



محمية دبي الصحراوية
DUBAI DESERT CONSERVATION RESERVE

Annual Report 2019-20





Chairman's message

The Dubai Desert Conservation Reserve (DDCR) provides a balance to Dubai's growth and rapid urbanisation, ensuring the conservation of our desert areas and unique wildlife. Over the past 20 years, the Emirates Group has continually supported the Reserve and its various initiatives to nurture a flourishing eco-system. It is an investment in our heritage, and in our future.

Through partnerships with local experts and academia, the DDCR continues to contribute to a growing body of research and successful projects that track, protect and reintroduce indigenous species to the UAE. We also ensure that desert safaris, one of Dubai's major tourism activities, remain a high quality experience and leave minimal impact on our natural environment.

This first annual report outlines the key highlights at the DDCR for 2019-20. We remain committed to the mission of the Reserve, and look forward to sharing more updates as we progress.

HH Sheikh Ahmed bin Saeed Al-Maktoum
Chairman, Dubai Desert Conservation Reserve





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1 Introduction

Over the past year, the Dubai Desert Conservation Reserve (DDCR) has finalised and started to implement its Management Plan for 2019 - 2024. The plan outlines the different issues and aspects of the DDCR. It provides comprehensive guidance on the policy and necessary strategies required for the successful management of the reserve.

In addition, the Management Plan states our new Vision, Purpose and Goals as we look to a successful future for the natural habitats and species we are working to protect, while sharing our amazing environment with visitors to the DDCR.



The reserve covers an area of
225km²
which makes up 5% of the
Emirate of Dubai



Vision: 'A desert haven for nature... A living heritage for people'



DDCR's overall purpose







Conserve a representation of the Dubai's Inland Desert original landscapes and indigenous fauna and flora, and through careful and effective management that promote natural processes for optimum conservation outcomes leading to rewilding of the desert habitat.

Provide an authentic desert experience for people which shows the beauty and marvel of the natural environment and educates on the intricacies of nature and the living heritage of Dubai.



44 Fauna species

Strategic management goals for the 2019 - 2024 planning period:

-  The DDCR has embarked on a new rewilding paradigm for regional desert conservation fostering thriving habitats and a diversity of indigenous species
-  All species populations, particularly ungulates, are in balance with natural regenerative properties of the available vegetation
-  All management interventions and practices are sustainable and orientated towards natural habitat rehabilitation
-  The reserve is an IUCN Green List protected area with effective management, good governance and planning that are realising optimum conservation outcomes
-  The DDCR is a regional leader in biodiversity conservation and building resilience to climate change in arid land ecosystems.
-  The reserve is promoted and recognised as the premier destination for authentic nature-based experiences in the UAE





2 DDCR Governance and Management

The DDCR's governance is in accordance with the Rulers Decree 11-2003 on the establishment of Protected Areas in the Emirate of Dubai. A Memorandum of Understanding has been signed between the Government Authority (Dubai Municipality) and Emirates, as the designated Management authority.

Underscoring its commitment to supporting conservation efforts, Emirates has spent AED 8 million on DDCR over the last five years. Cumulative sponsorship support of Emirates now exceeds AED 28 million since the establishment of the Reserve.

The Dubai Conservation Board (DCB) is Chaired by His Highness Sheikh Ahmed bin Saeed Al Maktoum.

Representatives from Emirates' Executive Management

- 🐾 Mr Ali Mubarak Al Soori – General Secretary DCB
- 🐾 Mr Devarajan Srinivasan – VP Asset Management
- 🐾 Mr Rahul Sawhney – Manager Asset Management

Key responsibilities

- 🐾 Work with operational management to formulate and then approve a strategic direction for DDCR. (DDCR Management Plan 2019 - 2024)
- 🐾 Due diligence on the induction of new Tour operators
- 🐾 Revenue management strategies and tacticals
- 🐾 Approval of annual operational budgets and monitoring of expenses
- 🐾 Funds management





Representatives from DDCR's Operational Management team

Greg Simkins

Conservation Manager DDCR

Greg has worked in the field of conservation and protected areas management since 2001. He began his career as a Field Guide with the Emirates Group in 1999 at the newly opened Al Maha Desert Resort & Spa. In 2001 he became a Reserve Officer and was heavily involved in the planning and implementation of ecotourism activities within the protected area of the DDCR, which was created in 2002. In 2003 Simkins took on his current role and was appointed Conservation Manager for the DDCR.

He is responsible for the overall management of the Reserve and has been at the forefront of its development from its conception in 2003 to the present day. Simkins also plays a major role in implementing the long term strategy for the DDCR's conservation programs, sustainable tourism, and species management, including re-introduction programs for the Arabian Oryx, Macqueen's Bustard, Arabian and Sand Gazelles.

Tamer Khafaga

Conservation Research Manager DDCR

Tamer is an ecologist with more than 20 years of experience in ecology and conservation management as well as sustainable development. He worked for the Egyptian Environmental Affairs Agency as an Environmental researcher for the St. Katherine Protectorate (May 1998 to August 2006) where his responsibilities included the implementation of biodiversity monitoring and management interventions.

Tamer's current work focuses on conservation and protected area research planning at the Dubai Desert Conservation Reserve.

Tamer is in the process of completing his PhD (Faculty of Science, Malaga University - Spain) with his research focusing on plant functional diversity responses to grazing in an Arabian hyper-arid protected inland desert ecosystem.

Moayyed Sher Shah

Conservation Officer DDCR

Moayyed is an ecologist with more than 19 years of experience in ecology and conservation management. He started his conservation career with Saudi Wildlife Authority in 2001 working on the re-introduction and monitoring of Asian houbara in Saudi protected areas.

Furthermore he was responsible for long-term monitoring of carnivores and small mammals projects and worked on several re-introduction programmes. He initiated the Arabian gazelle's programme (2011) in Central Saudi Arabia. From 2016 to 2018 Moayyed was part of Mahazat as-Sayd Protected Area management team managing the ungulates population by conducting regular game counts, assessing body conditions, and translocation and management of surplus animals.

Currently, Moayyed's primary role is to plan, control, develop and regularly monitor the conservation practices and environmental work within DDCR, part of his work is to conduct new research, and plan and implement long-term monitoring programs including the Arabian Oryx monitoring program.

Moayyed is working on finishing his Masters in Environmental Sciences from the University of South Africa on the research topic "Ecology of Sand gazelles during drought conditions in Mahazat as- Sayd Protected Area".

