

Wildlife survey in Nimr region



Wildlife survey in Nimr region



Wildlife survey in Nimr region

Team Work

Petroleum Development Oman (PDO)

Nabil Al-Lawati

Head Corporate Environment

Fahad Al-Raisi

Environmental Adviser

Ekhlas Al-Hinaiyah

Environmental Adviser

National Field Research Centre for Environmental Conservation (NFRCEC)

Said Al-Rashidi (Senior Wildlife Researcher)

Azzan Al-Kalbani (Senior Wildlife Researcher)

Mohamm ad Al-Muqeemi (Geographic IT. Technician)

Fatima Al-Zadjali (Research Assistant)

Abdul Halim Al-Rashdi (Wildlife Professional)

Nasr Al-Rahbi (Wildlife Professional)

Waleed Al-Zakwani (Wildlife Professional)

Supervision: Khalifa Badawi Al-Higgi

Local Deposit Number:

ISBN:



Index of Contents

Table of Contents	4
Index of Tables	4
Index of charts	5
Map Index	5
Photo Index	5
Introduction: Environment in the Sultanate of Oman	6
Joint cooperation between the NFRCEC and PDO	7
Biodiversity survey in Nimr concession area	8
Summary	8
Company's efforts for environmental conservation in Reed beds	8
Objectives of study:	10
Area of study (Nimr region):	10
Location	10
Geomorphology of the Nimr area	11
Environments in the Nimr area	12
Mechanism of work used for the study of Nimr area	13
1. Research of previous studies of the region and a 3-day preliminary field survey	13
2. Selection of study sites and development of a plan for conducting field surveys	13
3. Beginning of field survey, analysis of results	14
Discussion on the results	14
Large Mammals' Survey	14
Small Mammals' Survey	17
Plants' Survey	20
Birds' Survey	25
Insects' Survey	31
Reptiles' survey	35
Recommendations	36
References	37
Appendices	38
1. Table of diversity of vegetation in Nimr area	38
2. Table of bird species in Nimr area	42
3. Insect diversity table for Nimr area	46
4. Table of Reptile Diversity in Nimr Concession	50
5. Tables of spatial scores for the biodiversity survey in Nimr area	51

Index of Tables

Table 1: Small mammal species in Nimr area	18
Table 2: Weights of Small Mammals by Type	19
Table 3: Distance covered by a single small mammal in Nimr area	20
Table 4: Examples of the diversity of vegetation in the Nimr area	22
Table 5: Birds' species spotted by the team in Nimr area	28

Index of Charts

Plan 1: Large mammal species in Nimr area	16
Plan 2: Number of Catches of Small Mammals by Type	18
Plan 3: Bird species' monitoring data as per environmental habitats and survey sites	30
Plan 4: Proportion of bird species in the study area, according to their environment	30
Plan 5: Results of insect diversity survey in the study area according to their family classification	40

Index of Maps

Map 1: Location of the study in the Sultanate of Oman	10
Map 2: Topographic map of the Nimr area	11
Map 3: Study locations (samples) in Nimr area	13
Map 4: Distribution of Secret Cameras in Nimr area	15
Map 5: Distribution of Sherman fisheries in study area	17
Map 6: Locations of vegetation study samples in Nimr area	20
Map 7: Insect traps in study area	31

Index of images

Picture 1: PDO's areas of concession	7
Photo 2: Reed beds (before the water treatment project) 31 December 2014	9
Photo 3: Reed Cultivation Area (after the Reed Cultivation Project) 1 September 2015	9
Photo 4: Wadi Ronab elevation point above the base level	11
Photo 5: Wadi Ronab below the base level	11
Figure 6: Examples of the types of environments in the study area	12
Photo 7: Mechanism for the working of hidden cameras	14
Photo 8: traces of small mammals in the Omani Ghaf region, South Gobra area	14
Photo 9: Hidden cameras spotted red fox in Wadi Shibun (Amal area)	15
Photo 10: Hidden cameras tracked Arabian Gizal in Wadi Roneb	16
Photo 11: Shirman fishing net installed by the team	17
Fig. 12: Method of distribution of Shirman net for sampling	18
Photo 13: Spiny Mouse	19
Photo 14: Oman's Ghaf Forest in southern Ghubrah region	21
Picture 15: An endangered plant BlepharisLinariifolia	21
Picture 16: Examples of vegetation in Nimr area	24
Photo 17: Part of ecosystem cycle of the presence of bird species in the reed farms	25
Photo 18: Little Owl – Wadi Roneb	26
Photo 19: Birds in Nimr concession area	27
Picture 20: Traps for studying insect diversity in study areas	31
Picture 21: Multi-legged Crustacean - Wadi Shinbun	32
Picture 22: Examples of insect diversity in study area	34
Photo 23: Lizard of Sinai in the Nimr area	35
Photo 24: Reptiles in Nimr area	35

Environment in the Sultanate of Oman

Introduction:

The Sultanate of Oman is located in the southeastern quarter of the Arabian Peninsula. It covers an area of 309,500 km² overlooking three sea fronts: the Sea of Oman, the Arabian Sea, and the Arabian Gulf. Its coastline extends from the Strait of Hormuz in the north to the far south in Dhofar governorate. The total length of coasts is estimated to be about 3,165 km. In the west it has land border.

God has blessed the Sultanate of Oman with a unique environmental diversity. This is due to its geographical location. It has plains, mountains, wadis, seas, beaches and deserts. There are many environmental and wildlife forms in these areas. This has led to diversity in the environments. The Sultanate has recorded approximately 1,407 types of plants and trees and 546 species of migratory and endemic birds. It has also prepared records of marine and coastal environment. These records show that there are 20 species of whales and dolphins, 5 types of turtles, and 130 types of coral reefs, as well as 99 types of reptiles, insects, butterflies and other forms of wildlife. The Sultanate has some rare types of wildlife which are in the red list and are subject of global concern such as the Arabian tiger in Jabal Samhan and the Arabian Oryx in Wildlife Sanctuary of Al Wusta governorate. Also there are Juniber trees in the Western Hajar Mountains, Al Baoab plants and other such elements. The Sultanate believes in this rich and unique diversity of wildlife. This is why it gave huge attention to the environment. It signed treaties and agreements to join the global efforts to preserve environment and reduce the damages and risks posed to it due to continuous development. It set up authorities and institutions to work in the area of environmental conservation. It framed laws, rules and regulations to make a framework for human interaction with the environment. In addition to this, it established natural and wildlife reserves and research centers and encouraged institutions and individuals to take care of the environment.

Cooperation between NFRCEC PDO

The National Field Research Centre for Environmental Conservation (NFRCEC) is a reflection of the Sultanate's approach towards field research projects. The terms of reference of the center were formed in the light of the Royal Decree No. 54 / 2009. It focuses on carrying out field studies and environmental research projects. It cooperates with institutions and organizations for its work. It also encourages researchers and stakeholders in the environment. It makes concerted effort to spread awareness. The Petroleum Development Oman (PDO) decided to consolidate its cooperation with the NFRCEC. Therefore, it signed a memorandum of understanding for environmental cooperation, and began study of biological diversity and surveyed it in Nimr area. The environment is one of the priorities of the PDO in all its cooperation.



Biodiversity survey in Nimr area

➤ A Brief

The oil and gas field is one of the most important human economic activities in the Sultanate of Oman. A large area of the land of the country with various types of habitats including beaches, deserts and wadis, are located under these activities. In view of the existing activities in the oil and gas sector and its spatial interference with these wildlife elements, the study of the environmental habitats was conducted. It was meant for gauging positive and negative impact on these habitats. The result of this survey or the study could help make a plan to manage the wildlife and conserve it. The total area of the natural habitats is around 16,000 km² which is 13% total concession area of the company.

➤ A look at some of PDO's efforts for environmental conservation (the reed plantation project)

The water treatment project in the Nimr fields is one of the largest industrial projects being established on a wetland in the world. The project consists of groups of graded reed fields and evaporation ponds, the combined size of which equals the size of 640 football fields in which 760 barrel water is treated in a day to be associated with the production from Nimr fields in the concession areas of the south. The PDO has planted more than 1.2 million seedlings to keep the land wet. This has made the area a haven for more than 100 species of birds including flamingo, sand martins, cuckoos, swallow birds, red-necked fluparps and black crown birds, as well as insects and small reptiles.

