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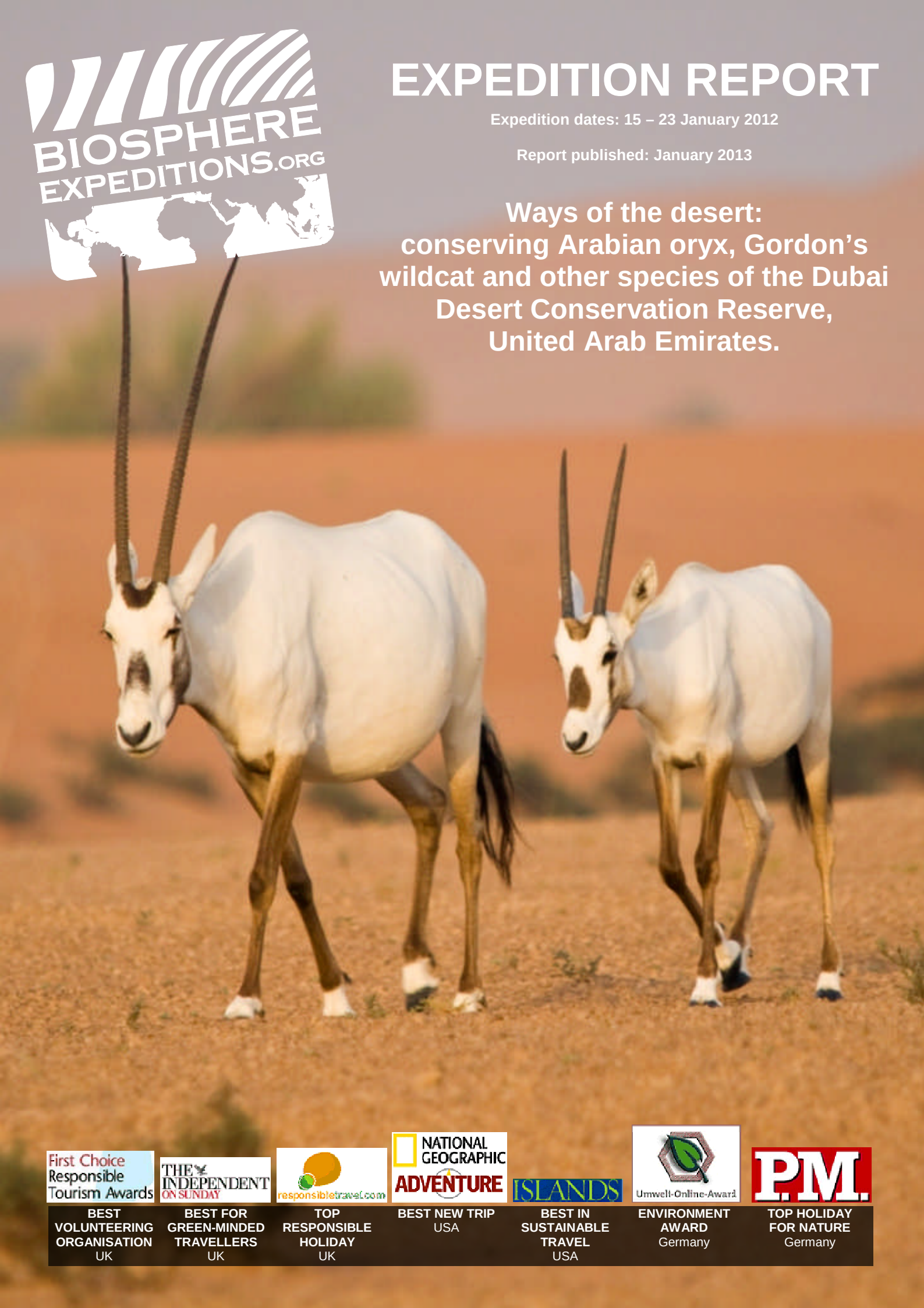
EXPEDITION REPORT

Expedition dates: 15 – 23 January 2012

Report published: January 2013

Ways of the desert: conserving Arabian oryx, Gordon's wildcat and other species of the Dubai Desert Conservation Reserve, United Arab Emirates.



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Ways of the desert: conserving Arabian oryx, Gordon's wildcat and other species of the Dubai Desert Conservation Reserve, United Arab Emirates.

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Authors:
Stephen Bell, Peter Roosenschoon & Greg Simkins
Dubai Desert Conservation Reserve

Matthias Hammer & Adam Stickler (editors)
Biosphere Expeditions

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Abstract

This study was part of an expedition to the Dubai Desert Conservation Reserve in the United Arab Emirates run by Biosphere Expeditions from 15 to 23 January 2012. The aim was to conduct the first systematic survey of Arabian oryx (*Oryx leucoryx*) and Gordon's wildcat (*Felis silvestris gordoni*) in this area. This was achieved through three main survey activities: Gordon's wildcat live capture survey and camera trapping as well as Arabian oryx monitoring. In addition the expedition team members also recorded any other species observation or encounters while in the field.

The live capture survey of 48 trap nights resulted in one capture of a feral hybrid cat. The camera traps recorded 316 pictures over 56 camera days at a capture rate of 2.46. Fourteen oryx herds where surveyed, which gave a male:female sex ratio of 2:3 and an average condition score of 2.81. In conjunction with the camera trap and Arabian oryx monitoring data, the species encounters data provided a snapshot of species distribution and diversity, which will serve as a comparative baseline for future expeditions data.

Through provision of a long-term dataset, surveys will give managers a better understanding of the Arabian oryx and Gordon's wildcat population in the reserve. Data on movement, habitat and food preferences, as well as inter- and intra-species interaction will help managers ascertain major threats and help improve management.

الملخص العربى

يعتبر هذا التقرير جزءاً ونتيجة للرحلات الإستكشافية والتى تمت داخل حدود محمية دبى الصحراوية فى دولة الإمارات العربية المتحدة. تشرف على إقامة تلك الرحلات الإستكشافية البحثية مجموعة (بيوسفير الإستكشافية) بالتعاون وتحت إشراف إدارة وباحثين محمية دبى الصحراوية وذلك فى الفترة من 15 يناير وحتى 23 يناير لسنة 2012 ميلادية.

إن الهدف الأساسى لتلك الدراسات والرحلات البحثية هو إجراء مسوح ودراسات على أساس علمى ومنهجى وذلك لكل من حيوان المها العربى وكذلك للقط جوردون البرى وقد تحقق ذلك من خلال تطبيق ثلاث أنشطة رئيسية لدراسة جميع مناطق المحمية:

1- وضع العديد من المصائد للإمساك بالقط جوردون البرى.
2- مراقبة الحياة البرية عن طريق مصائد الكاميرات.
3- مراقبة ودراسة طبيعة طرق حياة المها العربى.

بالإضافة إلى ذلك قام أعضاء الفريق بتسجيل ملاحظاتهم عند وجود أى أنواع أخرى لم يتم تسجليها من قبل داخل المحمية.