Key responsibilities

- Work with executive management to formulate a strategic direction for DDCR. (DDCR Management Plan 2019 - 2024)
- Implement all conservation programmes
- Implement all research and monitoring activities
- Manage sustainable tourism within the DDCR



- ✈ DDCR implements a paperless Visitor Management System and reporting solution *(1 February 2019)*
- ✈ DDCR Management Plan completed for the next five years (2019 - 2024) *(1 April 2019)*
- ✈ MoU is signed with Prague University and a Master's (MSc) student starts a camera trap study. *(6 June 2019)*
- ✈ Nara Desert Escapes becomes a concession holder in the DDCR to provide unique desert experience to visitors *(1 September 2019)*
- ✈ DDCR Approved Tours launches to promote high-quality tours with a focus on nature and local culture. *(1 October 2019)*



121 Sand
Gazelle

3 Significant Events

Research Collaborations

- Mohammad Bin Rashid University of Medicine and Health Sciences (College of Medicine) on small mammals in DDCR
- UAE University (College of food and agriculture-department of veterinary medicine) on Pathogen risk assessments of felines in DDCR
- East Anglia University for MSc project on pitfall traps sizes efficiency surveying arthropods
- Natural History Museum of London studying desert termites *(13 November 2019)*

- ✈ Wildlife Diplomacy Delegation from the USA visits DDCR. *(09 February 2020)*
- ✈ MOU signed with Loughborough University, UK, to work in conjunction with Zayed University on Drone studies within the DDCR and machine learning on the images collected. *(11 February 2020)*
- ✈ Installation of weather and virtual reference station in co-operation with Survey Department - Dubai Municipality. *(30 March 2020)*





Workshops

- ✈ A Joint Workshop Against Illegal Trade in Birds of Prey ADIHEX - Abu Dhabi Moayyed (27 August 2019)
- ✈ Arabian Oryx National Strategy SSC-Abu Dhabi Greg & Moayyed (6 October 2019)
- ✈ Sustainable Tourism in the UAE - Modul University Dubai Greg (presenting) & Moayyed (30 October 2019)
- ✈ Drones Synergies Tamer & Greg (18-19 November 2019)
- ✈ Alien Species Workshop - Ministry of Climate Change Moayyed (19 November 2019)
- ✈ Sharjah Workshop Moayyed & Tamer (3-5 February 2020)
- ✈ Smart Map of Natural Capital of the UAE Workshop Ministry of Climate Change & Environment Greg, Tamer & Moayyed (13 February 2020)

Conferences

- ✈ International Congress for Conservation Biology Malaysia (21 July 2019)
- ✈ IUCN Regional Conservation Forum - Kuwait Greg & Tamer (9 - 11 September 2019)
- ✈ IUCN Species Survival Commission - Abu Dhabi Greg, Tamer & Moayyed (6 November 2019)

Presentations

- ✈ Dubai Natural History Group Greg (9 June 2019)
- ✈ Abu Dhabi Natural History Group Tamer (5 November 2019)



Other Activities

- ✈ Conservation International Vice-Chair Harrison Ford and CEO M. Sanjayan visit the DDCR as part of a delegation from the Global Government Summit (12 February 2019)
- ✈ Le Club Accor event visit to DDCR (12 April 2019)
- ✈ Ministry of Climate Change & Environment (MoCCE) and Paul Atkin CEO Zealandia visit DDCR (2 May 2019)
- ✈ Emirates Groups Photography Club Visits to DDCR four visits Moayyed & Greg (August 2019, October 2019, January 2020, February 2020)
- ✈ Dubai Natural History Group Visit (9 November 2019)
- ✈ NYU Student Field Trip (9 November 2019)
- ✈ World Soil Day - Emirates Soil Museum, Dubai (4 December 2019)
- ✈ Dubai Tourism Police Awards (10 December 2019)
- ✈ Director of Kew Foundation, UK, Meredith Pierce Hunter visits the DDCR (20 February 2020)



4 Conservation and Environmental Research Work

Research Policy

DDCR Management Plan 2019 - 2024

Research conducted within the DDCR should assist in applying sound scientific ecological principles to the decision-making process and/or adding new knowledge about the species and habitats of the DDCR. The DDCR will be promoted as a destination for applied research in arid land ecosystems by national and international academic institutions. The DDCR Research Committee will evaluate all research proposals based on relevance to the reserve, and the ethical and practical implications.

Research is vital for the effective management of the DDCR and to make informed management decisions as well as in the mitigation against climate change and desertification.

4.1 Desert Research Centre

The vision of the research centre is to promote and facilitate scientific studies by establishing and running a programme to solve environmental challenges with collaborative research on natural, human, social and ecological aspects of the inland hyper-arid desert toward developmental progress.

DDCR is seeking a leadership position within the UAE and the region by building a robust scientific

community connected with UAE, regional and international stakeholders.

We aim to prioritise the continued integrity of the ecological and social systems, values and resources by facilitating research and providing study opportunities, logistical and field support within a research-friendly environment for students, researchers and volunteers to address essential questions and gain experience and networking skills, and to become a centre of excellence in biodiversity research.

The objectives of the Desert Research Centre are to:

- Grow functional capacity for effective management and governance of protected areas in the UAE and West Asian region.
- Draw on the strengths, expertise and technical capabilities of universities and other institutions both in the UAE and internationally, to offer the highest quality research products.
- Build on the regional opportunities and enhance the chances to demonstrate, guide and support quality research in protected areas.
- Adapt, facilitate and coordinate protected area research and spread research results.
- Recognise, adapt, develop and promote excellence and model practice in protected areas research.
- Encourage and assist researchers willing to improve their knowledge and skills in protected areas research activities to find ideas and opportunities relevant to their needs, and facilitate ongoing learning and sharing through professional networks and communities of practice.



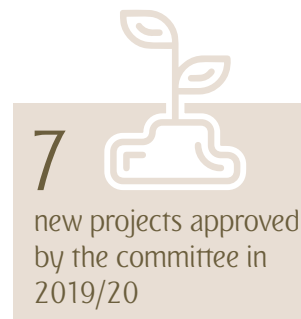


4.2 DDCR Research Committee

Following the establishment of the DDCR Research Centre, we initiated a research committee to evaluate all research proposals based on relevance to the reserve, ethical and practical implications with a defined Terms of Reference (ToR), and to hold regular (Bi-annual) meetings to propose, evaluate and guide research activities within the DDCR.

The research committee members are from diverse backgrounds and well-regarded in their respective fields.