The area planted with this artificial cane is a farm which covers an area of approximately 2.4 million cubic meters, which was previously a desert. This reed forest is irrigated by using the water associated with the production of oil after separating it from it during the oil production operations in Nimr field. This is one of the top fields in the concession area in terms of production. There is also higher quantity of water.





picture 2: -----



picture 3: -----

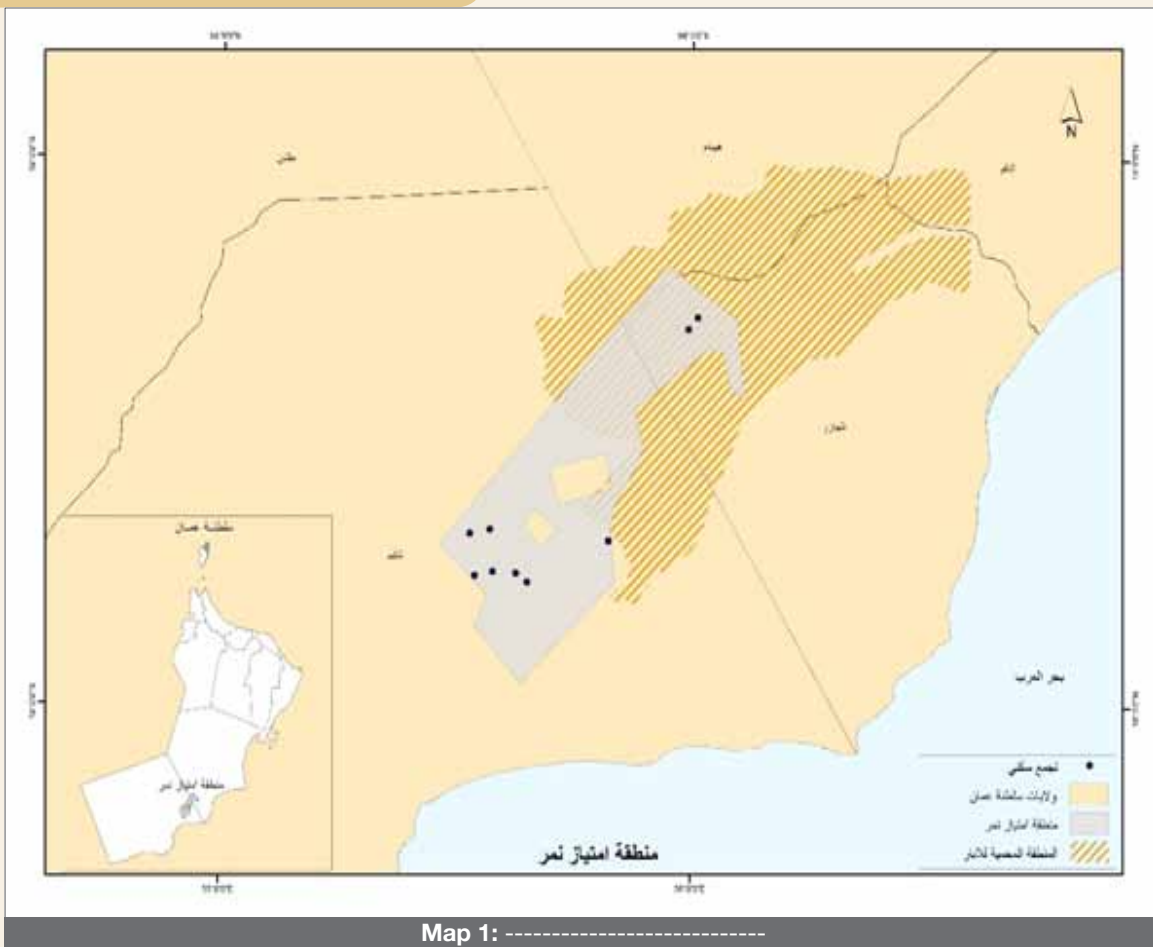
► Objectives of the study:

The study and wildlife survey of the Nimr area had several objectives. The most important objectives are:

- Learning about different environments of the area of the study and its types of wildlife.
- Creating a digital environmental database to be a reference for studies and conservation of environment.
- Making a biodiversity map for Nimr area.
- Determining effects on the environment of the area, and setting plans to achieve sustainable development.

► Study area:

Location



The study area is the southern part of the PDO concession area, as shown in Map No. 1: the location of the study area in the Sultanate of Oman.

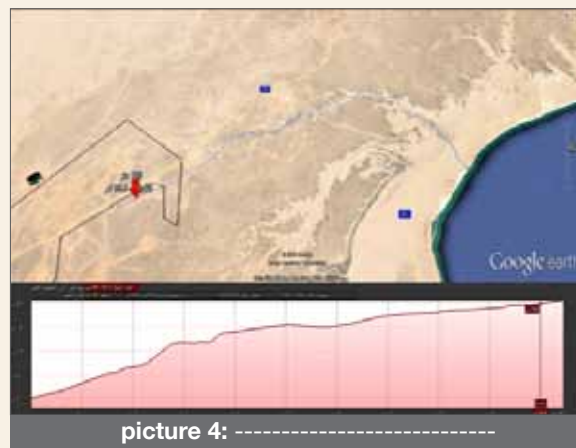
Geomorphology of Nimr:



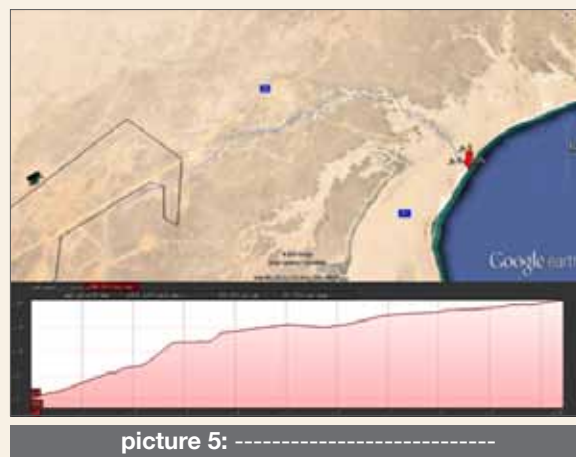
Topographicl Map of Nimr Cluster

Map 2: -----

The geomorphological nature of the study area is characterized by a slight variation in the altitudes, which makes it a plain with a maximum height of 270 meters from the general base level. (The level to which water tries to reach and the point which erosion cannot exceed. It is often called sea level) There are some relatively low water courses around it. It forms a place for concentration of dry desert vegetation. (This is evident in Amal area) The deep surface levels is the cause of limited number of wadis such as Wadi Roneb. This is due to the influence of geomorphological processes caused by the water flowed since the ancient times to make its way towards the general level of the base. The wadi Roneb shows a gradual extension in the level of depth from the Omani Ghaf Forest in the southern Ghobrah (Northeast) to the coast in wilayat Al-Jazir overlooking the Arabian Sea. It shows the highest point of the wadi Roneb , as in image 4, from the general base level. The image 5 shows the lowest point of the Ronneb Valley near the general base level.



picture 4: -----



picture 5: -----

Environments in Nimr area

During the field surveys, the researcher come across diversity in the environmental habitats in the area, especially which was caused by the intervention of the human element leading to change in the land cover of the reed plant on a large area. The reed farming area is a unique environmental habitat in a desert region.

The Nimr area can be divided according to its environmental habitats into four main types, which were chosen as study and sampling sites:



1- Environment of Wadis and mountains

It is in different places on the heights. The low areas are the course of rain water and are concentrated in the south eastern part of Nimr area. It is clearly evident in wadis Roneb and Shibon . The highest points on both sides of wadi Roneb Valley represented are examples of the mountain environment.

3- Wetland environment

It is an environment resulted by human activity in the area. It is due to the PDO's actions in the oil field and the methods it used for extraction. This environment has diversity of wildlife. It has become a transition point and settlement area for many migratory coastal birds.

2- Desert environment

These are the areas which are predominantly drought and where the soil types differ between sandy and gravel. This environment is in parts of the southern Ghobra and Amal area.

4- Environment of Gardens and Parks

This environment is in the residential area of the employees of the company. The forestation and irrigation of water in the residential neighborhood led to the attraction of garden birds and other types of wildlife. Keeping in view this diversity, four sites were chosen to be the focus of the environmental field survey.