- تم نصب وتثبيت ثمانية وأربعون مصيدة كل ليلة من أجل محاولة الإمساك بالقط جوردون البرى ولكن للأسف كانت هناك صعوبة فى ذلك وفى المقابل تم إصطياد قط من الأنواع الهجينة الضالة.
- تم تسجيل ثلاثمائة وستة عشر صورة على مدار ستة وخمسون يوماً من خلال الكاميرات بمعدل تسجيل حوالى 2.5.
- تم مراقبة أربعة عشر قطيع من قطعان المها العربى الموجودة داخل حدود المحمية مما أعطى نتائج عن نسب الذكور إلى الإناث والتى كانت 2:3 (ذكرين لكل ثلاث إناث)، وبمقارنة الحالة الصحية للقطيع لوحظ أنه (3) على مقياس جامعة كاليفورنيا والذى تم وضعه عام 2003. (المقياس من 0 إلى 5)

تلخيصاً لما سبق: بربط جميع النتائج التى تم الحصول عليها أعطى ذلك لمحة سريعة ملخصة عن توزيع وتنوع الحياة البرية والتى يمكن أن تساعد مستقبلاً صناع القرار عند إجراء أى بحوث لمقارنة الدراسات ببعضها البعض.

متوقع أن تعطى الدراسات المتتالية لتلك المنطقة رؤية أوضح وأشمل لمتخذى القرار بالمحمية عن حالة المها العربى والقط البرى وتوزيعاتهم الجغرافية وكذلك عن طبيعة تحركاتهم وبيئاتهم بالإضافة إلى إختياراتهم الغذائية وكذلك العلاقات التفاعلية بين النوع الواحد وبينه وبين الانواع الاخرى المتواجدة بنفس البيئة مما يساعد إدارة المحمية لتحديد المخاطر الموجودة أو المحتملة وبالتالى يتبع ذلك تحسين جودة إدارة محمية دبى الصحراوية.

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1. Expedition review

M. Hammer & A. Stickler (editors)
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Our expeditions are open to all and there are no special skills (scientific or otherwise) required to join. Our expedition team members are people from all walks of life, of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This expedition report deals with an expedition to the Emirates that ran from 13 to 25 January 2012 with the aim of assisting scientists of the Dubai Desert Conservation Reserve (DDCR) to gather scientific data on Arabian oryx, Gordon's wildcat and Macqueen's bustard in order to gain a better understanding of their ecology so that informed management decisions can be made. All three species are on the IUCN Red list and the expedition's work will help to ensure the survival of the species in the wild.

In gaining a better understanding of the Arabian oryx (*Oryx leucoryx*), Gordon's wildcat (*Felis silvestris gordoni*) and Macqueen's bustard (*Chlamydotis macqueenii*), through observations on their movements, habitat and food preferences and through their interaction with other species, this project is able to ascertain what the major threats are to their continued survival. Based on this, project scientists can then develop appropriate management plans that will provide a safe environment for the study species to thrive in.

1.2. Research area

The Dubai Desert Conservation Reserve (DDCR) is an area of 225 km² that comprises 4.7% of Dubai's land area. Conservation in this area started in 1999 when the Al Maha Desert Resort was opened within a protected area of 27 km² (Al Maha Reserve). One of the first conservation actions of the reserve was a wildlife reintroduction programme for Arabian oryx and the two indigenous gazelle species (sand as well as Arabian gazelle), as well as programmes for the protection of other key components of the ecosystem, in particular the vegetation (close to 6000 indigenous trees were planted in 1999 to create a natural seed bank which has now led to germination of indigenous plants).

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In 2001 the resort management began a major environmental audit of the surrounding area. Following this audit a proposal was submitted to the Dubai government on the formation of a formal national park. The proposal was accepted and sanctioned almost immediately and work began on protecting the area to be known as the Dubai Desert Conservation Reserve.

Figure 1.2a. Flag and location of United Arab Emirates and study site.

An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at Google Maps.

Today the DDCR is a representative of the Dubai inland desert ecosystem and is characterised by a sandy desert environment consisting of sand dunes interspersed with gravel plains. There is one rocky outcrop in the north of the reserve, which provides nesting sites for the desert eagle owl and two groves of rare ghaf trees (*Prosopis cineraria*).

The Al Maha Reserve (27km²) was the core area for the reintroduction of the Arabian oryx, Arabian gazelle and sand gazelle. Currently the DDCR contains approximately 420 Arabian oryx from the 100 that were originally re-introduced in 1999. Both the Arabian oryx and the gazelle species have expanded into the DDCR naturally as the amount of human activity has decreased and been controlled. Estimated populations of approximately 300 Arabian and 100 sand gazelle can now be seen throughout the DDCR.

1.3. Dates

The expedition ran from 13 – 25 January 2012 and was composed of a team of international research assistants, guides, support personnel and an expedition leader (see below for team details).

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1.4. Local conditions & support

Expedition base

The expedition field base was composed of a Bedu style tent camp (of a Bedu mess tent and modern one and two person dome tents for sleeping in). Each person had their own dome tent to sleep in (larger tents for couples) and there were campsite-style showers and toilets. An expedition cook was with the team and cooked in the field. Vegetarians and other special diets were catered for.

Weather

The UAE has a subtropical, arid climate with sunny blue skies most of the year. Over the eight days of the expedition the weather varied from clear to lightly overcast skies and even some rainfall. The mean low and high temperatures during the expedition were 14.1º and 24.8º C respectively. Rainfall (2.1 mm) was recorded during the evening of 20 and morning of 21 January 2012 (on 21 January the minimum temperature dropped to 7 º C.

Field communications

There was an (emergency) telephone close to base and mobile phones will largely worked in and around camp and around the study site. In the field, two-way radios and mobile phones were used for communication between research teams.

The expedition leader also sent an expedition diary to the Biosphere Expeditions HQ every few days and this (text only) diary appeared on www.biosphere-expeditions.org/diary for friends and family to access. Excerpts of the diary with multimedia content such as pictures and video clips also appeared on the Biosphere Expeditions' social media sites such as Facebook, Google+ and the Wordpress blog.

Transport and vehicles

Team members made their own way to the Dubai assembly point in time. From there onwards and back to the assembly point all transport and vehicles, kindly provided by Land Rover and DDCR, were provided for the expedition team, for expedition support and emergency evacuations.

Medical

The expedition leader was a trained first aider, and the expedition carried a comprehensive medical kit. Further medical support was provided by a network of first-rate private and government hospitals in Dubai. Safety and emergency procedures were in place. There were no medical incidences during the expedition and none of the medical support network or safety procedures were called upon.

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1.5. Scientists

Greg Simkins, who is South African by birth, is the Conservation Manager for the Dubai Desert Conservation Reserve (DDCR) and has worked in the field of conservation and protected areas management since 2001. Greg began his career as a field guide in 1999. In 2001 he became a Reserve Officer in the DDCR and was heavily involved in the planning and implementation of eco-tourism activities within the protected area, which was created in 2003. In 2003 Greg took on his current role and was appointed Conservation Manager for the DDCR. He is now responsible for the overall management of the Reserve and has been at the forefront of its development from conception in 2003 to its current international recognition. He also plays a major role in conducting key conservation research studies throughout the DDCR. Prior to coming to the Middle East, Greg studied at the University of Natal, Pietermaritzburg in Kwazulu-Natal, where he also did graduate work while, including resource assessment and allocation for a farm, soil surveys and research at an ostrich export farm in the Eastern Cape.

