محمية دبي الصحراوية
DUBAI DESERT CONSERVATION RESERVE

Monitoring Program for the Major Site Values of the Dubai Desert Conservation Reserve

Compiled by
Greg Simkins - Conservation Manager
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Moayyed Sher Shah - Conservation Officer

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Introduction

During the planning process for the DDCR Management Plan the following major site values were identified for the DDCR, these are aligned with the national conservation targets and their status are described in the Dubai Protected Area Network (DPAN) Strategic Framework.

Fauna	
Arabian oryx	Oryx leucoryx
Arabian Gazelle	Gazella arabica
Sand gazelle	Gazella marica
Lappet-faced Vulture	Torgos tracheliotos
Pharaoh Eagle Owl	Bubo ascalaphus
Macqueen's Bustard	Chlamydotis macqueenii
Gordon's Wildcat	Felis lybica lybica
Habitat	
Sand sheets with perennial herbs	Tribulus arabicus, Dipterygium glaucum, Limeum arabicum
Interdunal Plains/ Gravel plains	Dwarf shrub and woody-based herb vegetation
Flora	
Ghaf groves	Prosopis cineraria

This monitoring program includes, for each of the major site values, the objectives, methodology and expected outcomes that have been approved by the DDCR Research Committee. The results of this monitoring program will provide the DDCR management with performance measures for each major site value that will be used to evaluate the effectiveness of our management to achieve successful conservation outcomes.

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DUBAI DESERT CONSERVATION RESERVE

Researcher(s) Name(s)	Contact Details (including affiliations)
Moayyed Sher Shah & Gregory Simkins	Conservation Officer and Conservation Manager, 0507305336

Research Proposal Title

Long term monitoring of Arabian Oryx in Dubai Desert Conservation Reserve

Project Summary

According to the IUCN red list criteria the Arabian Oryx *Oryx leucoryx* is classified as "Vulnerable". Arabian Oryx were previously extinct in the wild across their entire range on the Arabian Peninsula, and re-introduction programs were started in the UAE in1997. Two groups of Arabian Oryx were reintroduced in Dubai Desert Conservation Reserve (DDCR) in 1999 and 2003. One of the main aims for the DDCR is to maintain a healthy, optimum and self-sustaining population of Arabian Oryx in the reserve. To achieve this aim, it is imperative to implement a long-term monitoring program in order to have a better understanding of the Arabian Oryx population and their requirements and subsequently to utilise this understanding to make better management decisions for the DDCR.

Research Objective(s)

- <Objective #1: > To monitor population trends, birth rates and mortalities of Arabian Oryx within DDCR for better management of the population and the reserve.

- <Objective #2: > Evaluate (and assess) the health and condition of Arabian Oryx, especially during periods of unfavourable vegetation conditions.

- <Objective #3: > To monitor the distribution of Arabian Oryx within the DDCR and understand the changes occurring both seasonally and over the years.

- <Objective #4: > To gain an understanding of Arabian Oryx ecology by studying the movement patterns of Arabian Oryx within the DDCR, in particular, we will look to determine their seasonal and annual home range and which habitats within that home range they prefer. Furthermore, we will gain a better understanding of the relationship between the management support infrastructure, feed spots and waterholes and how they affect the movements of Arabian Oryx.

Methodology/Methods

1. **Weekly counts:** Counts are conducted of three ungulates species and Macqueen's bustard including the Arabian Oryx covering most of the DDCR including all feed spots, water holes and irrigated areas. During the count, every Tuesday total numbers of Arabian Oryx individuals recorded are taken into account, births and mortalities occurred during the week are also recorded. These counts are conducted by two vehicles providing feed one in the north and other in south in two hours.

2. **Body condition scoring:** Annually and also during the unfavourable vegetation conditions (including drought conditions) in DDCR the health condition of Arabian Oryx are assessed using the body condition scoring method. On each feeding points, the health condition of each Arabian Oryx individual will be assessed by body condition scoring ranging between 0-5, where 0 is an emaciated condition, and 5 is an obese animal.

3. **Distribution Assessment:** 62 permanent quadrants were established in DDCR, 45 quadrants of 2 X 2 km and 17 partial quadrants on the parameter fence of DDCR. Annual counts of three ungulate species including Arabian Oryx are conducted in all 62 quadrants in two days with the help of volunteers to know their distribution, and also numbers are recorded.

4. **Movement Studies:** Six to eight Arabian Oryx, with equal sex radios, will be selected from different herds geographically spread across the DDCR and GSM-GPS collars will be fitted to record the GPS location of the Oryx every two hours. Current GPS locations and activity data (i.e. grazing periods), as well as VHF signals, will be used to track the Oryx to ascertain their preferred fodder species and group composition. Observational data, locations, condition, social structure and activity of collared Oryx will be recorded by the DDCR team whenever collar numbers identify them.

Expected Outcomes	Description
<Deliverable #1>	Arabian Oryx population dynamics in DDCR are better understood, which in turn will contribute to better management of the population and reserve as a whole.
<Deliverable #2>	Overall health status of Arabian Oryx is assessed, and the decision of any intervention needed, such as the provision of supplementary food is based on the results of this assessment.
<Deliverable #3>	A better understanding of Arabian Oryx habitat utilisation within DDCR.
<Deliverable #4>	By understanding the movement and habitat use of the Arabian Oryx, our largest herbivore, we will gain a better understanding of the herbivore carrying capacity of the DDCR and thereby make the correct management decision to prevent overgrazing and habitat degradation.

Performance Measures	Thresholds
Population	Arabian Oryx population between 200-300 individuals in DDCR.
Body condition scoring (BCS)	When average body condition scoring of Arabian Oryx starts getting below 3.
Optimum Breeding	Minimum replacement.

Project Timeline			
Description	Start Date	End Date	Frequency
Species Weekly Counts	July 2020	December 2024	Weekly counts every Tuesday
Body condition scoring (BCS)	August 2021	December 2024	Annual BCS and more frequent during drought conditions.
Distribution Assessment	January 2021	January 2024	Annually in January
Movement Studies	January 2021	January 2024	Regular Basis-Tracking data

Applicant(s) Signature	Date
M. S. SHAH	15 August 2020
Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).	