➤ Mechanism of the study of Nimr area:

1- Review of previous research and studies of the area and a preliminary field survey for 3 days

The team preliminary did field survey between October 7 and 9, 2018 to understand the nature of the area and look which are the important sites which are attractive for creatures. Two sites were chosen to carry out the survey in the area: the area which had reed plants, in addition to the Omani Ghaf forest in the southern Ghobrah. As a result, it was concluded that there is a diversity in the vegetation. The effects on the Omani Ghaf forest indicated the presence of diversity in large mammals such as foxes, diversity in reptiles and insects, in addition to the presence of many types of coastal migratory birds found in the area of reed cultivation as a suitable station for them.

2- Selection of study sites and a plan for conducting field surveys

The team selected 4 main sites which represented the environmental habitats in the study area as shown in map 3. This is to complement the study of biological diversity in the area after the initial survey and field study and research using satellite engines (PDO earth-Digital Globe) for the important sites.

- First site: the artificial reed plant breeding site – BorNimr
- Second site: Omani Ghaf Forest - Southern Ghobra
- Third site: Wadi Shibon, in Amal area
- Fourth site: Wadi Roneb

The field survey work was divided according to the study sites. They focused every two weeks on one area during which the researchers conducted the environmental survey for biodiversity. The survey began in November 2018 and the field survey lasted four months.



3- Beginning of the field survey, discussion and analysis of results

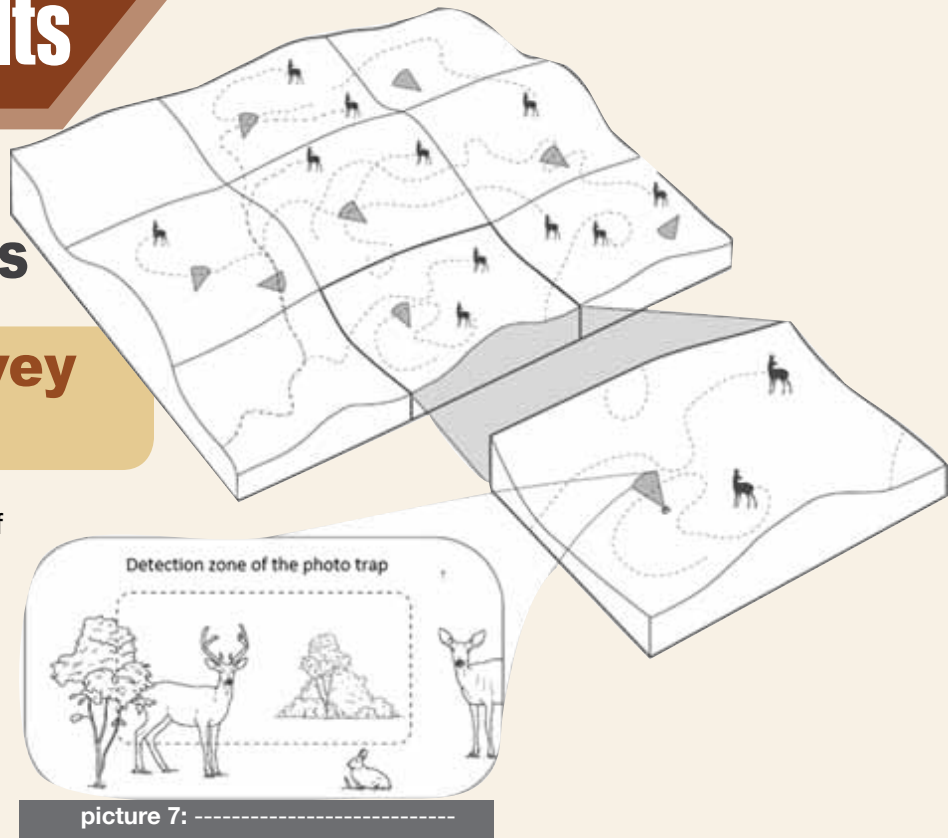
The biodiversity survey included a survey of birds and vegetation, insects, reptiles and small and large mammals at identified sample sites.

Discussion of results

► Survey of large mammals

1- Method of survey and its tools

To assess the state of a type of large mammals and to prove its presence, a lot of scanning methods can be used. But one of the most recent methods require use of special cameras. This method helps researchers in conducting surveys with minimal interference in the environment of these organisms. The idea of this work depends on sensors which senses the movement and records it in its memory cards continuously day and night (working with infrared at night) and for long periods which may extend to six months. In some locations, the research team conducted a biodiversity fingerprint survey which included samples of wildlife droppings, footprints and foxholes to determine where to install the cameras. The results of the preliminary study of the project helped to identify some important sites of biodiversity in the region. Accordingly, 45 cameras were installed in the Nimr area, which included the study area in different environments. It is followed-up from time to time to see what the cameras recorded and its power state. The cameras were placed in the study areas for sixteen weeks continuously (4 months). This period is short for this type of survey. To get better results about the biological diversity in the region, leave the cameras for a longer period of time which is estimated to be at least six months.



picture 8:

The cameras were placed in the study areas for sixteen weeks continuously (4 months). This period is short for this type of survey. To get better results about the biological diversity in the region, leave the cameras for a longer period of time which is estimated to be at least six months.



Map 4: -----

2- Results and discussion

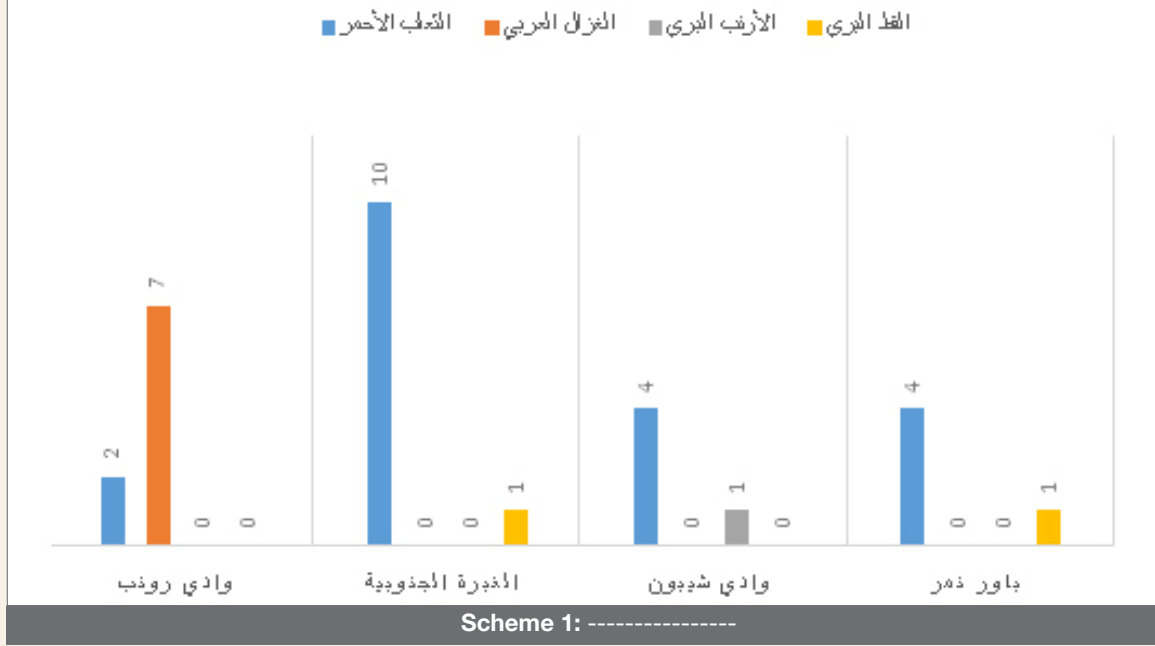
The sensors recorded approximately 15,000 images and videos of movement in the study areas. It varied between movement of wildlife, effect of air movement in the tree leaves. They also recorded domestic animals like camels and livestock.