Name	Affiliation	Institute
Greg Simkins	Conservation Manager	DDCR - UAE
Tamer Khafaga	Conservation Research Manager	DDCR - UAE
Moayyed Sher Shah	Conservation Officer	DDCR - UAE
Gary Brown	Ecologist	Freelance - Germany
Brigitte Howarth	Entomologist	Zayed University - UAE
Jacky Judas	Ornithologist	Emirates Nature - WWF - UAE
Kosmas Pavlopoulos	Geologist	Sorbonne University Abu Dhabi - UAE
Andrew Leonce	Computer Science	Zayed University - UAE
Stephane Boissinot	Herpetologist	New York University - UAE
Janin Tan	Entomologist	Zayed University - UAE
Roxanne Whelan	Ecologist - young professional	Freelance
David Gallacher	Botanist	Sydney University - Australia
Teresa Navarro	Botanist	Malaga University - Spain





4.3 Research reports

4.3.1 Investigating optimal pitfall trap rim circumference for sampling surface-dwelling arthropods in a desert habitat

Salma Elserafi, East Anglia University. (2019/FN/01)

Pitfall trapping is one of the most extensively used methods for sampling surface foraging arthropods in ecological monitoring and biodiversity studies. Despite variations in trap design influencing catch rate and species composition, there is no standardisation protocol associated with pitfall trapping.

Larger traps are known to increase catch rate and species richness sampled, but also increase handling and processing time and have been found to enhance the positive body size bias towards larger species. Many studies have investigated how trap size influences the size bias and trapping efficiency but studies focused on optimal rim circumference are few.

This study consisted of a single short sampling period, investigating the role of rim circumference in sampling surface-dwelling arthropods in an Emirati desert environment. Four rim circumferences (22, 27, 35 and 45 cm) were assessed across four sites (4 sizes, 20 replicates, 80 traps) on their diversity estimates and catch mean body length. To assess the strength of any catch body size bias, body length was compared between the pitfall size classes using

one-way ANOVAs, and no consistent significant over-representation of larger-bodied species in larger traps was found.

Three criteria were then considered in choosing optimal rim circumference; handling/processing time, ability to maximise species diversity and ethical consideration. The results suggest that the second largest trap size was optimal. For the same number of traps and handling time, the 35cm size class caught the highest number of species (>4) out of all the other traps (<4). Moreover, larger traps may increase the potential for trapping non-target species, further justifying the second-largest circumference as the optimum.





4.3.2 Conservation of the Asian Houbara Bustard in the UAE-Cultural contexts and Initiatives

Basil Roy, Sorbonne University Abu Dhabi (2019/FN-EC/02)

Over the past few decades the Asian Houbara Bustard (*Chlamydotis macqueenii*), and the African Houbara Bustard (*Chlamydotis undulata*) have been classified as vulnerable on the IUCN Red List. This phenomenon is due to the over-cultivation of the houbara's natural habitat, desertification, and the extensive hunting of the species.

The houbara bustard is a historically symbolic bird, most notably associated with falcon hunting. The conservation of houbara is important for both environmental and cultural reasons. It has a unique status in Emirati culture. Just like the Arabian Oryx, the Houbara Bustard has

been overhunted; and similarly, great efforts have been made to increase their populations.

This paper focuses on the cultural position of the houbara, looking back on the historical significance of the houbara.

Also, falcon hunters have been interviewed to determine attitudes regarding its cultural significance, the level of awareness regarding the vulnerability of the houbara, and whether or not they are willing to consider alternative hunting practices. This paper also discusses conservation efforts being done in the UAE.

Working with conservation organisations such as The National Avian Research Center and the Dubai Desert Conservation Reserve allowed me to collect field data and

determine whether or not these initiatives are successfully increasing houbara populations in the UAE.

The UAE's houbara conservation initiative is highly achievable given the right strategy and planning. Linking the survival of the houbara bustard to the ancient art of falconry has proved to be successful, not only conserving the United Arab Emirates' natural environment but also its identity.



250

houbara were released into the DDCR in January 2020





4.3.3 Hyper-arid tall shrub species have differing long term responses to browsing management

David J. Gallacher & Tamer Khafaga,
Zayed University & DDCR (2019/FL-EC/03)

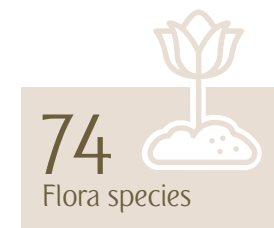
Hyper-arid rangeland vegetation is typically dominated by large woody species which are often overlooked in herbivory studies. Long-term responses of tall shrub populations to herbivory change are poorly understood in the Arabian Peninsula.

Population and size of 1,559 individuals from four shrub species were assessed over 11 years under two herbivory regimes, one in which domestic livestock (camels) were replaced by semi-wild ungulates (oryx and gazelles) before, and the other during, the study period. Each shrub species exhibited a different response to the change in herbivory.

Populations of *Calotropis procera* decreased dramatically. Populations of both *Calligonum polygonoides* and *Lycium shawii* increased through sexual reproduction, but the spatial distribution of recruits indicated different modes of seed dispersal. Average lifespans were estimated at 22 and 20 years respectively.

The persistence strategy of *Leptadenia pyrotechnica* was similar to tree species of this habitat in that vegetative regrowth was prioritised over recruitment, and average lifespan was estimated at 95 years. Shrub responses to changes in ungulate management are therefore species-specific. The response of individual plant size was faster than the response of population size, which was limited by slow sexual recruitment (*L. pyrotechnica*) or localised seed dispersal (*C. polygonoides*).

(https://www.researchgate.net/publication/332440462_Hyperarid_tall_shrub_species_have_differing_long-term_responses_to_browsing_management)





4.3.4 Biosphere Expeditions Arabia 2020

Moayyed Sher Shah & Greg Simkins, DDCR (2020/EC/01)

Biosphere expeditions and the Dubai Desert Conservation Reserve completed their 9th consecutive annual survey in January 2020. Key results include an improved understanding of Arabian Oryx and gazelle species distribution, evidence of healthy rodent populations throughout the reserve and sightings of rare species including Arabian hare, Lappet-faced vulture and Gordon's wildcat.

The international team of 14 citizen scientists, two Biosphere Expeditions (BE) leaders and three DDCR staff surveyed the Arabian Oryx, Arabian gazelle and Sand gazelle populations across the entire 227km² reserve. This massive effort provided population estimates and distribution predictions for these three species, which will help improve management, especially in light of upcoming translocations.

The 2020 expedition used the following survey and monitoring techniques to collect data: camera trapping survey, rodents trapping, Arabian red fox survey, carnivores live trapping, ungulates and targeted species circular and random counts.

Key results of the Biosphere Expeditions 2020 Arabia within the DDCR:

- 🐪 A total of 648 Arabian Oryx, 148 Arabian gazelles and 21 Sand gazelles were counted while surveying the 62 quadrants and feeding points. The data collected will allow their estimated distribution to be mapped within the reserve, providing the DDCR with data necessary for herd management.
- 🦅 Important species recorded during the random observations in DDCR were 12 Lappet-faced vultures, one Pharaoh eagle owl, seven Arabian hares and seven Greater hoopoe larks.
- 🐭 Small rodent live trapping resulted in a total of 28 Cheeseman's gerbils and three Baluchistan gerbils being captured-recaptured over the 239 trapping nights in six trapping areas. Faecal samples collected from captured individuals will provide data on the genetics and food preferences for both species.