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	G. D. Simkins

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DUBAI DESERT CONSERVATION RESERVE

Researcher(s) Name(s)	Contact Details (including affiliations)
Moayyed Sher Shah & Greg Simkins	Conservation Officer and Conservation Manager, 0507305336

Research Proposal Title
Long term monitoring of Arabian Gazelles in Dubai Desert Conservation Reserve

Project Summary

According to the IUCN red list criteria, the Arabian gazelle *Gazella arabica* or Idmi is classified as "Vulnerable". In efforts to restore the Arabian gazelle population to its original habitat in UAE a group of Arabian gazelles were released into the Dubai Desert Conservation Reserve (DDCR) during 1999. One of the main aims for the DDCR is to maintain a healthy, optimum and self-sustaining population of Arabian gazelles in the reserve. To achieve this aim, it is imperative to implement a long-term monitoring program in order to have a better understanding of the Arabian gazelle population and their requirements and subsequently to utilise this understanding to make better management decisions for the DDCR.

Research Objective(s)

- <Objective #1: > To monitor population trends including birth rates and mortalities of Arabian gazelles within DDCR for better management of the population and the reserve.

- <Objective #2: > To monitor the distribution of Arabian gazelle within the DDCR and understand the changes occurring both seasonally and over the years.

Methodology/Methods

- **Species Weekly counts:** Counts are conducted for three ungulates species and Macqueen's bustard including the Arabian gazelles covering most of the DDCR including all feed spots, water holes and irrigated areas. During the count every Tuesday total numbers of Arabian gazelle individuals are recorded, births and mortalities occurred during the week are also recorded. These counts are conducted by two vehicles providing feed one in north and other in the south in two hours.

- **Distribution Assessment:** 62 permanent quadrants were established in DDCR, 45 quadrants of 2 X 2 km and 17 partial quadrants on the parameter fence of DDCR. Annual counts of three ungulate species including Arabian gazelles are conducted in all 62 quadrants in one and half days with the help of volunteers to know their distribution, and also numbers are recorded.

Expected Outcomes	Description
<Deliverable #1>	Arabian population dynamics in DDCR are better understood, which in turn will contribute to better management of the population and the reserve as a whole.
<Deliverable #2>	A better understanding of Arabian gazelle habitat utilisation and distribution within DDCR.

Performance Measures	Thresholds
Population size	Arabian gazelles population increase more than 200-300 individuals

Project Timeline			
Description	**Start Date**	**End Date**	**Frequency**
Species Weekly Counts	January 2020	December 2024	Weekly counts every Tuesday
Distribution Assessment	January 2020	January 2024	Annually in January

Applicant(s) Signature	Date
M. S. SHAH	15 August 2020
Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).	

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	*G. D. Simkins*

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DUBAI DESERT CONSERVATION RESERVE

Researcher(s) Name(s)	Contact Details (including affiliations)
Moayyed Sher Shah and Greg Simkins	Conservation Officer and Conservation Manager, 0507305336

Research Proposal Title
Long term monitoring of Arabian Sand Gazelles in Dubai Desert Conservation Reserve

Project Summary

According to the IUCN red list criteria the Arabian Sand gazelle *Gazella marica* or Reem is classified as "Vulnerable". The Sand gazelle population was extinct from most parts of its range on the Arabian Peninsula (distribution) including the UAE. In efforts to restore the population to its original habitat in UAE, a small group of Sand gazelles were released into the Dubai Desert Conservation Reserve (DDCR) during 1999. One of the main aims for the DDCR is to maintain a healthy, optimum and self-sustaining population of Sand gazelle in the reserve. To achieve this aim, it is imperative to implement a long-term monitoring program in order to have a better understanding of the Sand gazelle population and their requirements and subsequently to utilise this understanding to make better management decisions for the DDCR.

Research Objective(s)

- <Objective #1: > To monitor population trends including birth rates and mortalities of Sand gazelle within DDCR for better management of the population and the reserve.

- <Objective #2: > To monitor the distribution of Sand gazelle within the DDCR and understand the changes occurring both seasonally and over the years.

- <Objective #3: > To gain an understanding of Sand gazelle's ecology by studying the movement patterns of Sand gazelle within the DDCR, in particular, we will look to determine their seasonal and annual home range and which habitats within that home range they prefer.

Methodology/Methods

- **Species Weekly counts:** Counts are conducted for three ungulates species and Macqueen's bustard including the Sand gazelle covering most of the DDCR including all feed spots, water holes and irrigated areas. During the count, every Tuesday total numbers of Sand gazelle individuals recorded are taken into account, births and mortalities occurred during the week are also recorded. These counts are conducted by two vehicles providing feed one in the north and other in south in two hours.

- **Distribution Assessment:** 62 permanent quadrants were established in DDCR, 45 quadrants of 2 X 2 km and 17 partial quadrants on the parameter fence of DDCR. Annual counts of three ungulate species including Sand gazelle, are conducted in all 62 quadrants in one and half day with the help of volunteers to know their distribution, and also numbers are recorded.

- **Home Range and Movement Studies:** 10 Sand gazelles with equal sex radios, will be selected from different herds geographically spread across the DDCR and GSM-GPS collars will be fitted to record the GPS location of the Sand gazelles. Current GPS locations and activity data (i.e. grazing periods), as well as VHF signals, will be used to track the Sand gazelles to ascertain their preferred fodder species and group composition. Observational data, locations, condition, social structure and activity of collared Sand gazelles will be recorded by the DDCR team whenever collar numbers identify them.

Expected Outcomes	Description
<Deliverable #1>	Sand gazelle population dynamics in DDCR are better understood, which in turn will contribute to better management of the population and reserve as a whole.
<Deliverable #2>	A better understanding of Sand gazelles habitat utilisation within DDCR.

<Deliverable #3>	By understanding the movement and habitat use of the Sand gazelles, we will gain a better understanding of the herbivore carrying capacity of the DDCR and thereby make the correct management decision to prevent overgrazing and habitat degradation.
<Deliverable #4>	Possible M.Sc thesis for movement studies.

Required Resources	Quantity (with the unit)
Radio Collars (GSM-GPS-VHF)	Ten pieces
Tag no.	50 pieces
M.Sc student to assist in movement studies	1

Performance Measures	Thresholds
Population	Sand gazelles population increase more than 100-200 individuals
Breeding Effort	Increase in Population

Project Timeline Description	Start Date	End Date	Frequency
Species Weekly Counts	January 2012	December 2024	Weekly counts every Tuesday
Distribution Assessment	January 2014	January 2024	Annually in January
Home Range and Movement Studies	January 2021	January 2024	Daily Basis-Tracking data

Applicant(s) Signature	Date
M. S. SHAH	15 August 2020
Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).	