The results of the survey in the study area confirmed the presence of wildlife species. The cameras monitored the presence of Arabian gazelle, red fox, rabbit, and wild cat. In these recordings, the presence of the Arab red fox is very clear in the Nimr area, as most of the cameras recorded its presence, especially in the Omani Ghaf forest area, southern Ghobrah. It was recorded in all cameras installed in this area. Some cameras recorded groups of three foxes, most of which were caught during the night. While the red fox recorded in the other three locations. Their presence was relatively less intense than in a southern qhobra. From the observed red fox and some photos taken with photography cameras, it was noticed that some of these red foxes are frantic and pose a threat to the biodiversity in the area this include workers and residents of those areas and their pets. They demanded that these foxes be killed because they believed they caused certain dieses in their cattle which graze in same area. The team also documented the presence of dead foxes. Drought, certain disease etc are likely to be the causes of their death.



picture 9: -----

أنواع الثدييات الكبيرة في منطقة الدراسة



As for the Arabian Gazelle, its presence was recorded in wadi Roneb. The team, during their field survey, found them in a group of five. The cameras also recorded their activities in the day and night. Some traces of human activities were also found. There were signs of ammunition which was likely to be used for hunting. It was also confirmed by wildlife watchers that there were hunting activities still continuing in the area and threatening the site and its biodiversity.

Wild cat was also recorded in the Omani Ghaf forest area, reed planting area or Power Nimr. In wadi Shibon, the arabian rabbit was recorded by the team, but it failed to take their photos due to their swift movement. Similarly, some local livestock, such as sheep and camels, was also traced in large scale. The figure 1 shows large mammals in the study area.

The team expected that there were some large mammals in the area. But they could not be proved such as Arabian tahr, hyena, arabian wolf, desert lynx, sand cat, ruble foxes, sheep and the honey badger, which were previously seen in the area, according to wildlife watchers.

The team has faced some challenges in using hidden cameras, as blowing wind and leaves of plants effect the work of sensors and recording of movement. This is why lots of photos and video clips are consumed and took lots of time in sorting and classifying them. Due to condensed dew on the camera, some of the recordings are not clear in the night or early morning on some days.

picture 10:

► Survey of Small mammals

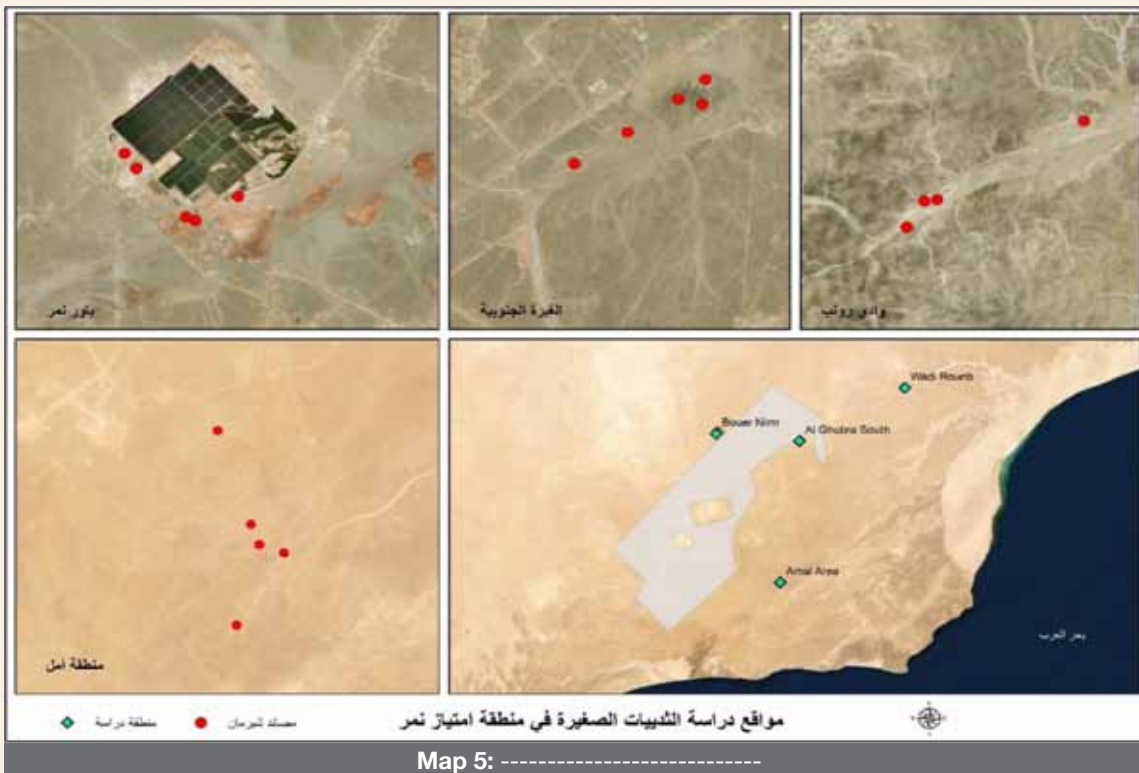
1. Method and tools of survey

Small mammals' survey was done to understand their types, extent of their spread in the study area, their relations with the biodiversity associated with them in the foodchain. A method of mark-recapture approach was used to study the samples of small mammals. This method is based on the use of Sherman traps, which are small metal boxes in the form of «semi-cubes». They are installed in straight lines with a fixed distance between one trap and another. They have tastes of food items mostly as oats and peanut butter which attract small mammals. It is at the surface such as mountains and sands or in dense vegetation area. They determine the trap lines and their distance. The traps are checked every day, as they are made of heat-conducting material substance.

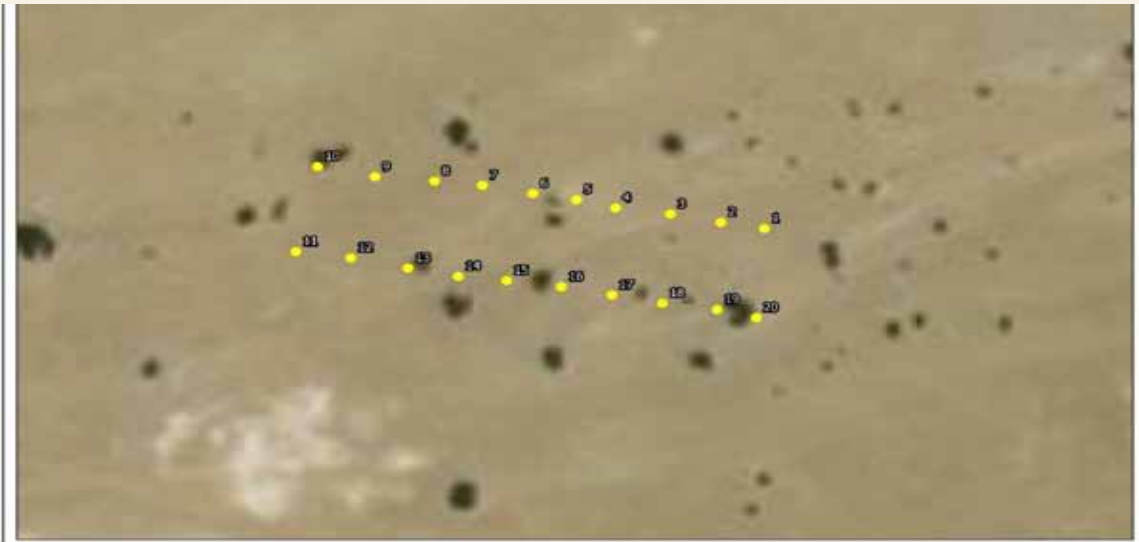


picture 11: -----

They must be followed up frequently so that the organisms are not threatened or pass away. This method helps in calculation of the area of movement of the animal in the area in search of food. The researchers record the data of small mammals which included trapped, their gender, weight and the number of trap. A mark is put on the animal to distinguish them if they are caught again. Nearly 380 Sherman traps were installed in the Nimr area as shown in map no. 5. Each 20 traps are installed in two parallel lines covering an area of 1800 square meters.