- 📷 Sixteen camera traps were set throughout the reserve with over 6,000 images captured during the week. The most significant species recorded was of a Gordon's wildcat, a rare subspecies of wildcat which is threatened by hybridisation with feral cats.
- 🦊 A total of 68 Red fox dens were surveyed. 45 active and inactive fox dens from previous surveys and 23 new fox dens were identified, including one potentially used by a Rüppell's fox, a species last recorded in the DDCR five years ago.
- 🐈 One feral cat was captured from the carnivore live trapping over 36 trapping nights.





4.4 Current research

4.4.1 Quantitative analysis of the Hyper-arid vegetation changes under grazing pressure in the Dubai Desert Conservation Reserve

DDCR (2020/FL-EC/02)

Implement a continuous practical and efficient vegetation monitoring program by applying analytical tools for effective data interpretations. As vegetation is the base of the food pyramid the expected data and information is indispensable for managing the ecology of the Dubai Desert Conservation

Reserve (DDCR). This study will evaluate the current state of the DDCR vegetation, and it focuses on the assessment of density, cover, and biodiversity of the flora in the DDCR and follows the continued monitoring and repeated vegetation studies of 2004 (El Alqamy, 2004) and 2009 (Khafaga, 2009). To present the results through the mapping of the vegetation and by defining the lineage between different floral communities, using multivariate analysis combined with GIS techniques.

4.4.2 Changes in functional diversity under grazing pressure in hyper-arid shrubland ecosystems

DDCR (2020/FL-EC/03)

To investigate the term functional diversity “a variety of life-history traits presented by an assemblage of organisms” with regards to the vegetation diversity of DDCR. It has been postulated to be critical for the maintenance of ecosystem processes and properties. The conceptual linkages between ecosystem disturbance, species diversity and functional diversity are fundamental to resource management and conservation planning.

This research will study the changes in intensity and timing of grazing and its effect on the changes in taxonomical and functional composition and subsequent changes in ecosystem functioning. These changes will explain the great interest in monitoring the impact of grazing on plant communities to preserve their biodiversity and economic or aesthetic values.

4.4.3 Assessment of forage productivity and carrying capacity

DDCR (2012/FLEC/01)

To investigate and recommend strategies to manage and restore the rangelands and conserve their biodiversity in the Dubai Desert Conservation Reserve.

Quantification of the forage productivity and evaluation of the impact of important determining factors, such as soil and rainfall

Estimation of the rangelands carrying capacity, that is, the maximum possible stocking of livestock that a rangeland can support on a sustainable basis

Assessing the response of soil and vegetation to different grazing management practices for optimal rangeland use

Assessment of the possibility of restoring the degraded rangelands with indigenous forage plants and defining the most appropriate conditions for this process.





4.4.4 Seasonal Dynamics of Herd Structure of Reintroduced Arabian Oryx in the DDCR

Czech University of Life Science (2019/FN-EC/04)

Arabian Oryx (*Oryx leucoryx*, Pallas, 1777) is the largest species of antelope on the Arabian Peninsula.

This magnificent animal was only saved from extinction through a captive breeding and reintroduction program, and by 2011 the status of Arabian Oryx according to the IUCN Red List was changed from “Extinct in the wild” to “Vulnerable”.

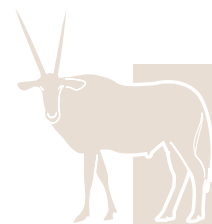
The Dubai Desert Conservation Reserve (DDCR) contributed to this recovery through a successful re-introduction in 1999. The population of Arabian Oryx on the DDCR has substantially increased (Lignereux, Alzahlawi, Al Kharusi and Pesci, 2018), however, the knowledge of their dynamics in time and seasons is limited.

Monitoring species abundance and distribution is a prerequisite when assessing species status and population viability. This study will attempt to describe the dynamics of Arabian Oryx population around feeding points, water holes and natural location; to understand the herd structure and

influences driven by natural or artificial factors – all these are essential for successful development of management plan for the protected area.

The main goal of the project is to identify the population dynamics over a selected time in relation to seasons, climatic conditions, locations and management measures. The period between 2009 and 2019 will be the main focus of the research.

This timescale has a close connection to the present condition of the animal population and will help to prognoses the future population trend.



Arabian Oryx
can live up to
20 years



4.4.5 Monitoring of the Arabian Oryx (*Oryx leucoryx*) in the DDCR

DDCR (2016/FNEC/01)

To gain an understanding of the ecology of the Arabian Oryx within the DDCR, in particular, we will look to determine their home range and which habitats, within that home range, they prefer and finally which plant species they utilize within that habitat.

- ✎ Gain a better understanding of the movements of Arabian Oryx through the use of GPS collars and so collect data on their home range and habitat selection
- ✎ Gather data on activity patterns (i.e. time spent grazing, resting or moving) of the Arabian Oryx in relation to factors such as habitat, temperature, sex and life phase
- ✎ Gain an understanding of the dependence of the oryx herd to the provided feed and how this can affect their behavioural and distributional patterns
- ✎ Study the grazing habitats of the Arabian Oryx to establish grazing preferences in relation to plant species and growth form

4.4.6 The Genetic Study of the Arabian Oryx population in Dubai

DDCR (2018/FN/01)

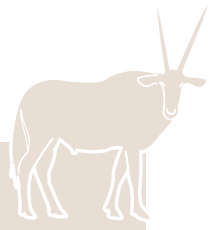
Over the past 20 years, the breeding of Arabian Oryx has been very successful, both in Dubai and around the world. Bring the species back from the state of Extinct in the wild and classified as 'Endangered' by the IUCN Red List to having healthy re-introduced populations in several countries have led to a downgrade of its endangered status to 'Vulnerable'.

However, it is important to now change the objective from reproduction to a sustainable population by ensuring we have the most genetically diverse and viable population possible to ensure their long-term survival.

This research aims to achieve the following:

- ✎ Ascertain the genetic diversity of the oryx population found within the Dubai Emirate
- ✎ Utilize the genetic data to develop a strategy to improve the genetic quality of Dubai's Arabian Oryx population
- ✎ Contribute to the regional efforts for the conservation of Arabian Oryx

824
Highest count of
Arabian Oryx in 2019






4.4.7 Monitoring of arid rangeland ecology using unmanned Aerial Vehicles (UAVs) desert drones over Dubai

DDCR (2014/EC/01)

To establish a base in this emerging field within DDCR for the civilian use of aerial photography from Unmanned Aerial Vehicles (UAVs) and demonstrating its values for arid rangelands conservation.