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	*G. D. Simkins*

DUBAI DESERT CONSERVATION RESERVE

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Researcher(s) Name(s)	Contact Details (including affiliations)
Moayyed Sher Shah & Gregory Simkins	Conservation Officer and Conservation Manager, 0507305336

Research Proposal Title

Monitoring of Lappet-faced Vulture in the Dubai Desert Conservation Reserve

Project Summary

According to the IUCN red list criteria the Lappet-faced vulture *Torgos tracheliotos* is classified as "Endangered". The global population of Lappet-faced vultures is approximately 5700 mature pairs; the total population of Lappet-faced vulture in the Middle East is estimated at around 500 individuals (IUCN 2016). The population of Lappet-faced vultures in UAE is not known. The main threats to the Lappet-faced vulture population globally are poisoning and persecution, as well as ecosystem alterations (Birdlife international). Dubai Desert Conservation Reserve (DDCR) is among the few sites where Lappet-faced vulture are regularly recorded in the UAE. The first record of Lappet-faced vultures in DDCR were two juvenile individuals photographed in 2006 by a remotely triggered camera trap, part of a survey for elusive and nocturnal animals within the reserve. In 2012 a total of 47 Lappet-faced vultures were seen on an Arabian oryx carcass in DDCR, and this was the largest group of vultures ever seen in the UAE. Lappet-faced Vultures are not resident in DDCR but are seen regularly in the reserve. Till date, there are no breeding records of Lappet-faced vultures in Dubai Emirate, and little is known about their breeding and roosting sites in UAE.

One of the main aims for the DDCR is to gain a better understanding of the status of the Lappet-faced vulture population visiting the reserve and identify their home-range, breeding and roosting sites. To achieve this aim, a long-term monitoring program for Lappet-faced vultures is planned through this proposal to have a better understanding of the species and their requirements.

Research Objective(s)

- <Objective #1: > To evaluate the population status of Lappet-faced vulture visiting DDCR.
- <Objective #2: > To know the breeding and roosting sites of Lappet-faced vultures around DDCR.
- <Objective #3: > To study their daily movements, seasonal and annual home range.
- <Objective #4: > To understand and study the feeding behaviour of Lappet-faced vultures in DDCR.

Methodology/Methods

1. Camera Trapping Survey: As many species in the desert environment are rare and elusive, including Lappet-faced vultures, camera traps are one of the best tools to collect information on their population and behaviour. Two different approaches will be used to study the Lappet-faced vultures using Camera traps.

  a. Water Point Camera Traps Survey: At least six Camera traps are set and distributed on water resources (points) to record the presence and numbers of Lappet-faced vultures visiting DDCR. These camera traps will be set over the year. These Camera traps will be checked every month and data will be collected.

  b. Ungulate Carcass Observation Point: Some of the carcasses of ungulates found dead in DDCR will be taken to two sites. Camera traps will be set on these two permanent ungulate carcass dumping sites to record the presence and visits of Lappet-faced vultures to DDCR. Also, their feeding behaviour will be studied.

2. Random Observations (Sightings): Random observations are taken by DDCR staff whenever Lappet-faced vultures are sighted visiting DDCR. The number of vultures, location, time, date and behaviour will be recorded and reported. These observations are reported through an application (Handy GPS) on the DDCR WhatsApp reporting platform (group).

3. Movements Studies: Attempts will be made to capture at least four Lappet-faced vultures in DDCR on the ungulate carcass sites. PTT transmitters will be fitted on all captured individuals. Also, metal rings and wing tags

with numbers will be secured on captured individuals. Feather and blood samples will be collected from a captured individual for genetic studies in future. Daily movements of the PTT fitted Lappet-faced vulture with studied. The roosting and breeding sites will be located through the tracking. Also, the seasonal and annual home range of Lappet-faced vultures will be studied.

4. Intensive (or Selected Points) Surveys: Ten sites will be selected in the DDCR based on previous regularly visited sites by Lappet-faced vultures and will be surveyed once every two months intensively. Camera traps data will be used to know the best time and days to survey these ten sites. Data on a group size of Lappet-faced vultures recorded, age of individuals (adult & juvenile), time, date, and behaviour will be collected.

5. Breeding Sites Study: Once the breeding sites for Lappet-faced vultures are known, these sites will be visited and studied in detail to understand their breeding ecology. Nesting behaviour of Lappet-faced vultures such as time of lying egg, incubation period and behaviour will be studied. Nesting site details such as the location, species of tree nest are recorded, height and width of tree, habitat and vegetation will also be recorded and studied.

Expected Outcomes	Description
<Deliverable #1>	The number of Lappet-faced vultures within and around DDCR will be known.
<Deliverable #2>	Movement patterns of Lappet-faced vulture visiting DDCR.
<Deliverable #3>	Breeding grounds and roosting locations of Lappet-faced Vulture around DDCR will be known.
<Deliverable #4>	Threats to Lappet-faced vulture population.
<Deliverable #5>	Possible M.Sc thesis for movement and breeding site studies.

Performance Measures	Thresholds
Annual visiting population	20-40 individuals recorded in DDCR.
Roosting	Roosting sites within and outside DDCR are known.
Breeding	Breeding sites are Identified.

Required Resources	Quantity (with the unit)
PTT transmitters	4 Pieces
Tag numbers	20 Pieces
Metal rings	100 Pieces
One Volunteer for movement and breeding site studies	1
Vulture capturing equipment	

Project Timeline Description	Start Date	End Date	Duration
<Project Duration>			

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Camera Trapping Survey	Sep 2020	Dec 2024	Throughout the year
Movements Studies	Mar 2021	Dec 2023	Attempt capturing vultures: 6 months from March 2021 Movement studies: throughout the year after capturing
Observations	Jun 2020	Dec 2020	Random: Throughout the year Selected locations (From March 2021): Once every two months

Estimated Budget	
Category 1	Price
PTT transmitters (4 Pie)	
Total Costs	
Category 2	
Tag numbers (20 Pie)	
Total Costs	
Category 3	
Metal rings (100 Pie)	
Total Costs	
Total	

Applicant(s) Signature	Date
M. S. SHAH	15 August 2020
Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).	