The expedition's field scientist is Stephen Bell. Born in South Africa, he graduated in Biology in 1996, with a bachelors degree from the University of Witwatersrand, South Africa. Stephen spent most of his career guiding throughout South Africa and Zambia in private game lodges. He was also a trails guide in the greater Kruger National Park where he conducted 5 day walking safaris. Stephen fell in love with the fauna and flora of the Arabian desert whilst he spent six years guiding in the area at the Al Maha Desert Resort & Spa. Stephen joined the DDCR as a Conservation Officer in 2009 and works closely with on-going conservation projects on the reserve. Stephen has a passion for birding and is always keeping an ear out for the odd bird call. Stephen has always had a keen interest in wildlife from a young age he was always found playing with all sorts of creepy crawlies. During his off time Stephen can be found with mates diving around the world.

Peter Roosenschoon fell in love with nature in his early years while camping and hiking. After first working in the corporate world, in 1997 he decided to change his perspective towards wildlife and became more involved with voluntary work related to wildlife. In 2003 he became a professional field guide working in Southern Africa until in 2007 he started working as a guide at the Al Maha Desert Reserve and Spa. After working as a guide in the reserve for three years, he joined the Dubai Desert Conservation Reserve as a conservation officer. His roles and interests in this position are tour operator relationships, arthropods and Gordon’s wildcat.

1.6. Expedition leader

The expedition was led by Malika Fettak. Malika is half Algerian, but was born and educated in Germany. She majored in Marketing & Communication at the University of Frankfurt, which led her to jobs in PR & Communications. She has travelled widely, especially in Africa and Northern Europe. Her love of nature and the outdoors, and taking part in a few Biosphere expeditions, persuaded her that a change of career was in order and here she is since 2008, leading expeditions and desperately trying to make herself useful around the office :) Malika is a keen sportswoman - triathlon, skiing, volleyball, etc. and enjoys the outdoors.

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1.7. Expedition team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds. They were (with countries of residence):

Evelyn Brey (UAE), Anne Crauser (Germany), Peter Gosnell (journalist) (Australia), Ingrid Kletzl (Austria), Nick Leech (journalist) (UAE), Vanhan Nguyen (France), Tess Sansome (USA).

Also present for part of the expedition were journalists Colin Simpson and Daniel Birkhofer, as well as Biosphere Expeditions founder and executive director Dr. Matthias Hammer.

1.8. Partners

The main partner on this expedition is the Dubai Conservation Board, a government-appointed organisation concerned with the conservation and protection of the Dubai inland desert. Other partners include the National Avian Research Centre.

Corporate support was gratefully received from Land Rover & Swarovski Optik, who supplied high-quality vehicles and optical instruments respectively.

Biosphere Expeditions also gratefully acknowledges grant support from the Ford Motor Company Conservation and Environmental grants.

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1.9. Expedition Budget

Each team member paid towards expedition costs a contribution of £980 per seven-day slot. The contribution covered accommodation and meals, supervision and induction, all maps and special non-personal equipment, all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses such as telephone bills, souvenirs, etc., as well as visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how these contributions were spent are given below.

Income	£
Expedition contributions	2,940
Grants	4,788
Expenditure	
Start-up costs includes setting up base, research, staff, logistics, etc.	1,815
Staff includes local & international salaries, travel and expenses	3,611
Research includes equipment and other research expenses	1,276
Transport includes fuel, taxis and other local transport	313
Base includes food and camping fees	1,646
Administration includes local sundries and fees	308
Team recruitment Emirates as estimated % of PR costs for Biosphere Expeditions	6,400
Income – Expenditure	**- 7,640**
Total percentage spent directly on project	**199%***

*This means that in 2012, the expedition ran at a loss and was supported over and above the income from the expedition contributions and grants by Biosphere Expeditions.

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1.10. Acknowledgements

This study was conducted by Biosphere Expeditions, which runs wildlife conservation expeditions all over the globe. Without our expedition team members (listed above) who provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff (also mentioned above) were central to making it all work on the ground. Biosphere Expeditions would also like to thank Land Rover, Cotswold Outdoor, Motorola, Swarovski Optik, Globetrotter Ausrüstung and the Friends of Biosphere Expeditions for their sponsorship and/or in-kind support.

1.11. Further information & enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Copies of this and other expedition reports can be accessed via at www.biosphere-expeditions.org/reports. Enquires should be addressed to Biosphere Expeditions via www.biosphere-expeditions.org/offices.

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2. Desert species surveys

2.1. Introduction and background

The United Arab Emirates, and Dubai in particular, is well known for its rapid development over the past 40 years as well as for the mega-construction projects such as the Palm Islands and the Burj Khalifa (the world's tallest building). Less well known is the diversity and beauty of the natural environment, from the dugongs and corals in the Arabian Sea, the flamingos in the khors (inlets) of the coastline, the rugged Hajar mountain range, to the serene splendour of the sandy dune inland desert. Also little known is that the largest piece of land given to any single project in Dubai was for the establishment of the Dubai Desert Conservation Reserve (DDCR); at 225 km², 4.7% of Dubai's total land area.

Arabian oryx is one of four oryx species, all of which are adapted to arid and semi-arid environments, locally known by its Arabic name of Al Maha, the Arabian oryx was first described in 1777. Endemic to the Arabian Peninsula, the Arabian oryx's historical range was across Oman, Saudi Arabia, Jordan, United Arab Emirates, Yemen, Kuwait and Iraq, but the advent of firearms saw their rapid decline due to hunting all across Arabia. Since 1986 Arabian oryx is classified as "Endangered" on the IUCN Red List, but was already "very rare and believed to be rapidly decreasing in numbers" in 1965. The Arabian oryx is the largest of the antelopes in the region and it is very well adapted to the extremely arid environment. It is culturally significant in Arabia, revered for its beauty, common in poetry and as a woman's name, Maha. Re-introduced into the DDCR in 1999, the population has steadily grown from the original 100 individuals to over 400 today.

For the next phase of the oryx project, local scientists need a greater understanding of how oryx fit into the DDCR's natural environment, which habitats and plants they prefer, what the social structure of the herd is and how it is affected by their environment. This can only be achieved through monitoring and keen observation for extended periods. Biosphere Expeditions provides the manpower to complete this task that will help the DDR achieve its ultimate goal of a sustainable herd of Arabian oryx within the reserve.

The Gordon's wildcat is the same size as a domestic cat. The background colour of its coat ranges from reddish to sandy yellow to tawny brown to grey, and is typically marked with faint tabby stripes and spots. Their preferred habitat is the vegetated dunes, gravel plains and mountains, in which they hunt a mainly carnivorous diet at night. It is thinly distributed throughout the Nubian, Saharan and Arabian deserts, where it is generally restricted to mountains and dry watercourses. The biggest threat to the survival of the Gordon's wildcat as a species is the interbreeding with feral or domestic cats, which could lead to its extinction as a distinct species. Very little is known about the Gordon's Wildcat population within the DDCR; the last population estimate was done in 2004. The expedition has enabled DDCR scientists to update information on population size and distribution as well as conduct a DNA study of the species; information that is important for informed management decisions to be made and threats to be averted.

