species.

There have been unconfirmed reports from Baynouna in the Western Region of Abu Dhabi Emirate in 2005 about the presence of the Arabian sand cat. But there is no evidence such as photographs or scientific publications to confirm the presence of sand cats. We provide the photographs of the confirmed sightings of three individuals, one of them identified as a male. Our camera trap records will potentially help contribute with necessary information for recovery

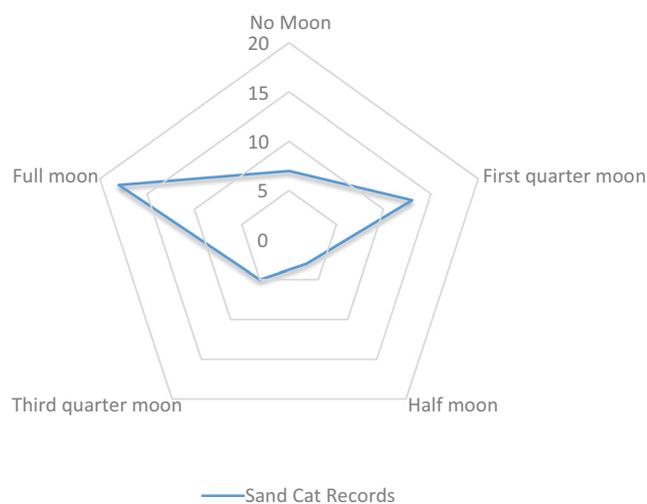


Fig. 4 Number of sand Cat records with respect to moon phase

of the population. As part of EAD's wildlife assessment and monitoring program, new areas will be explored to locate the possibility of new undetected populations.

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