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	*G. D. Simkins*

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DUBAI DESERT CONSERVATION RESERVE

Researcher(s) Name(s)	Contact Details (including affiliations)
Moayyed Sher Shah & Gregory Simkins	Conservation Officer and Conservation Manager, 0507305336

Research Proposal Title

Monitoring of Pharaoh Eagle Owl in Dubai Desert Conservation Reserve

Project Summary

According to the IUCN red list criteria the Pharaoh eagle-owl *Bubu ascalaphus* is classified as "Least Concern" globally and classified as "Critically Endangered" nationally in UAE. The Pharaoh eagle owl is distributed across most parts of the UAE. Primary threats to Pharaoh eagle owl population in UAE are habitat destruction and persecution. Dubai Desert Conservation Reserve (DDCR) is among the few reserves in the UAE where Pharaoh eagle-owl breeding is recorded. Breeding of Pharaoh eagle owl is recorded in DDCR. At least ten roosting sites and seven breeding sites are recorded within DDCR.

This study aims to understand the population status of the Pharaoh eagle owl and to learn more about their diet and breeding ecology within the DDCR. To achieve this aim a monitoring program for Pharaoh eagle owl is planned through this proposal to have a better understanding of the species and their requirements.

Research Objective(s)

- <Objective #1: > To evaluate the population status of Pharaoh eagle owl in DDCR.
- <Objective #2: > To study the breeding and roosting sites of Pharaoh eagle owl in DDCR.
- <Objective #3: > To understand and study the diet (and feeding ecology) of Pharaoh eagle owl.

Methodology/Methods

1. Camera Trapping Survey: Like many species in the desert environment are rare and elusive, including Pharaoh eagle owl, camera traps are one of the best tools to collect information on their population and behaviour. Camera Traps will be used to study the Pharaoh eagle owl in DDCR. At least six Camera traps are set and distributed on water resources (points) to record the presence and numbers of Pharaoh eagle owl. These camera traps will be set over the year. These Camera traps will be checked every month and data will be collected.

2. Surveys: 10 sites are selected in DDCR based on previous records of Pharaoh eagle-owl roosting and breeding sites (Table 1). All these sites will be surveyed once every three months intensively during the night and also day time. The following data on each sighting of Pharaoh eagle-owl will be recorded, the number of individuals, location, age (adult & juvenile) and sex of individuals, time, date and behaviour. During night surveys the calls of individual Pharaoh eagle owls will also be taken into account.

3. Breeding Sites Study: During the breeding season all the previously known breeding sites of Pharaoh eagle-owl will be surveyed, and attempts will be made to locate any nests. Potential sites of Pharaoh eagle owl nest will also be surveyed during the breeding season. Nesting behaviour of Pharaoh eagle-owl such as time of lying eggs, incubation period and behaviour will be studied. Nesting site details such as the location, time, date, habitat and vegetation condition will also be recorded and also studied if possible, chicks recorded in a nest will be captured and ringed for identification purpose.

4. Diet Studies: Pharaoh eagle owls pellets will be collected from the known roosting sites in DDCR. Pellet samples collected will be stored in sterilized plastic bags. With the help of experts, the analysis of pellet contents will be done to study the diet of Pharaoh eagle owls.

Expected Outcomes	Description
<Deliverable #1>	The number of Pharaoh eagle owl in DDCR will be known.
<Deliverable #2>	Breeding and roosting sites of Pharaoh eagle owls will be known in DDCR.
<Deliverable #3>	Diet contents (Feeding ecology) of Pharaoh eagle owls will be studied.
<Deliverable #4>	Possible graduation project or M.Sc thesis for the breeding site and diet studies.

Performance Measures	Thresholds
Population	5-10 pairs of Pharaoh eagle owl in DDCR
Breeding	2-5 Breeding pairs of Pharaoh eagle owl in DDCR

Required Resources	Quantity (with the unit)
Metal rings	100 Pieces
One assistant to PI	1

Project Timeline Description	Start Date	End Date	Duration
<Project Duration>			
Camera Trapping Survey	Sep 2020	Dec 2024	Throughout the year
Survey	Apr 2021	Dec 2023	Once every three months
Breeding Sites Study	Apr 2021	Dec 2023	During breeding season
Diet Studies	Jun 2021	Dec 2023	Once every three months

Applicant(s) Signature	Date
M. S. SHAH	15 August 2020

Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	*G. D. Simkins*

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DUBAI DESERT CONSERVATION RESERVE

Researcher(s) Name(s)	Contact Details (including affiliations)
NARC, Greg Simkins & Moayyed Sher Shah	Conservation Manager & Conservation Officer, 0504558770

Research Proposal Title

Reintroduction and Long-term Monitoring of the Macqueen's Bustard in Dubai Desert Conservation Reserve

Project Summary

Macqueen's bustard or Asian houbara *Chlamydotis macqueenii* is one of the flagship species for UAE, and according to IUCN, red list criteria is classified as "Vulnerable". Macqueen's bustard population globally had declined rapidly, mainly due to hunting. In efforts to conserve the Macqueen's bustard population, the UAE has started a breeding and reintroduction program, to release Macqueen's bustard back into the wild in several locations within and outside the UAE.

In a project done in conjunction with the National Avian Research Centre (NARC) and the office of HH Sheikh Mohammed bin Rashid al Maktoum, Macqueen's bustards were re-introduced into Dubai Desert Conservation Reserve (DDCR). Macqueen's bustards are released annually during the winter months by NARC. A total of 3101 Macqueen's bustards have been released to date (2020) in 10 groups ranging from 29-1000 birds since the first release in 2009. This reintroduction project aimed to have resident and established breeding population of Macqueen's bustard in DDCR and surrounding area.

Research Objective(s)

- <Objective #1: > To have a resident and breeding population of Macqueen's bustards in DDCR and surrounding area.

- <Objective #2: >To monitor population trends of newly released Macqueen's bustard including the survival, birth and mortalities in release sites and irrigated areas in DDCR.

- <Objective #3: > To monitor the movements and survival of released Macqueen's bustard inside and around the DDCR fenced area.

- <Objective #4: > To count and estimate the established (or survived) population of Macqueen's bustard within DDCR.

- <Objective #5: > To monitor the distribution of Macqueen's bustard within the DDCR.

Methodology/Methods

- **Release (NARC & DDCR):** Macqueen's bustards are captive bred in the NARC and reared to adulthood, before being transported to the DDCR. These bustards are release into the DDCR by one of two methods;
    - o Hard Release: The Bustards are released directly into the desert.
    - o Soft Release: The bustards are allowed to acclimatize to the area for one month in specially built cages before being released.
- **Weekly counts (DDCR):** Counts are conducted of three ungulates species and Macqueen's bustard covering most of the main DDCR tracks including all feed spots, water holes and irrigated areas. During the count, every Tuesday total numbers of Macqueen's Bustard individuals recorded are taken into account, and mortalities occurred during the week are also recorded. Two feeding vehicles each with two persons are conducting this count dividing DDCR in north and south.
- **Movement Studies (NARC):** At least 10-20% of Macqueen's bustards released every year are equipped with satellite PTT transmitters. Survival and movements of the transmitter fitted Macqueen's bustards are monitored.