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The Macqueen's bustard is a large bird in the bustard family. It is 60 cm long with a 140 cm wingspan. It is brown above and white below, with a black stripe down the sides of its neck. In flight, the long wings show large areas of black and brown on the flight feathers. Sexes are similar, but the female is smaller and greyer above. It breeds in deserts and other very arid sandy areas in south-western Asia. Like other bustards, the Macqueen's bustard has a flamboyant mating display raising the white feathers of the head and throat and withdrawing the head. It is classified as Vulnerable on the IUCN Red List due to a steady decline in its population. The principal threat is from overhunting by Middle East falconers, largely but not exclusively on the species' wintering grounds. Habitat loss and degradation compound this problem. Due to the serious decline of this species in the wild the UAE has, through the National Avian Research Centre (NARC), implemented large scale captive breeding to facilitate a release programme in both the UAE and in the species' breeding grounds. Bustards released elsewhere in the UAE made their way to the DDCR as an area of suitable habitat, so it was on this compelling evidence that the DDCR was selected for further releases. To date 199 Macqueen's bustards have been released into the DDCR, 26 of which carry PTT satellite tracking devices. Further information on their habits and preferences is required, especially on their breeding behaviour in the UAE and this expedition has helped to remove this gap in knowledge so that viable populations can be established.

Expedition members assisted DDCR scientists in three important surveys during the expedition: Gordon's wildcat live capture survey and camera trapping, as well as Arabian oryx monitoring, in addition to these surveys the expedition members were asked to record any species observation or encounters while in the field. During the expedition, team members were split into three groups in order to conduct the various surveys, in the north, central and southern zones of the DDCR.

2.2. Methods

2.2.1. Gordon's wildcat live trapping survey

'The successful capture and release of an animal is not only determined by the capture of the animal, but also by how the animals are handled, transported and kept after capture' (Ebedes et al. 2000).

Gordon's wildcat in the UAE cover a range of approximately 25 km² (Phelan & Sliwa 2005). In order to thoroughly survey the entire DDCR, 16 traps were used and dispersed at randomly selected points throughout the reserve. Each trap had a trapping range of 13.23 km². Traps were set for a total of three trap nights on each of the 16 sites.

Tomahawk live traps (www.livetrap.com) were used and set in the late afternoon. All traps were baited with tinned sardines and a cat attractant (Catnip or Valeriana spray). The bait was placed in far enough back the traps (using an extendable reacher/grabber) so the target species is forced to step on the pressure plate. The pressure plate was covered with sand to give the trap a more natural feel and ensure that the target species is at ease when entering the trap. Following Breitenmoser (personal communication), a cat attractant was sprayed around the trap to enhance the chances of capture. Traps were checked and closed the following morning and all data and observations recorded. This included date, time, weather conditions as well as additional information of tracks surrounding the trap.

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When a cat was trapped, the trap was covered with a towel to calm the animal down. A 23 cm × 27 cm crush plate, attached to a wooden rod, was then inserted at the front of the trap. Then slowly and gently the cat was pushed towards the back of the cage. This secures the cat and enables it to be injected through the wire mesh of the cage, with the cat sedative 'Dormitor' (dosage 0.1 ml/kg) to immobilise the cat (see Figure 2.1.1a below).

Figure 2.1.1a. Crush plate and injection technique.

Once immobilised, the cat was removed from the cage and standard body measurements were taken. A small skin sample for DNA analysis was collected. A microchip was placed behind the left ear and the microchip number recorded for re-identification at recapture. All procedures were conducted as quickly as possible and in the immediate vicinity of the trap. On completion of procedures, the cat was returned to a covered release box and moved to an appropriate location. Antisedan (dosage 0.1 ml/kg) can be injected to reverse the effects of the Domitor, if necessary. Alternately, the cat can be left to recover from the anaesthesia on its own, which may take several minutes.

2.2.2. Camera trapping

As many species in the desert environment are both nocturnal and elusive, it is difficult to gather reliable information on their populations. A camera trap triggers when an animal passes in front of an infrared and/or motion detector. This has the advantage of detecting, with equal efficiency, both nocturnal and diurnal activities, while having minimal environmental disturbance. The camera trap survey aims at recording the presence (or absence) of elusive and nocturnal species, in particular the smaller carnivores, within the DDCR.

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14 camera traps, 8 Cuddlebacks, 4 Reconyx RC60 and 2 Bushnell Trophy Cams, were deployed throughout the reserve (see Figure 2.2.2b), at randomly selected points: five in the Northern part of the reserve, four in the central area and five in the Southern part of the reserve. All cameras were deployed for a period of seven days and were collected on the last day of the expedition.

Data from each site were recorded at deployment. Memory cards were collected and all photos downloaded at the conclusion of the expedition. Photos were then classified, species identified and the data recorded into a spreadsheet.

Figure 2.2.2a. Expedition participants setting up a camera trap (image courtesy of S. Bell).

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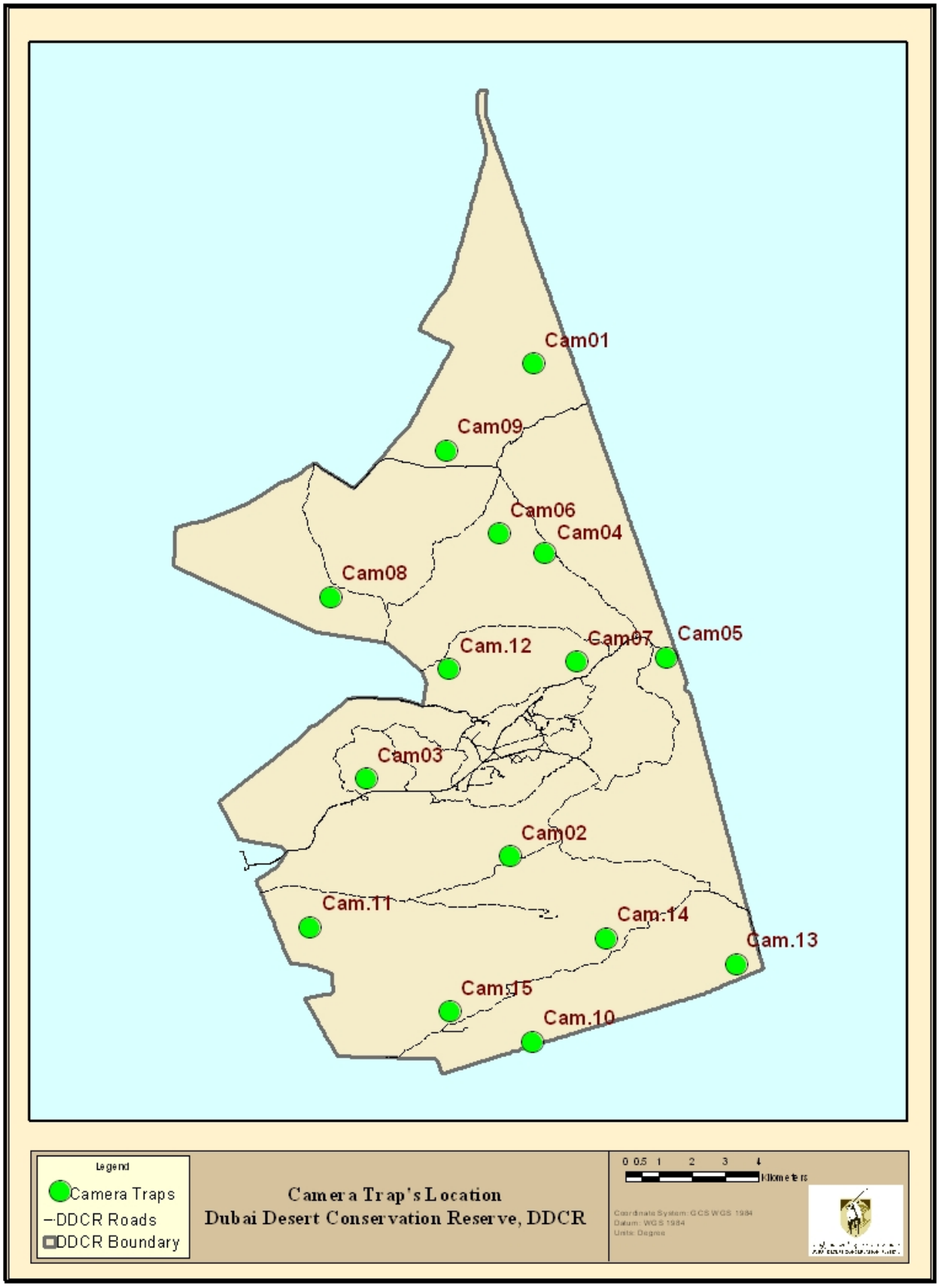