Collecting accurate, inexpensive data to:

- ✈ Monitor grazing pressure on rangelands and estimate botanic health of an arid ecosystem.
- ✈ Estimate and monitor the population of protected and endangered species
 - Arabian Oryx, gazelle species, foxes, Gordon's wild cats, Houbara bustard, birds of prey and Spiny-tailed lizards
 - Feral and invasive species, e.g. Prosopis juliflora
- ✈ Evaluate the extent of damage caused by off-road recreational driving
- ✈ Increase the accuracy of ecological maps and consequently habitat classifications

4.4.8 UAV (Unmanned Aerial Vehicle) - Machine Learning for Bio-diversity Monitoring and Tracking at Scale

Zayed University (2019/FN-EC/05)

The need to protect the environment has taken centre stage in recent years as the damage to the Earth's natural ecological balance has become increasingly tangible. Natural reserves are set to protect biodiversity. Understanding the populations of animals and vegetation living inside the reserve is a key parameter to secure the equilibrium and the continuity of the ecosystem.

We propose to investigate the problem of biodiversity monitoring and tracking using machine learning techniques for mining useful information from complex data, image/videos.

Deep learning methods have proven to be efficient in the image processing field. Their introduction in this area has reshaped the way images are processed and understood. The novelty in this project resides in two folds: it is the first time that the performances of existing algorithms will be evaluated in such large magnitude and diversity of experiments, which will support the investigators to propose new algorithms. The second novelty resides in the application

of the approach in the area of biodiversity tracking and monitoring in the desert.

In fact, the investigators are not aware of any existing efforts that suggest the application of image mining in the desert. The investigators intend to work closely with the DDCR to help detect and monitor the different species, their evolution, movement, and gender. This will directly help the DDCR in better estimating the number of animals, predict their evolution, understand their moves, and understand the density of those animals. The project is expected to be beneficial for wildlife and biodiversity.





4.4.9 UAV (Unmanned Aerial Vehicle) - Environmental Protection

Zayed University (2019/EC/06)

The need to protect the environment has taken centre stage in recent years as the damage to the Earth's natural ecological balance has become increasingly tangible. As humans, we generate a large amount of plastic and it is common practice to dispose of unwanted waste improperly in the form of litter and illegally dumped garbage. Littering has become a significant problem in many societies and contexts.

Deep learning methods have proven to be efficient in the image processing field. Their introduction in this area has reshaped the way images are processed and understood.

A large number of works have been performed and many methods have been proposed to tackle different aspects of the problem. The novelty in this project resides in two folds: it is the first time that the performances of existing algorithms will be evaluated in such large magnitude and diversity of experiments, which will support the investigators to propose new algorithms.

The second novelty resides in the application of the approach in the area of litter identification in the desert. In fact, the investigators are not aware of any existing efforts that suggest the application of image mining in the desert.

The investigators intend to work closely with the DDCR to help detect and monitor litter in three key areas; along the boundary fence, camp areas and driving routes throughout the reserve. This will directly aid the DDCR in coordinating litter recovery as well as issuing fines to parties who have violated the regulations regarding litter.

In addition to a potential monetary gain and reduction in resources dispensed in patrolling the reserve, the wildlife will benefit from reduced exposure to harmful objects which they may mistake for food.





4.4.10 Pathogen Risk Assessment of Arabian Felines

UAE University (2019/FNEC/07)

Arabian felines (Arabian leopards, cheetahs, wildcats, sand cats and caracals) are either regionally extinct, critically endangered or their populations are worryingly declining in the Arabian Peninsula. Thus, the International Union for Conservation of Nature (IUCN), claimed the need to carry out further research on the factors that may threaten these five felids.

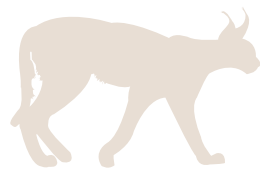
Felid conservation will increasingly need to include assessments of disease risks and strategies for disease management to be successful since it is known that most wild-feline populations are at risk of exposure to new pathogens due to deterioration of many of their inhabited ecosystems, as well as the fact that historic geographic barriers have been bridged, which might imperil population health.

At the same time, due to the gravity of these animals' situation in the wild, they are held and bred in captivity at centres worldwide. Such captive breeding programmes are essential in maintaining genetic diversity and saving these species from extinction, since their reintroduction may be the only means of restoring their populations in the wild. Nevertheless, captive animals are more likely to contract diseases because animals live in close proximity to each other.

Whereas in nature, diseases that are caused by parasites comprise one of the major problems resulting in even morbidity and mortality in these animals, in captivity, the effects range from sub-clinical to death. In this framework, this project would aim to determine the types, prevalence, and intensity of parasitic, bacterial and viral infections in the wild and captive Arabian felines located in the United Arab Emirates and Oman. Very little has so far been published

on pathogenic diseases of these felines in the Arabian Peninsula either in the wild or in captivity, and a study of this scope in such a field would be the first of its kind.

The results obtained will constitute baseline data and a vital reference for future research in such a neglected area. Moreover, the knowledge obtained from this project will, inevitably, be used in future reintroduction and reinforcement projects of these species in both countries.







4.4.11 Statistical Evaluation of Atmospheric Forecasting System at DDCR

Sorbonne Abu Dhabi (2019/EC/08)

Sorbonne University Atmospheric Forecasting System (SUAFS) is an integrated combination of advanced models able to provide detailed weather desert forecasts on various temporal scales over the Arabian Peninsula and the greater UAE areas.

The following predictions currently available by SUAFS (<http://forecast.psuaad.ac.ae>) are:

 Weather forecast for 72 hrs ahead (3 days)

 Desert dust forecast for 72 hrs ahead (3 days)

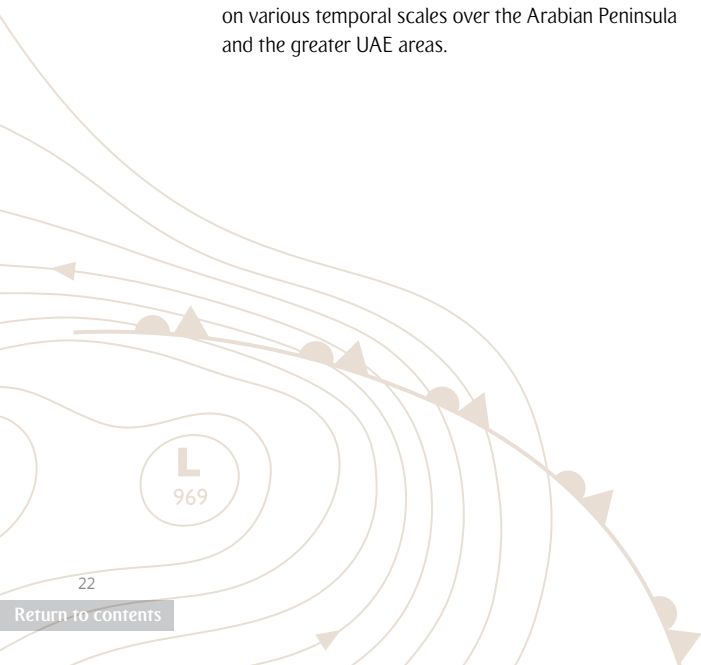
SUAFS has been operational since July 2018 and an annual archive of weather and desert dust forecasts are almost available for evaluation. This research proposal offers a unique opportunity to initiate the framework for an important collaboration with DDCR in terms of environmental warnings and monitoring.