Map 5: -----



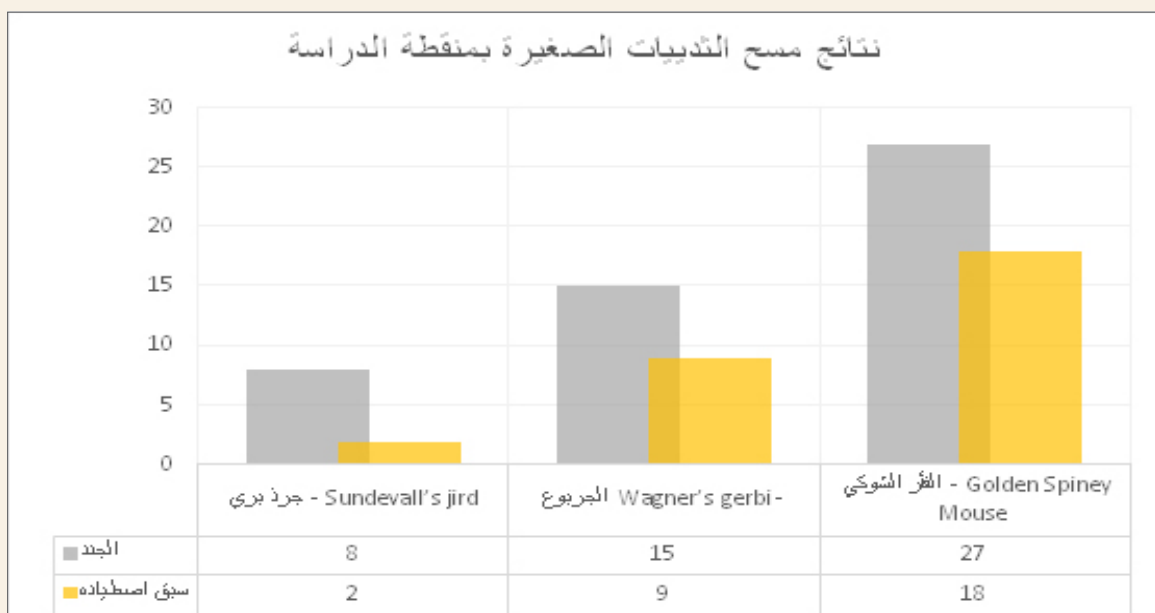
picture 12: -----

2. Results

Sherman traps managed to catch three different types of small mammals at the study sites in Nimr area. The total number of these species of small mammals reached 79. The table no. 1 shows the results of the survey of small mammals.

Arabic Name	The Scientific Name	Type
Wild rat	Meriones crassus	Sundevall's jird
The desert jerboa	Dipodillus dasyurus	Wagner's gerbil
Spiny mouse	Acomys russatus	Golden Spiney Mouse

Table 1: Small mammal species in Nimr area



Scheme 2: Frequency of Catching Small Mammals by Type

According to what we see in chart no. 2 of the results of the survey of small mammals, 45 spiny mice were recorded in the Sherman traps. The number of spiny mice recorded without repeating was 27, while 18 mice were trapped again. The presence of spiny mice was concentrated in wadi Roneb. This is perhaps because of their preference for mountainous areas, and large vegetation which forms a safe environment for them.

Ten wild mice similar to home mice were caught, two of which were previously trapped. They were most concentrated at the Power Nimr site. Also, 24 qerbil were caught; including nine were recaptured again. They are concentrated in wadi Shibon.

Results of wadi Roneb and Wadi Shibon show a good density of small mammals, which provide food for predators such as red foxes, wild cats, etc. A spiny mouse and a qerbil was recorded in the Omani Ghaba Ghaf area. No other species were traced there. The team faced many challenges, including: distance from the camp, death of a number of mice during the study and escaping of other. In addition to this, the team found that some Sherman traps were removed from their location by some animals looking for their food in the traps. These animals also made some of these young mammals are their prey. The average weight of small mammals, as can be seen in table no. 2, was also calculated. Through the table, we can understand the weight of mammal through calculation of each species with the average weights.



picture 13: -----

	Jerboa (n = 14)	Spiny Mouse (n = 19)	Rat (n = 5)
Average small mammal weight (grams)	48.15	46.28	18.2
Standard deviation +/-	27.73	19.34	1.48
Standard error	7.41	3.79	0.66

Table 2: Weights of Small Mammals by Type

The results in the previous table show that Jerboa get good nutrition. Therefore, their average weight increases same as the spiny mouse and the rat. Also, the accuracy of the average rats' weight is approximately the actual average weight of home rats naturally, as indicated by the results of statistical calculations in the standard error. The standard deviation indicated the convergence of the sample weights around their averages.

The following table shows the average distance an individual from among small mammals can travel (in meters) for food, according to their dominant species.

Type	Power Nimr	Wadi Roneb	Wadi Shibon
Rat	10	-	-
Spin mouse	-	36.25	-
Jerboa	-	-	19.3

Table 3: The distance covered by an individual from a small mammal in the study area

► Plants' survey

1. Method and tools of survey

The team followed the method of determination of squares for survey (vegetation plots). After determining the dimensions of the squares 10X10 meters, the study of whatever species of vegetation was inside them was conducted. The team also drew a long line of 100 meters for the study of each species of vegetation which pass on it. This method was followed in Power Nimr area.

Map 6 shows: Distribution of sample points on the main locations of survey



Map 6: -----

2. Results

In view of its geo-morphological nature of Nimr area and its weather, the vegetation cover has desert trees which are resistant to heat and draught. It is concentrated in the lower areas from where the water of wadis passes. The survey revealed that there were vegetations in the land which were not eroded due to the flow of wadis. Seasonal plants were seen growing after rains. In the survey of the area, 100 species of vegetation including trees, shrubs, and plants were covered. The Omani Ghaf trees were one of the desert trees. They are also ancient trees spread all across the Sultanate of Oman. They are known for their permanent greenery. They are mostly concentrated in the desert areas in the southern Ghobra area and Wadi Roneb. They are part of the vegetation.

picture 14: -----



It is noted that the Omani Ghaf in southern Ghobra is threatened by the grazing of camels. This is the reason its leaves become similar due to same situation. There are some Omani Ghaf trees which are newly grown. But they are facing the same problem of continuous camel grazing they grow taller. There some desert



picture 15: -----

trees were also recorded, including Samr and Talh. The plants are one of the forms of vegetation cover of the area. They are dense in wadi Shibon as the earth in the area does not erode. Among the most notable plants which were recorded were some rare plans of the Sultanate as well as BlespharisLinariifolia which is facing extinction. The wadi Roneb has a number of climbing trees CocculusPendulus. It has two white branches which expands and climbs on rocks and trees. It is spread all across Dhofar region in its areas which are more dry. This type of plants is known to climb on other trees. It gets benefit from these trees as well in getting lights and other elements required for its life. (Dhofar plants, southern region of the Sultanate of Oman, traditional economic and medicinal uses, 1988, Anthony Miller-Miranda Morris).

* (Appendix 1: Table of Plants' Diversity in the Nimr area)

Scientific Name	Local Name	Family	Spread	Site
Acacia spp	السنت	Fabceae	common	رونب
Aerva javanica (Burm. F) Juss. ex Schult	الري - الرء	Amaranthaceae	common	رونب
Arnebia hispidissima (Lehm.) A.DC.	حماط, كحل, مليح	Boraginaceae	common	رونب
Blepharis ciliaris	شوك الضب, كنب	Acanthaceae	rare + threatened	رونب
Blepharislinariaefolia	شوك الضب	Acanthacea	common	رونب
Cappariscartilaginea	لصف, علبليب, عصلوب	Capparaceae	common	رونب
*Cocculus balfouriiSchweinf	-	Meinspermaceae	common	رونب
Commicarpus stenocarpa	عيطف, غرمل, رفر	Nyctaginaceae	common	رونب
Convolvulus hystrix	شبريق - شبرم	Convolvulaceae	endemic	رونب
Convolvulus virgatusBoiss	هاب, رشا, عظم	Convolvulaceae	near endemic	رونب
Cucumis prophetarum	حنيطان, شري الذئب, حيدق	Cucurbitaceae	common	رونب
Dipterygium glaucumDecne	علقى, علكة, صغيرة	Cleomaceae	common	رونب
Euphorbia granulata	ملبانة, لبان, زغر	Euphorbiaceae	common	رونب
Fagonia indica	مشكاع, شويكة, جربة	Zygophllaceae	common	رونب
Ficus cordatathumb	اللثب, اثب	Moraceae	endemic	رونب
Glossonema varians	العتر, الرتع, غمرضة	Asclepiadceae	common	شيبون
Heliotropiumbacciferum	المرام	Boraginaceae	common	شيبون
Heliotropiumlongiflorum	هبليم, شبرم, هيبيغ	Boraginaceae	common	شيبون
Hyoscyamus gallagheri	زغوف	Solanaceae	endemic	شيبون
Indigofera arabicaJaub. &Spach	نيلة - شجرة الارنب - نبتة الزلل	Leguminosea	common	شيبون