Figure 2.2.2b. Location of camera trap sites within the Dubai Desert Conservation Reserve.

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2.2.3 Arabian oryx monitoring

The main purpose of this survey was to provide a measurable, quantitative and informative indicator of the composition, fitness and condition of the Arabian oryx herd in the DDCR. This was done through obtaining an accurate indication of the sex ratio and age profile (adults, juveniles and calves) of each herd in conjunction with using an adapted body condition scoring method previously used for cattle (El Alqamy 2010, Gilbert and Woodfine – personal communication).

Figure 2.2.3a. Monitoring an Arabian oryx herd.

2.2.4. Species encounter surveys

Whilst conducting the main survey tasks above, participants were also tasked to record all observations of other species on a separate data sheet. Data to be recorded included date, time, species, total number, sex and age (if possible), current GPS position, bearing and distance from current position as determined with the aid of a compass and laser range finder.

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2.3. Results

2.3.1. Live trapping survey

Participants set 16 live traps throughout the reserve resulting in a total of 48 trapping nights (3 nights x 16 traps). This trapping effort resulted in only one capture of a hybrid/feral cat, which was removed from the reserve. Future expeditions will show whether this is a good yield for the trapping effort expended.

2.3.2. Camera trapping

A total of 316 pictures were captured during the expedition of which 46.5% were classified as live (containing a subject) (Figure 2.3.2a). This refers to 138 pictures of wild or feral animals. (Table 2.3.2a) Over 56 camera days (total functional days of all cameras) resulted in a capture rate of 2.46.

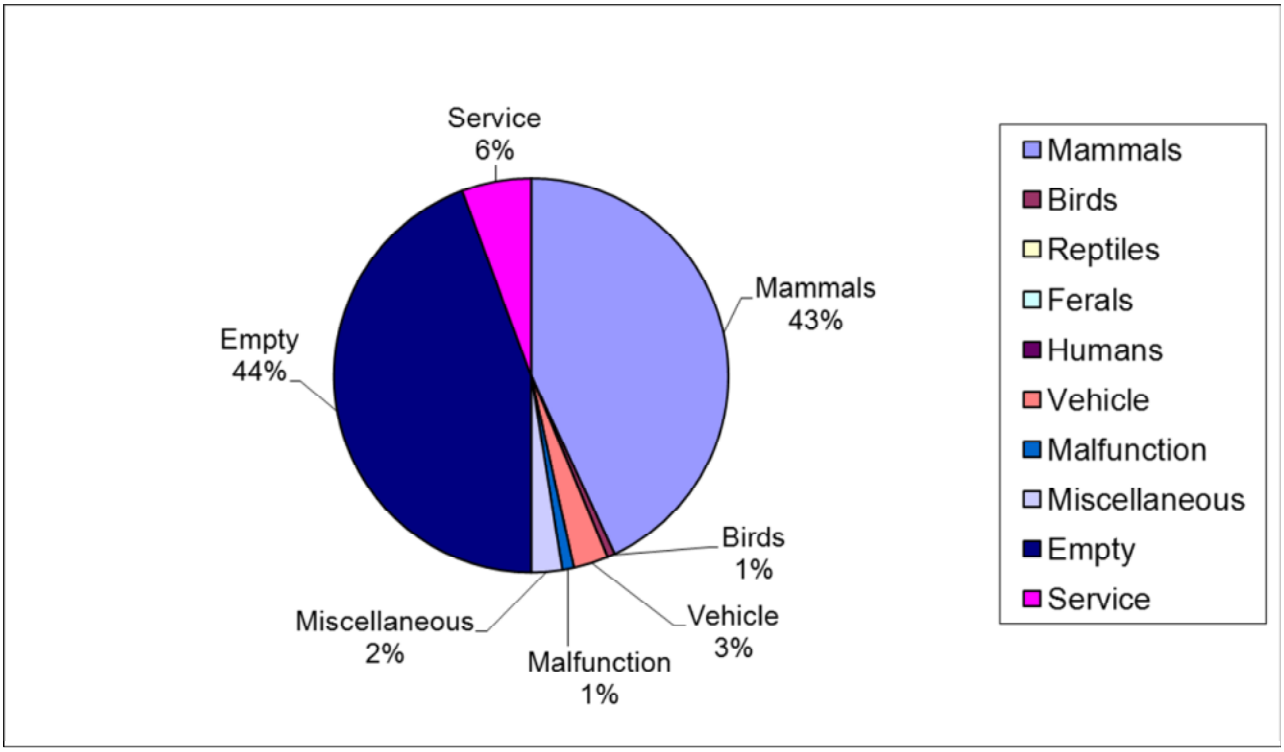

Figure 2.3.2a. Subjects of pictures taken by the camera traps.

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Table 2.3.2a. Summary of pictures taken by camera trap.