Thus, the main aim of Phase-1 is to validate SUAFS forecasts against the atmospheric measurements obtained from DDCR meteorological stations. The entire records and data of the main atmospheric parameters from the network of the meteorological

stations of DDCR, as well as the neighbored available stations, will be utilised for comparison with SUAFS forecasts.

The extracting statistical scores will be helpful to identify the forecast errors of the system and their propagation into the period of the simulation. The results of this research work will lead SUAFS forecasts to achieve greater accuracy and reliability especially over the area of interest. These results will be the base of Phase 2, which focuses on the air quality monitoring and dust forecasting for the DDCR.

All the results will be at the DDCR and SUAD disposal and a report with all the data will be submitted. Phase-1 will also act as a preparatory phase for attracting additional funding to launch the demanding Phase-2.





Analysis of trophic niche partitioning of desert rodents through diet reconstruction

(2019/FN-EC/09)

For this project, we want to investigate the trophic niche partitioning of the desert rodents found in the Dubai Desert Conservation Reserve. Currently, the rodent populations and inter-species interactions in the DDCR are relatively unknown.

We plan to use next generation sequencing (NGS) on faecal samples from the rodents species found in the DDCR to analyse their diet, gut microbiomes and parasite composition to evaluate the presence of trophic niche partitioning and to determine the functional role the gut microbe communities play in host evolution.

Furthermore, we want to evaluate the effects of anthropogenic features in the reserve (i.e. feeding stations and the Al Maha resort) on the rodents' diets by looking for significant differences in our data from both far and near these features.

We want to provide a deeper understanding of UAE desert ecological structures, their dynamics, and mechanisms. This is especially relevant for any future conservation or management action implemented on the area or the rodents themselves.



The Lesser Jerboa
tail can grow up to

250mm





4.4.13 Understanding Spatiotemporal Dynamics of Desert Gecko Communities

(2019/FN-EC/10)

Understanding trophic interactions and how they influence niche partitioning, remain the core of ecology and may have strong implications for conservation biology. Unfortunately, the dynamics of trophic interactions within communities of desert species remain largely undescribed.

An example reflecting this claim is a community of nocturnal geckos inhabiting sandy sheets of the UAE, which consist of three species – *Stenodactylus arabicus*, *Stenodactylus doriae* and *Bunopus tuberculatus*.

A single study investigating basic ecology of the desert lizards of Arabia characterised the aforementioned geckos as insectivores. However, the exact way in which the partitioning of the dietary niche occurs within the community remains unknown.

A similar lack of understanding occurs within a system of two species inhabiting gravel plains. *Stenodactylus slevini* and *Stenodactylus leptocosymbotes* are two closely related nocturnal species characterised by comparable morphological traits. Interestingly, field surveys revealed a lack of overlap in the occurrence ranges, indicating that these two gecko species

may exclude each other. An explanation of this phenomenon may be a potential overlap in dietary preferences, however, this claim has never been investigated.

Diet is also known to influence the microbial and parasitic composition. The vast majority of microorganisms associated with vertebrates can be found in the digestive system. It remains a major goal to determine the functional role of these microbe communities plays in host evolution.

Excessive grazing of captive camels has been recognised as the single greatest threat to the desert ecosystems in the UAE. However, the effect of this phenomenon on small vertebrate (i.e. lizard) communities remains unknown. Even though in most cases a direct prey competition between these animals and camels does not occur, there may be a strong indirect effect exerted by the grazers (decrease the number of prey animals who are dependent on substantial vegetation cover, reduction of hiding places, increase in terrestrial temperatures, etc.). Hence, it remains of utmost importance to understand how the results of overgrazing affect the dynamics of small vertebrate communities in order to establish appropriate conservation measures.

The proposed study aims at identifying the dietary preferences, microbial and parasitic composition of the gecko species across different seasons and locations with varying grazing pressure. For this, stool samples of *S. arabicus*, *S.*

doriae and *B. tuberculatus* will be collected over the three seasons (fall winter and summer), and the contents will be analysed using next-generation sequencing for barcoding purposes. Sampling will be conducted in two distinct locations – the DDCR and the Arabian Nights Village Road (Abu Dhabi), which differ significantly in the extent of vegetation cover.

The project will potentially be extended to include *S. slevini* and *S. leptocosymbotes* from the gravel plains to determine reasons for mutual exclusion.

The results from the next-generation sequencing will be analysed using Permanova and partial Mantel tests to detect significant differences in diet, microbial and parasite composition between the study species.





4.4.14 Identifying the colony role of late instar larvae in *Psammotermes hybostoma*

British Natural History Museum (2019/FN/11)

Termites, particularly the lower termites, have extraordinary developmental plasticity which has allowed them to adapt to varied and even harsh environments. *Psammotermes hybostoma* exemplifies this due to their capacity to survive in ecosystems with net-zero productivity, such as arid deserts within the UAE.

This species also has a unique developmental pathway leading to older larvae which have an unknown function but are seemingly five times the size of the other individuals within the colony. It has been hypothesized that these individuals may produce metabolic water to help hydrate the colony, therefore could potentially be a new sterile worker caste.

By collecting this species from the wild and undergoing behavioural experiments in the lab, the true nature of these individuals can be discovered.

4.4.15 Arthropod Diversity in Ghaf Groves

Zayed University (2018/FN-EC/02)

Arthropods are frequently sampled using a passive collection method called malaise trap. Such a trap can collect flying, crawling, walking and jumping arthropods. A similar trap is used for sampling arthropods aerially (e.g. in trees) called a SLAM (Sea Land Air Malaise). A preliminary study from October 30th 2017 until April 3rd 2018 at the DDCR in a Ghaf Grove showed clear differences in arthropod diversity and abundance between samples collected using a malaise trap and SLAM trap.