- **Annual Nest Survey (DDCR):** During the breeding season male Macqueen's bustard display will be recorded, and attempts will be made to locate the nests of breeding females in DDCR. Data, including the location, date, time, and habitat of Macqueen's bustard will be recorded for display and nesting behaviour.
- **Standardized Circular Observation Counts (NARC):** NARC conducts standardized circular observation counts (SCO) on 59 points (locations) which are the centre points of 1x1km grid covering the DDCR to count and assess the Macqueen's Bustards population. Three teams of two to three observers participate to these counts. Macqueen's Bustards are detected and counted on each point and also counts conducted in the main irrigations areas and the release sites. These SCO counts are conducted before the Macqueen's Bustards release every year in October-November. Sex, ring numbers, transmitter details, location, date and time, are recorded for each Macqueen's Bustards detected or observed.
- **Distribution Assessment (DDCR):** 62 permanent quadrants were established in DDCR, 45 quadrants of 2 X 2 km and 17 partial quadrants on the parameter fence of DDCR. Annual counts of ungulate species and Macqueen's bustards are conducted in all 62 quadrants with the help of volunteers to know their distribution, and also numbers are recorded.

Expected Outcomes	Description
<Deliverable #1 & 2>	To have a breeding population of Macqueen's Bustard in DDCR and areas surrounding DDCR.
<Deliverable #3>	By satellite tracking to have a better understanding of movements of the newly released Macqueen's Bustards and their ecological requirements, monthly update reports.
<Deliverable #4>	Macqueen's bustard population estimation and comparison of results with other sites in the UAE.
<Deliverable #5>	A better understanding of Macqueen's bustard habitat utilization and dispersal within DDCR.

Performance Measures	Thresholds
Population	Population of 25-50 Macqueen's bustards in DDCR.
Breeding Population	To record 1-5 nests of Macqueen's bustard annually in DDCR.

Project Timeline Description	Start Date	End Date	Frequency
<Project Duration>			
Release	February 2021	December 2024	Annually during January-February
Species Weekly Counts	January 2021	December 2024	Weekly counts every Tuesday
Movement Studies	January 2020	December 2024	Regular (daily)
SCO Counts	October 2021	December 2024	Annually in October-November
Distribution Assessment	January 2021	January 2024	Annually in January
Annual Nest Survey	February 2021	April 2024	Annually during the breeding season

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Applicant(s) Signature	Date
M. S. SHAH	15 August 2020

Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	G. D. Simkins

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DUBAI DESERT CONSERVATION RESERVE

Researcher(s) Name(s)	Contact Details (including affiliations)
Moayyed Sher Shah & Gregory Simkins	Conservation Officer and Conservation Manager, 0507305336

Research Proposal Title

Monitoring of Arabian Wildcat *Felis lybica lybica* in Dubai Desert Conservation Reserve

Project Summary

The Wildcat (including *Felis lybica and Felis silvestris*) is a small, widely distributed feline species, ranging through Western Europe to north-western China and India, North Africa and sub-Saharan Africa south to the Cape. According to IUCN red list criteria, the Wild cat species is classified as "Vulnerable" globally. The sub-species of Wildcat exists in UAE is Arabian wildcat *Felis lybica lybica*. A significant threat to the wildcat population globally and in UAE is the hybridisation with feral cats and the transmission of diseases. At the same time, habitat loss and degradation also adversely affects the Wildcat population.

Moreover, a study in the UAE indicated that the Arabian wildcats are also being persecuted by farmers because they prey on domestic chickens. A small population of Arabian wildcats exist in the Dubai Desert Conservation Reserve (DDCR). Efforts are made by DDCR management to conserve this small feline species; a monitoring program is in place to monitor the Arabian wildcat population in DDCR.

Research Objective(s)

- <Objective #1: > To monitor the Wildcat population in DDCR and collect morphological data of the species.
- <Objective #2: > To record the Wildcat individuals in the wild and estimate their density in DDCR.
- <Objective #3: > To eradicate the Feral cats from DDCR to avoid cross-breeding with Wildcats.

Methodology/Methods

- **Live Trapping:** Live trapping sessions are carried out to capture Arabian wildcats and other meso-carnivore within DDCR. Two different approaches are used; they are:
  1. Annual Trapping Survey: A total of nine Tomahawk live traps are set for five nights to capture Wildcats and Foxes using three traps each in the north, central and south zones in DDCR. This trapping session is part of the Biosphere expedition and is carried out annually in the winter season. All Traps are set and baited with sardines in the evening. Traps are checked the following morning; captured animals are sexed, morphological data is collected then they are marked and released back at the point of capture. Through a collaboration project hair, tissue and blood samples are collected for genetic studies by UAEU PhD student.
  2. Triennial Trapping Survey: One Triennial meso-carnivores trapping survey will be conducted every three years to calculate the density of Wildcats and other carnivores in the DDCR. Three trapping grids of 10 traps each will be set in the north, central and south of the DDCR and will be conducted for five nights using Tomahawk traps during the spring season. All Traps are set and baited with sardines in the evening. Traps are checked the following morning; captured animals are sexed, morphological data is collected then they are marked and released back at the point of capture.
- **Camera Trapping Survey:** As many species in the desert environment are both nocturnal and elusive, including Arabian wildcats, camera traps are one of the best tools to collect information on their populations. Seventeen camera traps are set and distributed on water resources (points) and natural sites in the north, central and south zones of DDCR to know the status of Wildcats. These camera traps are set annually for one month during the winter season. Camera traps are set during the Biosphere expedition by volunteers and collected by the researchers.

- **Feral Cat Trapping:** Traps are set to capture the feral cats around the tour operator camps and main entry point to the reserve (gates) and once captured these feral cats are removed from the DDCR. Information such as the location and date of capture, sex, age, marking pattern and colours of captured feral cat individuals are recorded and kept in the database. Through a collaboration project hair, tissue and blood samples are collected for genetic studies by UAEU PhD student.

Expected Outcomes	Description
<Deliverable #1>	Status of the Arabian wildcat population known in DDCR.
<Deliverable #2>	The density of Arabian wildcats in DDCR will be estimated.
<Deliverable #3>	Reduce the chance of Arabian Wildcat hybridisation, provide more space and prey base for Arabian wildcats in DDCR.