	Camera trap number															Total	Capture rate
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Species																	
Oryx	0	2	1	0	0	0	1	0	0	0	7	0	1	0	0	12	0.21
Arabian gazelle	0	0	2	0	0	0	0	0	0	3	0	0	1	2	2	10	0.18
Sand gazelle	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	7	0.13
Arabian red fox	0	5	5	0	0	0	0	0	0	1	34	0	8	20	21	94	1.68
Gordon's wildcat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Feral cat	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.02
Arabian hare	1	0	3	0	0	0	0	0	0	0	0	0	1	2	5	12	0.21
Brown-necked raven	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.02
Golden eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.02
Total	**2**	**7**	**12**	**0**	**0**	**0**	**1**	**0**	**0**	**4**	**41**	**0**	**11**	**29**	**31**	**138**	**2.46**

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2.3.3. Arabian oryx monitoring

A total of 14 Arabian oryx herds where surveyed as per table 2.3.3a below. Herd size ranged from 4 to 32 individuals. Male:female sex ratios were 2:3 and herd age profile on average was three adults for every one juvenile and calf (3:1:1). 70 individual oryx were assessed, resulting in an average condition score of 2.81.

Table 2.3.3a. Herd survey summary.

Date	Time	X	Y	Habitat	M	F	Juv.	Calv.	Oth.	Total
21-01-12	15:35	55.40.42.1	24.47.47.1	2			6	3		32
21-01-12	16:28	55.40.56.1	24.48.31.2	1 & 2				1		11
21-01-12		55.41.25.8	24.48.08.7					2		18
21-01-12	15:05	55.40.12.5	24.45.12.5	3						14
20-01-12	08:14	55.43.18.4	24.45.03.2	1	1		1			8
20-01-12	09:10	55.41.50.8	24.44.36.5							4
20-01-12		55.41.13.2	24.44.25.2					2		18
20-01-12	09:13	55.39.33.3	24.57.57.6	Nazwa	4	7	1	0	15	27
19-01-12	17:10	55.42.64.1	24.48.77.1		1	4			1	6
19-01-12	13:25	55.38.8.8	24.51.17.1	3			11	11		18
18-01-12	09:35	55.28.21.0	24.50.31.3	V-Dune	2	4		1		7
18-01-12	10:35	55.37.57.8	24.51.29.9	S-Dune	2	4	2	2	3	18
18-01-12	11:50	55.37.42.1	24.51.38.4	S-Dune	2	2				10
18-01-12	07:52			S-Dune	5	14	2	1	3	25

2.3.4. Species encounter survey

The pie chart below (Table & Figure 2.3.4a.) shows two 0% for Arabian red fox and Arabian hare. Both of these species are mainly nocturnal and fairly shy and were not target species.

The two species with the highest numbers were firstly Arabian Oryx, a target species for the expedition and the reserve's dominant species. Secondly, the Arabian gazelle numbers were high as this species is also common and is found all over the reserve.

Sand gazelle had the third highest percentage. When the reserve first started in 2004 this species was only found in the southern part of the reserve and was a fairly skittish species, always taking flight when approached. In recent years we have noticed a shift in their movements, confirmed by the expedition. They are now found in the central parts of the reserve and even in the northern parts. When the reserve first started there was only a small population of this species and the southern part of the reserve had the least human disturbance. Secondly, in the first two years of the reserve there were still free-roaming camels. Once they had been removed, the natural vegetation started to recover, which gave the growing sand gazelle population room to expand into.

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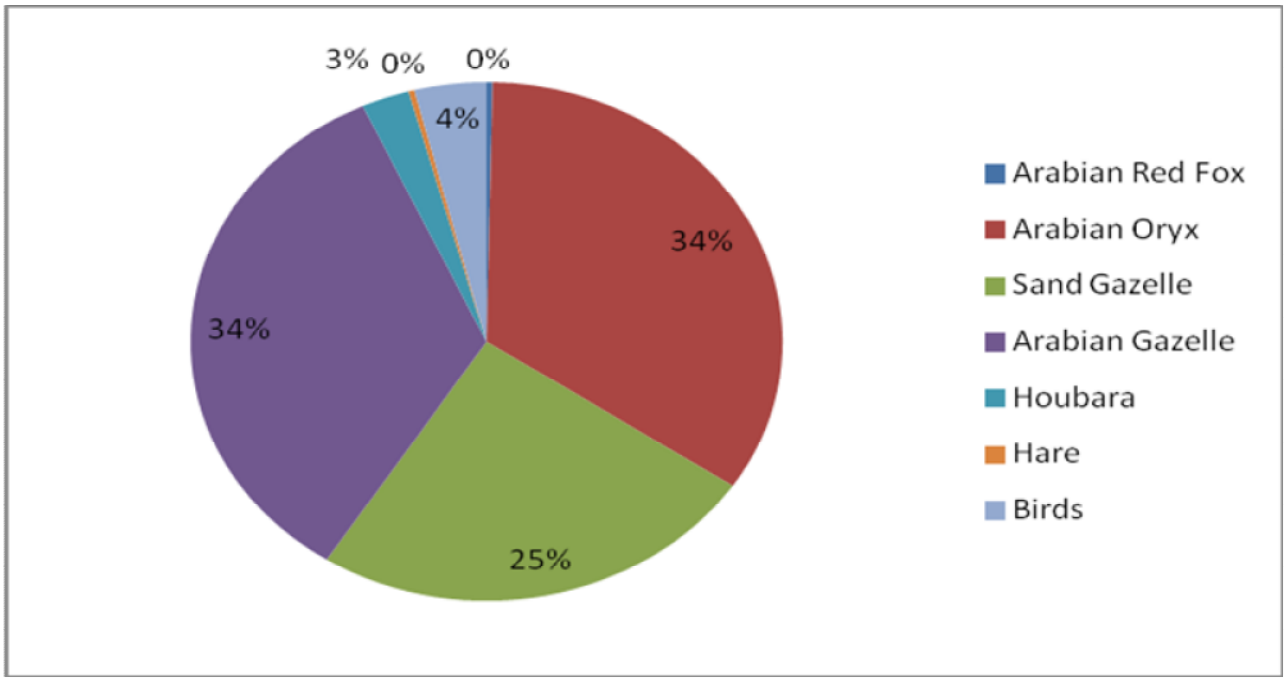
Table & Figure 2.3.4a. Species observed.

Species	Arabian red fox	Arabian oryx	Sand gazelle	Arabian gazelle	Houbara bustard	Arabian hare	Birds
Total	2	208	151	205	16	2	24



Houbara bustards were observed 16 times (3%) during chance encounters during the expedition. In the general birds category, two fairly rare species of birds were observed during the expedition: golden eagle and lappet-faced vulture.

2.4. Discussion and conclusions

2.4.1. Data analysis

Camera trapping, species encounters and oryx herd survey data were combined for further analysis and interpretation. Two main outcomes of this were predicted distributions for five species within the DDCR and a predicted diversity index for the reserve.

2.4.2. Species distribution predictions

One of the most commonly used techniques for species distribution predictions is inverse distance weighted (IDW) interpolation of ESRI® Arc Map™ 10.0. Within this piece of software, the spatial analyst extension provides tools for spatial data analysis that applies statistical theories and techniques to the modelling of spatially referenced data. Inverse distance weighted methods determine cell values using a linear-weighted combination set of sampling points, based on the assumption that the interpolating surface should be influenced mostly by the nearby points and less by the more distant points. The interpolating surface is a weighted average of the scatter points and the weight assigned to each scatter point diminishes as the distance from the interpolation point to the scatter point increases.