The proposed study will ascertain which arthropods are found at an elevation within a tree in comparison to those that are found from the ground upwards



Jumping spiders can leap

40 times their body length





4.4.16 Geoarchaeology SUAD – DDCR

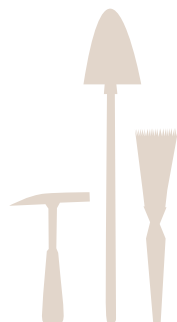
Sorbonne Abu Dhabi (2019/GE/12)

Sorbonne University Abu Dhabi has the interest to develop archaeological and geoarchaeological research in the broader DDCR area. The department of Archaeology and History of Art has great experience in archaeological prospection in archaeological sites implementing methods and technics related to photogrammetry and 3D scanning of artefacts and buildings.

The Department of Geography and Planning has great experience in geoarchaeological research implementing methods and techniques related to GIS, remote sensing and multi-proxy analysis of the sediments and landforms.

The aim of this research proposal is the systematic archaeological field investigation in selected areas of DDCR, collection archaeological objects, classification of archaeological findings, age determination, localisation by GPS, and their insertion in GIS database for evaluation and storage. Geomorphological mapping using remote sensing technics and fieldwork including sediments sampling for multi-proxy analysis and dating.

The results of archaeological analysis and from the geomorphological and remote sensing analysis with the sediments multi-proxy investigation can provide information about the potential existence of an archaeological site in the DDCR protected area.





5 Wildlife re-introductions

Ungulate populations have continued to increase over the past year, which has, in turn, placed pressure on the natural vegetation and the overall health of the DDCR habitats. The supplementary feed has also needed to be increased, to maintain the health of the herds, which has added to the costs for the DDCR.

The Arabian Oryx population has increased by 17%, with 88 births recorded over the last year, leading to an estimated population of 800 as of March 2020.

The Arabian gazelle population is distributed across the DDCR with concentrations of animals at the irrigated areas and some groups at the feed stations. The estimated population as of March 2020 is 450.

The Sand gazelle populations within the DDCR have remained in the range of 100 to 140 since 2014. The estimated population as of March 2020 is approximately 120. Numbers

of sand gazelle may be underestimated due to the widespread distribution making them difficult to count accurately.

The MacQueen's Bustard reintroduction project is done in conjunction with the National Avian Research Centre (NARC) and the office of HH Sheik Mohammed bin Rashid al Maktoum. Since the first release in 2010, a total of 3,101 individual birds have been released into the DDCR. On 28 January 2020, 250 MacQueen's Bustards were released, five females are still being monitored via satellite tags and regular sightings of birds without satellite tags are reported by the DDCR staff.



88
Arabian Oryx births
recorded in 2019



6 DDCR Visitors

Visitor Management Policy

DDCR Management Plan 2019 - 2024

As a premium tourism destination, the DDCR will continue to deliver a range of authentic and quality experiences for visitors by enforcement of regulations and limiting visitor numbers to levels which do not undermine the reserve's inherent values. In line with the DDCR's stated Purpose, high impact visitor activities will be strictly restricted to existing designated areas while low impact nature-based visits and activities will be promoted and encouraged with greater access to the reserve.
















Visitors to the DDCR all come through Tour Operators that hold a concession agreement with the reserve, or as guests of Al Maha Desert Resort.

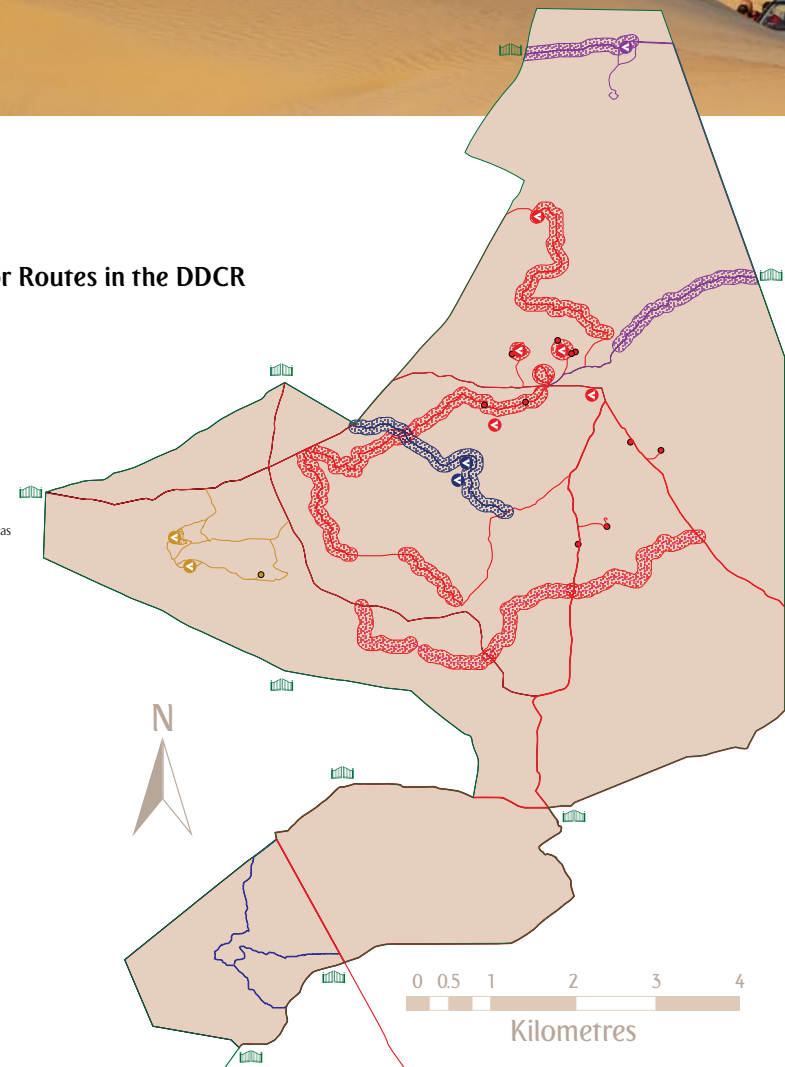
290k+
Visitors/year



Tour Operator Routes in the DDCR

Legend

-  Alpha Camp
-  Alpha Routes
-  Alpha Buffer Area
-  Arabian Adventures Camps
-  Arabian Adventures Routes
-  Arabian Adventures Buffer Areas
-  Travco Camps
-  Travco Routes
-  Travco Buffer Areas
-  Nara Camps
-  Nara Routes
-  Nara Buffer Areas
-  Platinum Heritage Areas
-  DDCR Gates
-  DDCR Boundary