Performance Measures	Thresholds
Population	Presence of Arabian Wildcat in DDCR
Feral cats	Eradication of Feral cats from DDCR

Required Resources	Quantity (with the unit)
Tomahawk Live Traps	10 Pieces
Baits	
Volunteers or assistant to enter camera trap pictures	2

Project Timeline Description	Start Date	End Date	Frequency
Annual Trapping Session	January 2020	Dec 2024	Annually 1 Trapping survey in the winter season (January-February)
Triennial Session	Jan 2021	March 2024	1 Trapping survey every three years (Jan-March)
Camera Trapping Survey	January 2020	Dec 2024	Annually one month in the winter season (January-February)
Feral Cats Trapping	January 2020	Dec 2024	Regular trapping sessions all over the years when feral cats or signs are observed.

Applicant(s) Signature	Date
M. S. SHAH	15 August 2020
Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval .	

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DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	*G. O. Simkins*

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DUBAI DESERT CONSERVATION RESERVE

Researcher(s) Name(s)	Contact Details (including affiliations)
Tamer Khafaga	Conservation Research Manager, 0566861641

Research Proposal Title
Surveys & Monitoring for Sand Sheet with perennial herbs

Project Summary
To implement the continuous practical and efficient vegetation long term monitoring program with the application of appropriate functional analysis for valid data interpretation that will lead to adaptive management plans for the reserve with sets of priorities and objectives.

Research Objective(s)

- Provide timely and decision support data for further management of natural communities
- Provide an assessment of the conditions (Diversity, cover and distribution) of the plant communities across the sand sheet with perennial herbs habitats.
- Assess how different management activities influence plant communities' structure and composition
- Assess how the different biotic natural and climatic condition affect the plant communities' diversity and density.
- Monitoring vegetation changes over time.
- Update the plant species list for the specific habitats

Methodology/Methods

There will be two division for this study proposal:

- Vegetation Survey Study to be conducted every five years (209 Sampling sites).
- Vegetation Monitoring Study to be conducted every year (4 sampling sites & 1 enclosure)

Both studies are planned to follow a unified methodology that been adapted since the initiation of these studies. The aim is to provide information about the status of the floral communities. Encompasses the plot sampling technique will be the primary data collection method, the sampling sites randomly distributed systematically all over the reserve and presenting the major site values (**Sand sheet with perennial herbs).**

Each study will run in two phases (Field data collection followed by data analysis) the aim is to produce a final comprehensive report at the end of each study cycle:

- **Vegetation survey study (every five years)**:
- Data collection: has two main themes; to assess the species diversity and to compare the floral communities in a different sand sheet with perennial herbs habitats. Using the plot sampling technique with a circular plot of 50m diameter; each is equivalent to 7800m^2 wherein each circular plot, five 10m

x 10m quadrants randomly sampled to record vegetation properties such as plant species and abundances along with the density and cover.
-   Data Analysis: Data analysis will involve the following methods:
    -   Diversity estimates and species richness: using Simpson and Shannon diversity index
    -   Community structures: plant density, relative density, frequency, relative frequency, abundance, relative abundance and relative cover
    -   Important Value index: for the dominant and co-dominant species in the community
    -   Floral diversity prediction for DDCR
    -   Species dispersion predictions
    -   Complementarity test to cover the distinction in species composition over a broad spectrum of environmental scales.
    -   Implement divisive classification TWINSPAN method to classify the vegetation by hierarchical divisions and construct an ordered two-way table form the original species by site's data.

-   **Vegetation monitoring study (Yearly)**
-   Data collection: has two main themes; to assess the species diversity and to compare the floral communities in a different sand sheet with perennial herbs habitats.

    -   Select (5) sites;
    -   Two out of then sites are entirely fenced preventing the ungulate grazing;
    -   Each site will be replicated with (10) permanent plots; each is 15x15m;
    -   A total of 10 quadrates (each 2x2m) will be randomly distributed within each plot;
    -   The following plant attributes will be collected (species list, species density, species frequency, species cover and the important value index);
    -   Species and richness and diversity indices will be calculated;
    -   Same attributes will be recorded inside the fenced areas to compare between the different grazing intensities.
-   Data Analysis: Data analysis will involve the following methods:
-   Diversity estimates and species richness: using Simpson and Shannon diversity index
-   Community structures: plant density, relative density, frequency, relative frequency, abundance, relative abundance and relative cover
-   Important Value index: for the dominant and co-dominant species in the community
-   Floral diversity prediction for DDCR
-   Species dispersion predictions
-   Complementarity test to cover the distinction in species composition over a broad spectrum of environmental scales.
-   Implement divisive classification TWINSPAN method to classify the vegetation by hierarchical divisions and construct an ordered two-way table form the original species by site's data.

Expected Outcomes	Description
<Deliverable #1>	Improve the understanding of the vegetation status within DDCR; the result will help in better management of DDCR

2

<Deliverable #2>	A full detailed report
<Deliverable #3>	A research article to be published in peer-reviewed journals
<Deliverable #4>	Abstract, short manuscript and PowerPoint presentation for any conferences contribution

Performance Measures	Thresholds
Diversity	0.8 - 0.9 (Simpson)
Cover	07 - 14 %

Required Resources	Quantity (with units)
Volunteers or Interns (with necessary plant ID background)	3 PAX
Quad bike	One bike
Field tools	miscellaneous

Project Timeline			
Description	Start Date	End Date	Duration
<Field Data Collection>	1st of February	31st of May	four months
<Data analysis>	1st of June	31st of October	Five months
<Report writing>	1st of November	31st of January	Three months

Applicant(s) Signature	Date
T. A. Khafaga	15 August 2020

Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	*G. D. Simkins*

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DUBAI DESERT CONSERVATION RESERVE

Researcher(s) Name(s)	Contact Details (including affiliations)
Tamer Khafaga	Conservation Research Manager, 0566861641

Research Proposal Title
Surveys & Monitoring for interdunal plains; gravel plains

Project Summary
To implement the continuous practical and efficient vegetation long term monitoring program with the application of appropriate functional analysis for valid data interpretation that will lead to adaptive management plans for the reserve with sets of priorities and objectives.