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Arabian oryx

There are high density levels of Arabian oryx in the reserve's far North, North Western and central parts (see Figure 2.4.2a). This matches where the oryx feeding points are in the reserve and where team members made most of the observations of the big oryx herds. Other groups of oryx are known not to use the feeding points and to frequent other parts of the reserve. The distribution would be far more evenly distributed if these smaller groups had been recorded during the surveys. For the 2013 expedition we will concentrate more on these smaller groups in order to obtain an even clearer picture of oryx distribution across the reserve.

Sand gazelle

Sand gazelle were found to be mainly distributed in the Southern part of the reserve (see Figure 2.4.2a). The sand gazelle is much more skittish and wary of humans. The Southern part of the reserve has less human activity and because of this is more suited for the species. In addition, less human activity mean more stable dunes, which in turn results in more dune grass preferred by the species.

Arabian gazelle

Arabian gazelle distribution map showing scattered pockets around the reserve, (see Figure 2.4.2a). The Arabian gazelle is the more common of the two gazelle species in the reserve. The original population spread out from what was used to be a confined area as defined by a fence, which has since been removed, around the Al Maha resort. From there the population spread to its preferred rocky habitat in the north and south, with a nucleus remaining around Al Maha.

Red fox

The prediction map of the red fox is not a true reflection of the distribution of the species. The red fox was not a target species of the expedition and it is a mainly nocturnal species, so the observations taken by the expedition during the day are not representative. The distribution on the map (Figure 2.4.2b below) is based on the numbers of foxes seen during the expedition during daylight. From a previous report done on red fox den density in the reserve we know that they are widespread and currently the apex predator of the reserve.

Arabian hare

As for the red fox, the Arabian hare was not a target species of the expedition, so the map is again based on random daylight sightings by expedition participants.

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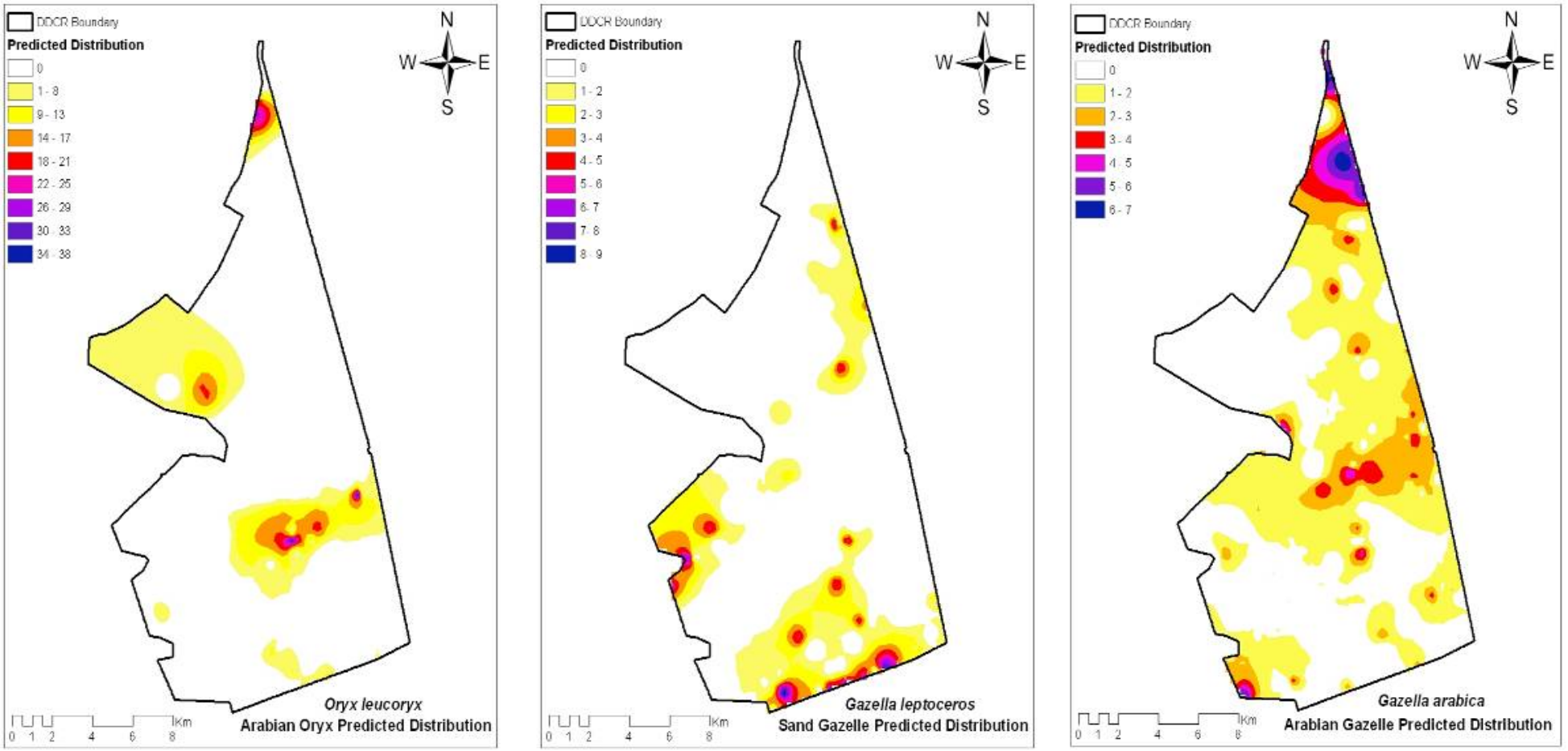

Figure 2.4.2a. Predicted species distributions for Arabian oryx, sand gazelle and Arabian gazelle.

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Predicted diversity

Three diversity indices were used to predict species diversity across the DDCR.

Type 1 indices: Shannon-Wiener's and Brillouin's indices (Peet 1974), which are more sensitive to the rare species of the reserve, were mainly influenced by the distribution of Arabian hare, Macqueen's bustard and other bird species. The Western part of the reserve between two of the entrance gates, which has almost zero human activity, showed the highest area of diversity.