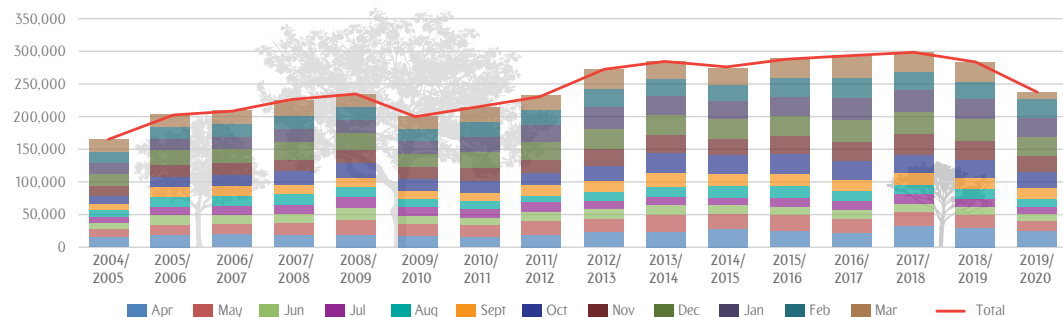
New concession agreements were entered into as of 1 April 2019, for a period of three years. The concession agreement for Lama Desert Tours was discontinued and replaced by Nara Desert Escapes.

Extensive removal and clearing of Lama's camps was required before handover to the Nara in July to allow them to build their two camps and start operations in September 2019.

Up until the end of February 2020, the number of visitors to the DDCR had decreased from the previous year (2018-2019) by approximately 11%.

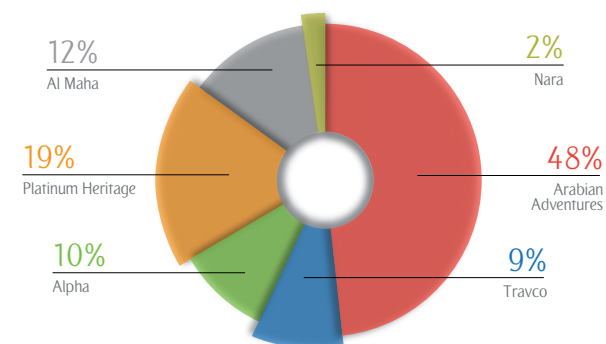
However, the global COVID-19 pandemic, the resulting restrictions on international travel and the subsequent government shutdown of all Desert Safaris from 17 March 2020 onwards, saw the DDCR finish the year with a 16% reduction in visitors from the previous year.

Dubai Desert Conservation Reserve - annual visitors



A total of 238,303 visitors came to the DDCR in 2019-20, with Arabian Adventures providing the bulk of visitors.

Tour operator summary 2019-20





7 Major Projects in 2019-2020

7.1 DDCR Visitor Centre






Outreach and Public Awareness Policy

DDCR Management Plan 2019 - 2024

Concerted efforts will be made and resources mobilised, to raise local, national and international awareness of the DDCR's natural and heritage significance, its conservation purpose and social values. The aim is to build wide public understanding and support for the Reserve's conservation which will involve designing and implementing awareness, outreach and marketing campaigns. The target audiences will be local and international visitors, tour operators, local communities and senior decision makers.

The desert visitor centre will be a place for people to enhance their environmental awareness and will connect them with the unique desert habitat of the DDCR. Visitor centres are facilities that prepare visitors physically, mentally and spiritually to experience special places.

A better visitor experience leads to better word of mouth, which leads to the better success of DDCR visitor activities. The visitor centre will aim to:

-  Enhance the visitor experience by adding a new activity that visitors can experience before or after visiting the reserve
-  Connect the DDCR visitor with the authentic desert experience
-  Be used as a platform to develop an educational program for schools and higher education
-  Better understand DDCR visitors' motivation and needs to identify the opportunities to provide a better experience
-  Raise visitors' awareness of the desert values and to elicit support for its conservation





7.2 Arabian Oryx enclosure and sorting facilities

Ungulate Population Policy

DDCR Management Plan 2019 - 2024

In line with the DDCR's accepted purpose and as an ecological imperative, the policy is to significantly reduce and then regulate ungulate populations to restore the natural balance and aid the recovery of the desert ecosystem.

This will be accomplished by a tested, phased and carefully monitored programme of reducing and subsequently regulating the ungulate populations that will involve a combination of translocation, controlled eradication and natural predation of the oryx and two gazelle species, with consequent adjustments to their supplementary feeding.

The populations of Arabian Oryx in the Reserve have reached unsustainable numbers and continue to grow exponentially. The Reserve's carrying capacity is undetermined but evidence of overgrazing is evident with damaging impacts on the natural vegetation. The situation has arisen as the Arabian Oryx have no natural population regulators such as food restrictions (supplementary feed is provided), migration or predators. Excessive populations create risks of disease

transmission, mortality from aggression and lead to the overall loss of biodiversity as other species are displaced through loss or change in habitats and overutilization of resources. It is therefore necessary to implement a project to remove some Arabian Oryx from the DDCR into two adjacent enclosures and then stop the continued breeding by separating males and females.

The objectives of this project are:

- ✎ Reduce the Arabian Oryx population within the DDCR, through the removal of animals
- ✎ Have sorting facilities and passive capture equipment to enable the intensive management of the removed Oryx population
- ✎ Separate males from females to prevent continued breeding and a subsequent increase in the size of the population
- ✎ Have holding enclosures large enough to hold the two separate herds

The expected outcomes of this project are described in the table below.

Expected Outcomes	Description
Reduction of DDCR Oryx population	Initially target a population of 250 Arabian Oryx within the DDCR
Gradual improvement of the DDCR vegetation	Monitoring of vegetation will indicate the improvements of the vegetation after grazing pressure has been reduced
A natural increase in biodiversity	Improved resources (vegetation) will result in a natural increase in biodiversity
Potential for the re-introduction of a diverse range of previously existing species	A healthy eco-system will allow for the re-introduction of different species to the DDCR. Dependent on numerous factors this could include Ostrich, Sand Cat or Cheetah

1,425
Ungulates
(As of April 2020)





8 DDCR Affiliations



IUCN Green List of Protected Areas

The IUCN Green List of Protected and Conserved Areas is the first global standard of best practice for area based conservation. It is a programme of certification for protected and conserved areas that are effectively managed and fairly governed. The DDCR is a Candidate Site for the IUCN Green List.

Green Destinations

The Green Destinations program for GSTC-Accredited Certification (Global Sustainable Tourism Council) and precertification benchmark awards, offers tailor-made solutions to protected areas (National Parks, UNESCO Geoparks) that are seeking international recognition for responsible tourism; for the way they manage their heritage, their environment and climate, and the quality of their tourism offering. The DDCR is registered for the program.





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