Table 4: -----

Scientific Name	Local Name	Family	Spread	Site
<i>Indigofera intricata</i>	رخيموه, قطيمي	Leguminosea	common	شيبون
<i>Launaea almaharhensis</i>	حوذان, حوه, حوا	Compositae	common	شيبون
<i>Launaea nudicaulis</i>	حواء عارية الساق, حوة, العبيذيد, صفاري, حواء الغنم	Compositae	regional endemic	شيبون
<i>Limonium axillare</i>	عويزران, الليمونيوم	Plumbaginaceae	not common	شيبون
<i>Nerium oleander</i>	الحن, الدفلى	Apocynaceae	common	شيبون
<i>Ochradenus arabicus</i>	هباب, حمار علندرة, حيرق	Asclepiadceae	not common	شيبون
<i>Pluchea arabica</i>	قضوت	Compositae	regional endemic	شيبون
<i>Polycarpaeaspicata</i>	غباشي, غبيرة	caryophyllaceae	common	شيبون
<i>Prosopis</i>	غاف	Leguminosea	common	شيبون
<i>Pulicaria glutinosa</i> Jaub	مهدي, شجرة فال	Asteraceae	common	غابة
<i>Salvadora persica</i>	الراك, شجرة السواك	Salvadoraceae	rare	غابة
<i>Schweinfurthia spinosa</i>	شاط	Scrophulariaceae	common	غابة
<i>Senna holosericea</i>	العشرق	Leguminosea	near endemic	غابة
* <i>Taverniera lappacea</i>	عصمط	Leguminosea	common	غابة
<i>Tetraena decumbens</i>	هرم	Zygophllaceae	rare	غابة
<i>Tetraena hamiensis</i>	هرم	Zygophllaceae	common	باور نمر
<i>Tetraena qatarensis</i>	هرم قطري, هرم	Zygophllaceae	common	باور نمر
<i>Tetraena simplex</i>	ثرمد, قرمل, زريعة ام ثريب	Zygophllaceae	not common	باور نمر
<i>Vernonia arabica</i>	حصي الحمار زبيب الحمار	Amaryllidaceae		غابة

Table 4: -----



picture 16: -----

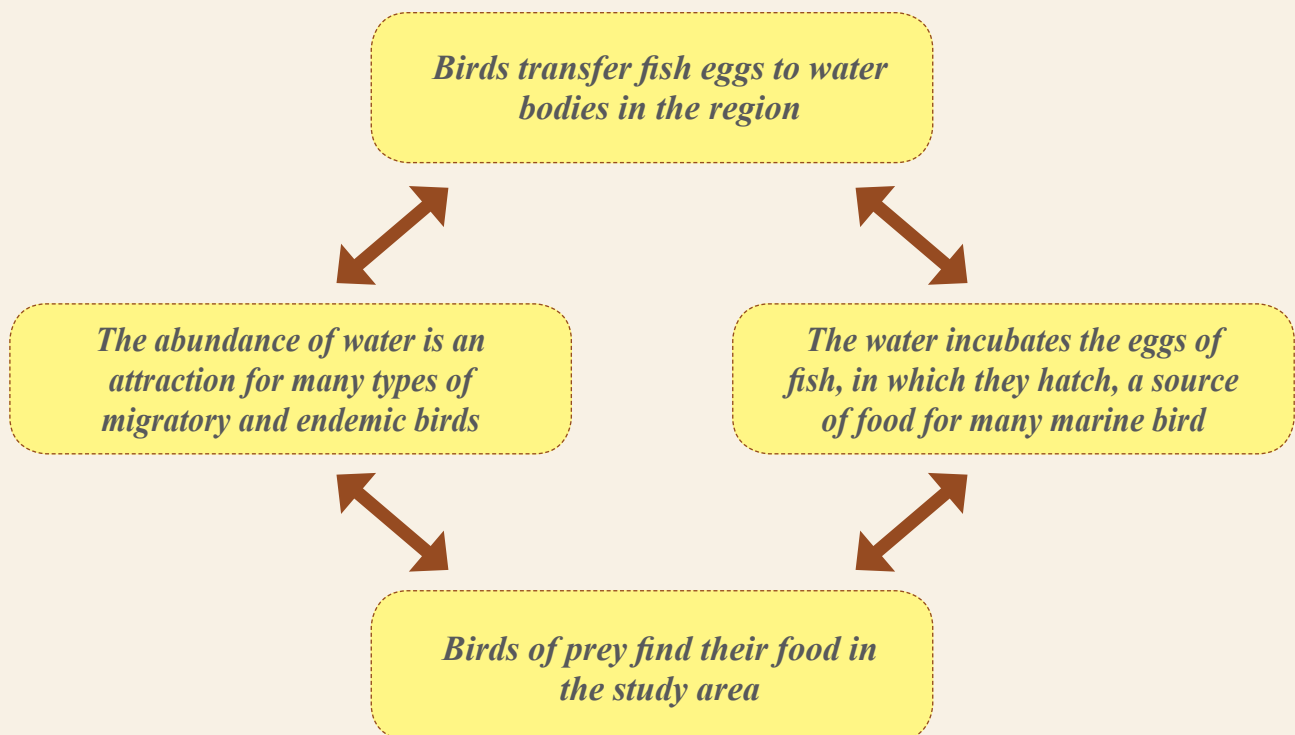
► Birds survey

1. Method and tools of survey

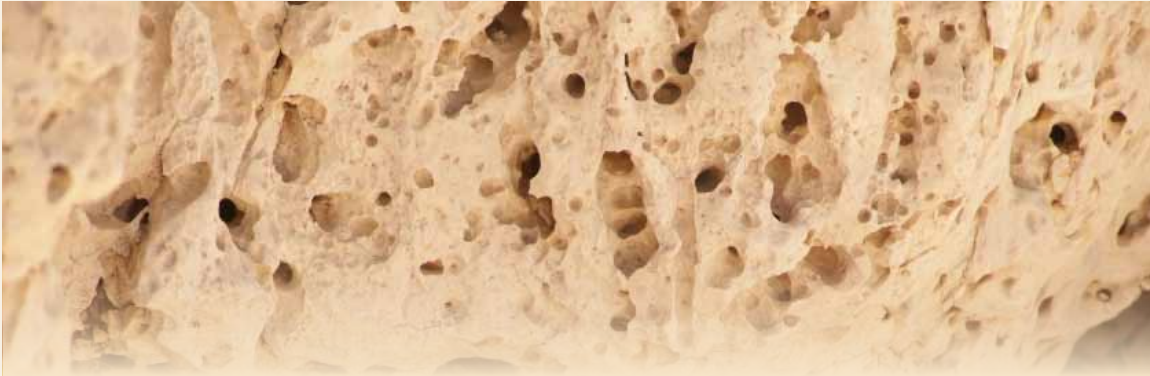
The researchers used «transect line», a method to determine the species found in the study area. In this method, a movement is made using a car in the longitude lines of each line to a distance of 2 km divided into stops at every 200 meters, and a speed not exceeding 20 km / hour. A survey form is used to record bird species, number and condition of each species during the monitoring process.