Research Objective(s)

- Provide timely and decision support data for further management of natural communities
- Provide an assessment of the conditions (Diversity, cover and distribution) of the plant communities across the interdunal plains and gravel plains
- Assess how different management activities influence plant communities' structure and composition
- Assess how the different biotic natural and climatic condition affect the plant communities' diversity and density.
- Monitoring vegetation changes over time.
- Update the plant species list for the specific habitats

Methodology/Methods

There will be two division for this study proposal:

- Vegetation Survey Study to be conducted every five years (93 Sampling sites).
- Vegetation Monitoring Study to be conducted every year (4 sampling sites & 1 enclosure)

Both studies are planned to follow a unified methodology that been adapted since the initiation of these studies. The aim is to provide information about the status of the floral communities. Encompasses the plot sampling technique will be the primary data collection method, the sampling sites randomly distributed systematically all over the reserve and presenting the major site values (**Interdunal plains; gravel plains).**

Each study will run in two phases (Field data collection followed by data analysis) the aim is to produce a final comprehensive report at the end of each study cycle:

- **Vegetation survey study (every five years)**:
- Data collection: has two main themes; to assess the species diversity and to compare the floral communities in different Interdunal plains and gravel plains. Using the plot sampling technique with a circular plot of 50m diameter; each is equivalent to 7800m^2 wherein each circular plot, five 10m x 10m

quadrants randomly sampled to record vegetation properties such as plant species and abundances along with the density and cover.

- <u>Data Analysis</u>: Data analysis will involve the following methods:
    - Diversity estimates and species richness: using Simpson and Shannon diversity index
    - Community structures: plant density, relative density, frequency, relative frequency, abundance, relative abundance and relative cover
    - Important Value index: for the dominant and co-dominant species in the community
    - Floral diversity prediction for DDCR
    - Species dispersion predictions
    - Complementarity test to cover the distinction in species composition over a broad spectrum of environmental scales.
    - Implement divisive classification TWINSPAN method to classify the vegetation by hierarchical divisions and construct an ordered two-way table form the original species by site's data.

- **Vegetation monitoring study (Yearly)**
- <u>Data collection</u>: has two main themes; to assess the species diversity and to compare the floral communities in different Interdunal plains and gravel plains.

    - Select (5) sites;
    - Two out of then sites are entirely fenced preventing the ungulate grazing;
    - Each site will be replicated with (10) permanent plots; each is 15x15m;
    - A total of 10 quadrates (each 2x2m) will be randomly distributed within each plot;
    - The following plant attributes will be collected (species list, species density, species frequency, species cover and the important value index);
    - Species and richness and diversity indices will be calculated;
    - Same attributes will be recorded inside the fenced areas to compare between the different grazing intensities.
- <u>Data Analysis</u>: Data analysis will involve the following methods:
- Diversity estimates and species richness: using Simpson and Shannon diversity index
- Community structures: plant density, relative density, frequency, relative frequency, abundance, relative abundance and relative cover
- Important Value index: for the dominant and co-dominant species in the community
- Floral diversity prediction for DDCR
- Species dispersion predictions
- Complementarity test to cover the distinction in species composition over a broad spectrum of environmental scales.
- Implement divisive classification TWINSPAN method to classify the vegetation by hierarchical divisions and construct an ordered two-way table form the original species by site's data.

Expected Outcomes	Description
<Deliverable #1>	Improve the understanding of the vegetation status within DDCR; the result will help in better management of DDCR

2

<Deliverable #2>	A full detailed report
<Deliverable #3>	A research article to be published in peer-reviewed journals
<Deliverable #4>	Abstract, short manuscript and PowerPoint presentation for any conferences contribution

Performance Measures	Thresholds
Diversity	0.8 - 0.9 (Simpson)
Cover	07 - 14 %

Required Resources	Quantity (with units)
If available during the survey; volunteers or Interns (with necessary plant ID background)	3 PAX
Quad bike	One bike
Field tools	miscellaneous

Project Timeline Description	Start Date	End Date	Duration
<Field Data Collection>	1st of February	31st of May	four months
<Data analysis>	1st of June	31st of October	Five months
<Report writing>	1st of November	31st of January	Three months

Applicant(s) Signature	Date
T. A. Khafaga	15 August 2020

Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	*G. D. Simkins*

DUBAI DESERT CONSERVATION RESERVE

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Researcher(s) Name(s)	Contact Details (including affiliations)
Tamer Khafaga	Conservation Research Manager, 0566861641

Research Proposal Title
Ghaf Groves Annual Drone Survey

Project Summary

Recent years have seen a rapid emergence of using the UAVs (Unmanned Aerial Vehicles) for ecological monitoring. The fast development of the different sensors, e.g. infra-red and multi-spectral sensors accompanied by advanced orthomosaic software provide new tools for the management of conservation areas with potential use for spatial ecology studies and biodiversity assessment. Using (UAV) has the potential for more detailed information compared to other technology such as satellite and human-crewed aircraft.

Mapping the change in the natural Ghaf groves over time is an essential aspect of conservation of the DDCR natural resources. Current drone-based methods can estimate the change in biomass, but monitoring at the species level currently requires on-ground observations. This project will explore the viability of tracking changes of individual tree plants over time across the two ghaf groves, by capturing information from each temporal survey and combining into a single database format.

Research Objective(s)

- Develop process(es) to capture relevant information of each plant (canopy size, height, canopy density, greenness, NDVI)
- Develop an automated process to convert image data into a database format, where one record = 1 plant and one column = 1 parameter recorded on a particular day and time.

Methodology/Methods

- Fly the ebee drone with different sensors over the two major ghaf groves in DDCR.
- Obtain the previous flights' data for comparison
- The flight plans will follow precisely the same earlier missions for accurate results
- Develop processes to extract tree-specific data from imagery and convert to database format.
- Develop processes for merging information from different temporal samples
- Collect precise on-ground data as ground-truthing
- Mark and fence any new natural growth as a sign of a healthy population
- The survey will be planned for each year in the spring season to get the maximum successful drone's flights

Expected Outcomes	Description
<Deliverable #1>	Orthomosaic Images
<Deliverable #2>	Database of the exciting Ghaf trees in the DDCR
<Deliverable #3>	A full detailed report
<Deliverable #4>	Abstract, short manuscript and PowerPoint presentation for any conference's contribution

Performance Measures	Thresholds
Orthomosaic Image	At least one Orthomosaic Image produced per each Ghaf grove per year
Trees recognition	Tree counts are similar or increasing the previous surveys
NDVI	Normalized Difference vegetation index increase of ghaf species in each grove.
Overall Canopy Size	Overall Canopy Size the same or increasing.