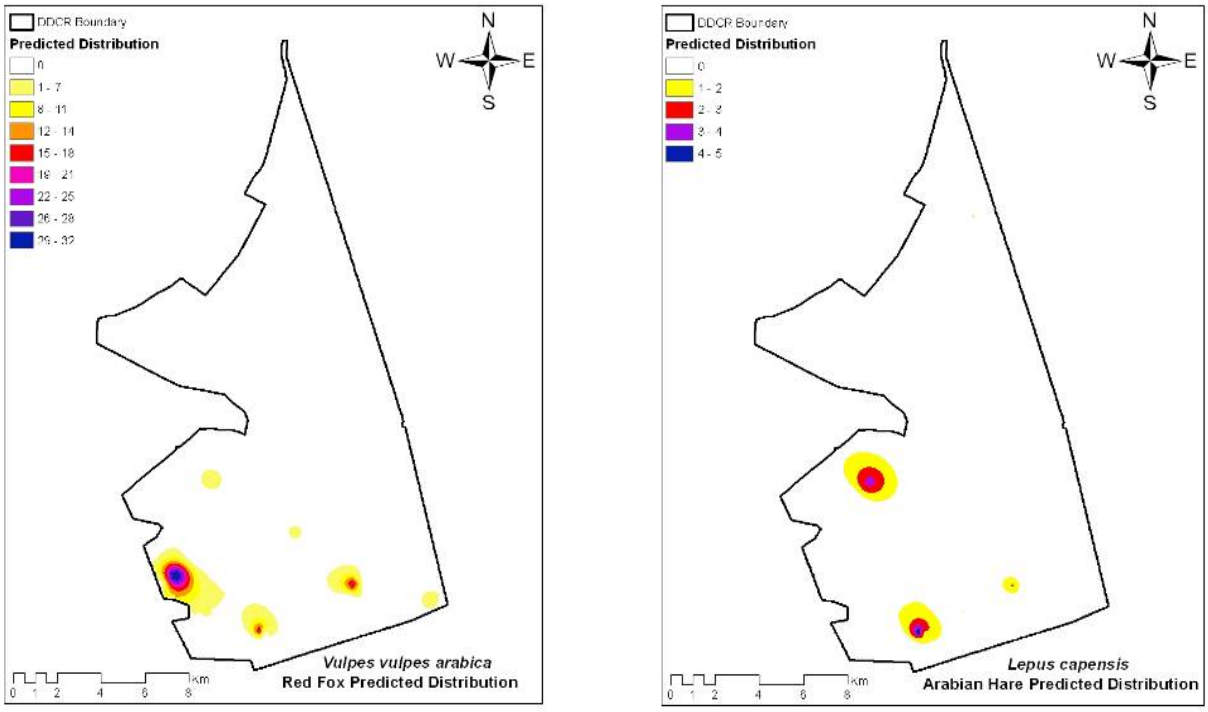

Figure 2.4.2b. Predicted species distribution for red fox and Arabian hare.

Type II index: The Simpson's diversity index is more sensitive to changes in the more abundant species. Abundant species in the reserve influencing the index are Arabian oryx, and Arabian gazelle first and foremost, followed by sand gazelle and also red fox. The southern part of the reserve has the highest diversity of abundant species, as this area has the least amount of human interference.

The Simpson abundant species diversity index shows two dark red nuclei in the northern part of the reserve matching the location of two oryx feeding points. These two points are present, but not as marked, as would be expected, on the Shannon and Brillion rare species indices.

None of the indices showed any diversity around the central parts of the reserve, where there are old farms, safari camps and a long history of human disturbance. This result is expected, but nevertheless important as it allows managers to address conservation issues and target conservation actions around the central part.

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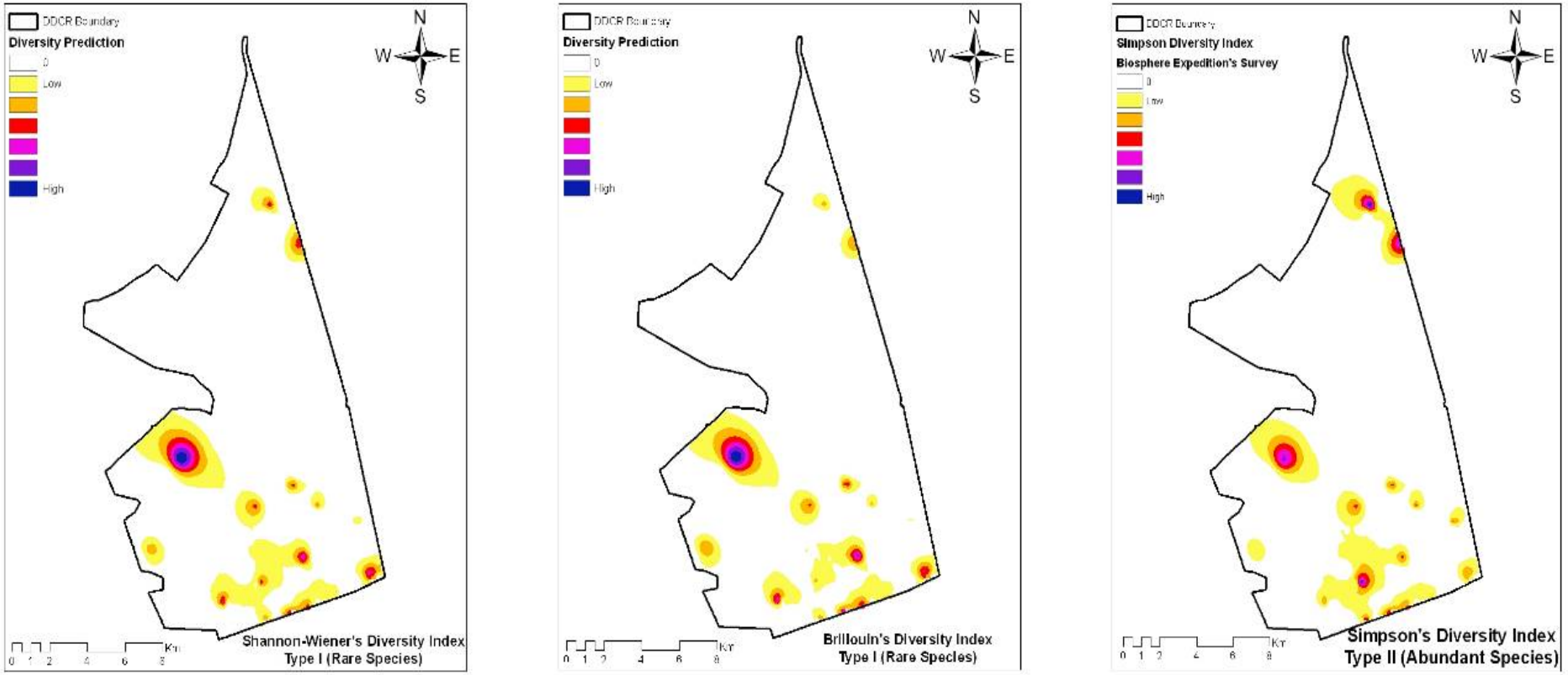

Figure 2.4.2c. Species diversity indices.

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In the south-western part of the reserve, rare species are developing a higher diversity nucleus compared to the more abundant species within the same range. This is the area of low human impact.

Finally, in the southern part of the reserve, the comparison between the two different types of diversity indices broadly look the same, meaning that the diversity patterns are evenly distributed between both the more abundant and the rare species. This is a result of many factors, of which human disturbance is likely to be the most important, and all of which warrant further investigation. Finding out more about species distribution patterns and the reasons behind them is an important question that further expeditions will address.

2.4.3. Recommendations for further work

Future expedition will put more emphasis on oryx herd surveys to answer questions of feeding ecology, body conditioning, habitat utilisation and population dynamics. This work will be done in the afternoons.

The mornings will be set aside for camera and live trapping.

Time management and research methodology will be improved so that more time can be spent on research activities rather than driving and vehicle recovery.

2.5. References

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Appendix I: Expedition diary

A multimedia expedition diary is available on http://biosphereexpeditions.wordpress.com/category/expedition-blogs/emirates-2012/.

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