2. Results

In the survey, the team tracked 57 species of birds in the area. The result of the survey carried out by the experts of the BouerNimr company in the reedbed farming area indicated that there are about 150 species of birds. It also pointed out that the wetland area (reed plant cultivation - BouerNimr) is one of the most attractive sites for most of the species in the concession area. Although the wetland environment is a habitat for coastal birds (such as heron, great esophagus, gullible gull, tern, waterfowl, etc.); there are areas of water from which birds drink at the site, resulting in purification for reed plants. This has helped in monitoring of species of birds of the gardens and farms' environment such as Western Yellow Wagtail and laughing dove, and birds of the desert environment such as the crow ring dove and desert wagtail. This diversity has also become a target area for the hunting birds such as eagles.



picture 17: -----

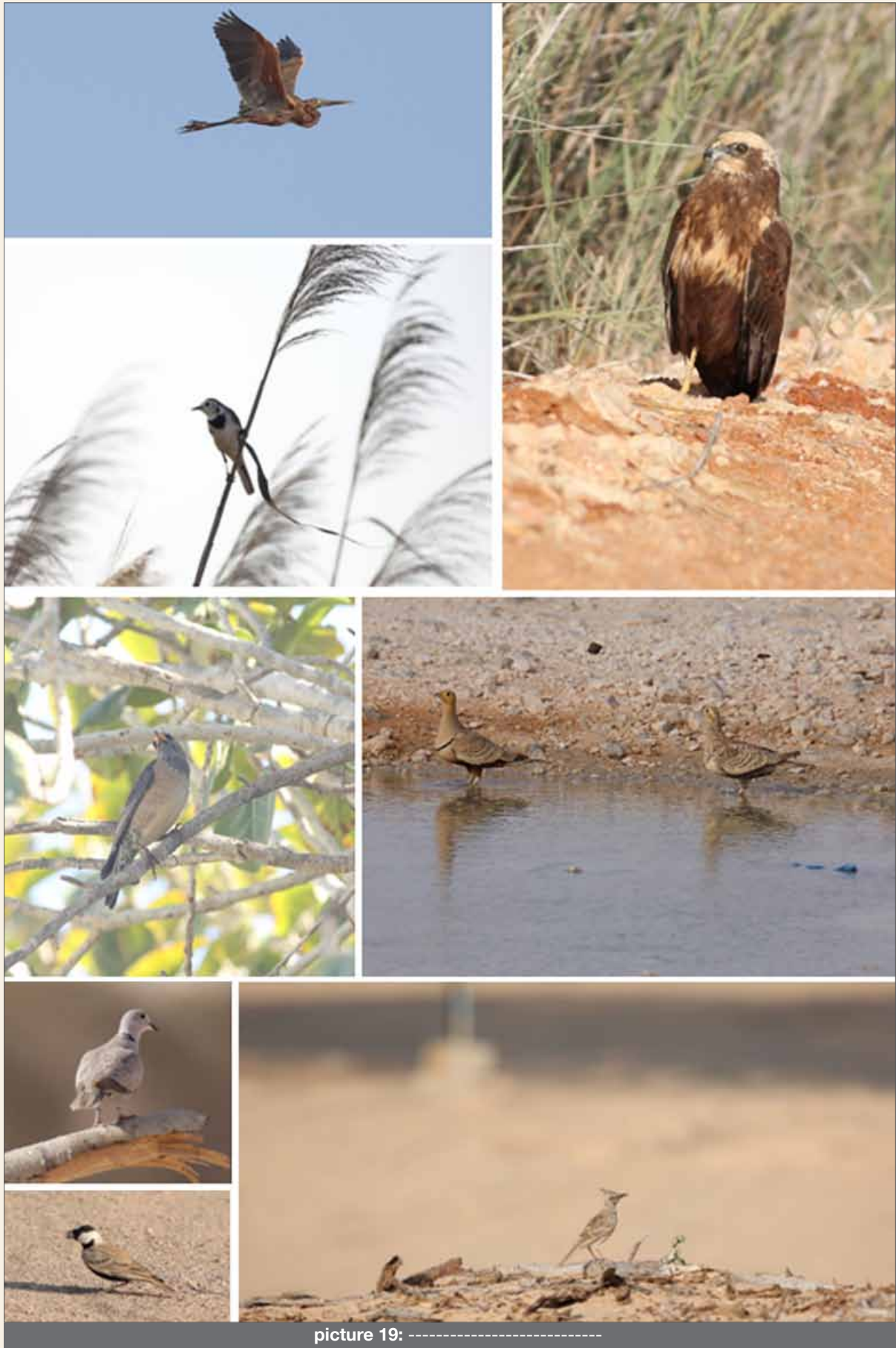


It was noticed that there are some small fish in the swamps of reed cultivation areas. This is as a result of birds transporting eggs of fish in their stomach and dumping them to hatch in the water in the study area. This leads to increased the attraction of birds which feed on them. This clears the relationship of environment in the creation of the habitats.

The environment of the gardens and parks is that of the residential camp of the company's employees in the Nimr area. Hoopoes, hose sparrow and some types of starlings were recorded in this environment. In the mountainous region of wadi Roneb, the team monitored small owl as there were caves where they lived. They also tracked a group of Arabian partridges and the sandgrass birds known for traveling long distances in search of water. The Omani Ghaf forest in southern Ghobrah recorded proportionally more collared dove pigeons than other study sites. The Stone Curlew was recorded in the Wadi Shibon of the Amal area. In addition to this, there were chattering birds, crow, peas, lark and laughing pigeons, and other birds were also recorded in Nimr area.



picture 18: -----



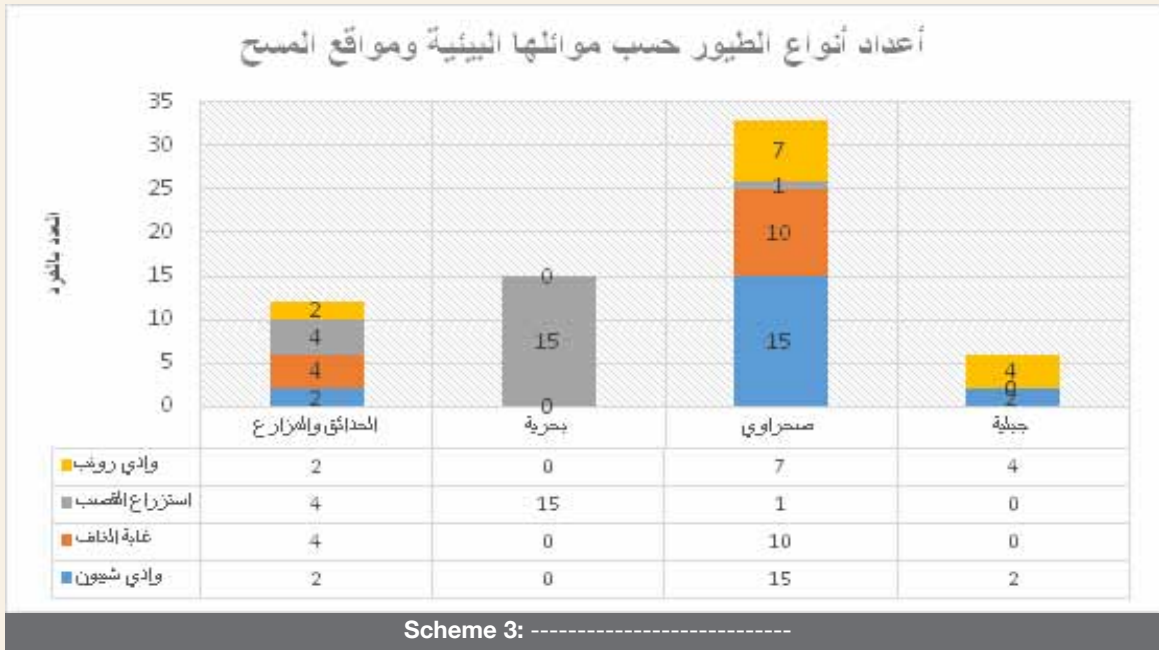
picture 19: -----

Environment	Location	Type	Latin name
Mountainous	Wadi Shibon	----	arabian wheatear
Desert	Wadi Shibon	----	blak- crowned sparrow-lark
Desert	Wadi Shibon	----	bron necked raven
Desert	Wadi Shibon	Sandstone	cream -coloured courser
Desert	Wadi Shibon	Crowned lark	crested lark
Desert	Wadi Shibon	Desert lark	desert lark
Desert	Wadi Shibon	Desert lark	desert wheatear
Desert	Wadi Shibon	----	desert whitethroat
Desert	Wadi Shibon	----	eurasian collared dove
Desert	Wadi Shibon	----	greater hoopoe- lark
Gardens and farms	Wadi Shibon	----	house sparrow
Desert	Wadi Shibon	----	isabelline shrike
Desert	Wadi Shibon	----	isabelline whwatear
Gardens and farms	Wadi Shibon	Palm dove	laughing dove
Desert	Wadi Shibon	Striped cat	lichtensteins sandgrouse
Desert	Wadi Shibon	Falcon	long legged buzzard
Desert	Wadi Shibon	----	red-tailed wheatear
Desert	Wadi Shibon	Large gray shrike	southern grey shrike
Mountainous	Wadi Shibon	Desert pitpit	tawny pipit
Mountainous	Wadi Roneb	----	arabian partridge
Desert	Wadi Roneb	----	arabian wheatear
Desert	Wadi Roneb	----	bron necked raven
Desert	Wadi Roneb	----	chestnut-bellied sandgrouse
Desert	Wadi Roneb	----	crowned sandgrouse
Desert	Wadi Roneb	----	desert wheatear
Desert	Wadi Roneb	----	eurasian collared dove
Gardens and farms	Wadi Roneb	----	hous sparrow
Gardens and farms	Wadi Roneb	So the date palm	laughing dove
Desert	Wadi Roneb	Striped cat	lichtensteins sandgrouse
Mountainous	Wadi Roneb	Owl Um Quwaiq	little owl
Mountainous	Wadi Roneb	Mountain dove	rock dove
Mountainous	Wadi Roneb	Planned study	striolated bunting
Desert	Ghaf Forest	----	black redstart