Required Resources	Quantity (with the unit)
Volunteer; Intern or postgraduate student for image data analysis	One
eBee Drone	One

Project Timeline

Description	Start Date	End Date	Duration
Drone Flights	1st January	31st May	Five months
Data processing	1st June	31st August	Three months
Reporting	1st September	31st December	Four months

Estimated Budget	
	Price
<Miscellaneous drone spare parts and maintenance >	5000 AED
Total Costs	5000 AED

Applicant(s) Signature	Date
T. A. Khafaga	15 August 2020

Please attach an up to date short CV, a completed risk assessment form, and evidence of ethical clearance approval (if required).

DDCR Approval Date	DDCR Signatory
03 -Sept - 2020	*G. D. Simkins*

Summary

		DDCR Monitoring Plan				
Major Site Values	**Monitoring Study**	**Aim**	**Methods**	**Timelines**	**Performance Measures**	**Thresholds**
1 Fauna						
1.1 Arabian Oryx *Oryx lueoryx*	**Monitoring of Arabian Oryx in the DDCR**	Maintain a healthy, optimum and self-sustaining population of Arabian oryx in the reserve. To achieve this aim it is imperative to implement a long-term monitoring program in order to have a better understanding of the Arabian oryx population and their requirements and subsequently to utilise this understanding to make better management decisions for the DDCR.	Species Weekly Counts	Weekly (Every Tuesday)	Population Size	200 - 300
			Body Condition Scoring	Annual	Body Condition Score	3
			Distribution Assessment	Annual (January)	Breeding Effort	Min. replacement
			Movement Studies	Continuous (Tracking Data)		
1.2 Arabian Gazelle *Gazella arabica*	**Monitoring of Arabian Gazelle in the DDCR**	Maintain a healthy, optimum and self-sustaining population of Arabian gazelles in the reserve. To achieve this aim it is imperative to implement a long-term monitoring program in order to have a better understanding of the Arabian gazelle population and their requirements and subsequently to utilise this understanding to make better management decisions for the DDCR.	Species Weekly Counts	Weekly (Every Tuesday)	Population Size	200 - 300
			Distribution Assessment	Annual (January)		
1.3 Sand Gazelle *Gazella marica*	**Monitoring of Sand Gazelle in the DDCR**	Maintain a healthy, optimum and self-sustaining population of Sand gazelle in the reserve. To achieve this aim it is imperative to implement a long-term monitoring program in order to have a better understanding of the Sand gazelle population and their requirements and subsequently to utilise this understanding to make better management decisions for the DDCR.	Species Weekly Counts	Weekly (Every Tuesday)	Population size	100 -200
			Distribution Assessment	Annual (January)	Breeding effort	Incr. Population
			Movement Studies	Continuous (Tracking Data)		
1.4 Lappet-Faced Vulture *Torgos tracheliotus*	**Monitoring of Lappet-faced Vulture in the DDCR**	Gain a better understanding of the status of the Lappet-faced vulture population visiting the reserve and identify their home-range, breeding and roosting sites.	Observations	Continuous	Population Size (visiting)	20 - 40 individuals
			Camera Trapping (Water points)	Continuous	Roosting	Roosting site identified
			Camera Trapping (Vulture Resturant)	Continuous	Breeding	Breeding site identified
			Movement Studies	Continuous (Tracking Data)		
1.5 Pharaoh Eagle Owl *Bubo ascalaphus*	**Monitoring of Pharaoh Eagle Owl in the DDCR**	Gain a better understanding of the population status of the Pharaoh eagle owl within the DDCR and to learn more about their diet and breeding ecology.	Survey (Pharaoh Eagle Owl)	Every three months	Population Size	5 - 10 Pairs
			Nest Survey (Pharaoh Eagle Owl)	Annual (Feb - May)	Breeding Effort	2 - 5 Nests
			Diet Analysis	Every three months		
			Camera Trapping (Water points)	Continuous		
1.6 Macqueen's Bustard *Chlamydotis macqueenii*	**Monitoring of the Macqueen's Bustard in the DDCR**	To have an established breeding population of Macqueen's bustard in the DDCR and surrounding area. Macqueen's bustards are released annually during the winter months by NARC.	Release	Annual (January/February)	Population Size	25 - 50 individuals
			Species Weekly Counts	Weekly (Every Tuesday)	Breeding Effort	1 - 5 Nests
			Distribution Assessment	Annual (January)		
			Movement Studies	Continuous (Tracking Data)		
			Standardized Circular Observation Counts	Annual (October/November)		
			Nest Survey (Macqueen's Bustard)	Annual (Feb - May)		
1.7 Arabian Wildcat *Felis lybica lybica*	**Monitoring of Arabian Wildcat in the DDCR**	To have a better understanding of the population status of the Arabian wildcats exists in DDCR and collect morphological data . As main threat to Arabian wildcats the Feral cats will be eriducated from DDCR.	Trapping - monitoring	Annual (January)	Population size	Presence
			Trapping - Survey	Every three years	Feral Cats	
			Camera Trapping	Annual (January - February)		
			Trapping (Feral Cats)	Continuous		
2 Habitats						
2.1 Sand Sheet with Perennial Herbs	*Vegetation survey for sand sheets with perenial herbs*	To implement the continuous practical and efficient vegetation monitoring program with the application of appropriate functional analysis for valid data interpretation that will lead to adaptive management plans for the reserve with sets of priorities and objectives.	Vegetation Survey	Every five years	Diversity	0.8 - 0.9 (Simpson)
			Vegetation Monitoring	Annual (January)	Cover	05 - 10 %
					Species Distributions	
2.2 Interdunal Plains and Gravel Plains	*Vegetation survey for interdunal and gravel plains*	To implement the continuous practical and efficient vegetation monitoring program with the application of appropriate functional analysis for valid data interpretation that will lead to adaptive management plans for the reserve with sets of priorities and objectives.	Vegetation Survey	Every five years	Diversity	0.8 - 0.9 (Simpson)
			Vegetation Monitoring	Annual (January)	Cover	07 - 14 %
					Species Distributions	
3 Flora						
3.1 Ghaf Groves *Prosopis cineraria*	*Ghaf Groves Drone Survey*	Mapping the change in the natural Ghaf groves over time is an essential aspect of conservation of the DDCR natural resources. Current drone-based methods can estimate the change in biomass, but monitoring at the species level currently requires on-ground observations. This project will explore the viability of tracking changes of individual tree plants over time across the two Ghaf groves, by capturing information from each temporal survey and combining into a single database format.	Drone Survey (Ghaf Groves)	Annual (January - May)	Trees population	Not declining
					Tree health (NDVI)	