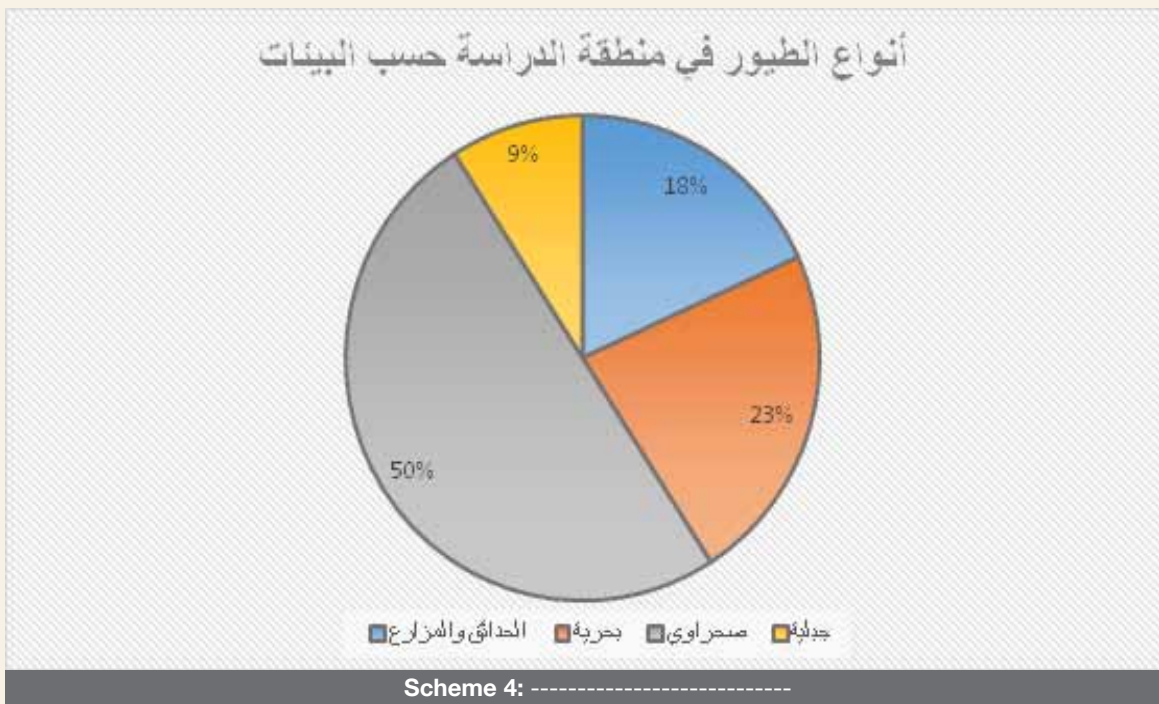
Table 5: -----

Environment	Location	Type	Latin name
Desert	Ghaf Forest	Common Kestrel	Common kestrel
Desert	Ghaf Forest	----	desert wheatear
Desert	Ghaf Forest	----	eurasian collared dove
Desert	Ghaf Forest	----	european nightjar
Desert	Ghaf Forest	----	golden eagle
Gardens and farms	Ghaf Forest	----	hous sparrow
Gardens and farms	Ghaf Forest	Palm dove	Laughing dove
Gardens and farms	Ghaf Forest	Palm dove	Laughing dove
Desert	Ghaf Forest	buzzard	long-eyed buzzard
Gardens and farms	Ghaf Forest	Asian sunbird	purple sunbird
Desert	Ghaf Forest	Red chest wheatear	red -tailed wheatear
Desert	Ghaf Forest	Rock plumper	rufous tailod rock thrush
Desert	Ghaf Forest	Large gray shrike	southern grey shrike
Marine	Reed farm	Hook	baen swallow
Desert	Reed farm	Minor eagle	boot eagle
Marine	Reed farm	Green water hen	common moorhen
Marine	Reed farm	Common sandpiper	common sandpiper
Marine	Reed farm	Big drop	great cormorant
Marine	Reed farm	Gray heron	grey heron
Gardens and farms	Reed farm	----	house sparrow
Marine	Reed farm	----	kentish plover
Gardens and farms	Reed farm	Palm dove	laughing dove
Marine	Reed farm	Reed farm	lesser sand plover
Marine	Reed farm	Back green Heron	little heron
Marine	Reed farm	----	Western Marsh Harrier
Marine	Reed farm	Sandwich tern	sandwich tern
Marine	Reed farm	Gull beak	slender-billed gull
Marine	Reed farm	Gull	soot gull
Gardens and farms	Reed farm	Yellow wagtail	sykess wagtail
Marine	Reed farm	Sandpiper	terek sandpiper
Marine	Reed farm	Heron of rock	western reef heron
Marine	Reed farm	Hybrid tern	whiskered tern
Gardens and farms	Reed farm	White wagtail	white wagtail

Table 5: -----



The plan shows that six types of mountain birds were recorded in two regions; Wadi Shimon, Wadi Roneb. This is due to the nature of the area, where there are no mountains in the southern Ghobrah region (Omani Ghaf Forest) and the reed farm area. Seabirds are found in Reed farm area. Garden and farm birds as well as desert birds were also recorded in all study areas. The recorded desert birds are largest in number in the region. The lowest ratio was of the mountain birds, as shown in the following graph



* (Appendix 2: Table of Bird Species in the Nimr area)

➤ Insect survey

1. Method and tools of survey

Insect diversity is an indication of the health of the ecosystem included in the survey work in the Nimr area. It has the largest diversity of organisms. The team worked on the study of the insects in the Nimr area to identify a set of points in each of the four locations. It used various types of traps such as the light trap which works to attract insects during night hours into the net. This is so that they can be collected as samples. The team also used several types of traps including falling traps (metal cups) to catch crawling and ground insects, The idea of the falling trap was actually of putting cups with a suitable depth and smooth sides to trap the insects. When the insects fall in it, it could not come out so that the one type of the trap changes the path of its movement of the insect and take a single path which leads to a package containing alcohol. The team also used insect yellow pan trap filled with water added to liquid soap which break surface tension. It makes it easier for the insect to sink into the water. They are often mostly used for flying insects. The insect survey team also used Aerial Insect Net to collect different types of insects from trees directly.



picture 20: -----



2. Results

During its surveys, the team detected some aqueous insects such as Gerridae and semi-aquatic bugs such as Coenagrionidae and some species of flies such as Asilidae and mosquitoes like Culicidae. Some of their species live closer to water bodies such as hoppers Gryllidae. Most of the water insects were hunted by light traps when the sun sets or by use water traps in the daytime for some insects which are not attracted by light at night. As for plant-eating insects such as Noctuidae, Miridae, Rhyparocromidae, they were directly caught using air traps, light traps and water dishes. Some of these insects feed on flower components such as pollen. They are Melyridae, Dermastidae, Scaptiidae and Coccinellidae. Some feed on nectar such as Nymphalidae, Hesperiidae, Spingidae.

The team also monitored a group of predatory arthropods which include different types of insects. Most of them have membranous wings such as wasps which feed on locusts, bed larvae, Neuroptera ants. Some of the insects were caught by yellow water traps. Similarly air traps were also used on flowers because they take the flower pollen as an additional food to their diet. Also, various species of bees were also recorded. They feed on nectar and pollen. They play an important role in pollinating wild flowers such as Apidae, Colletidae.

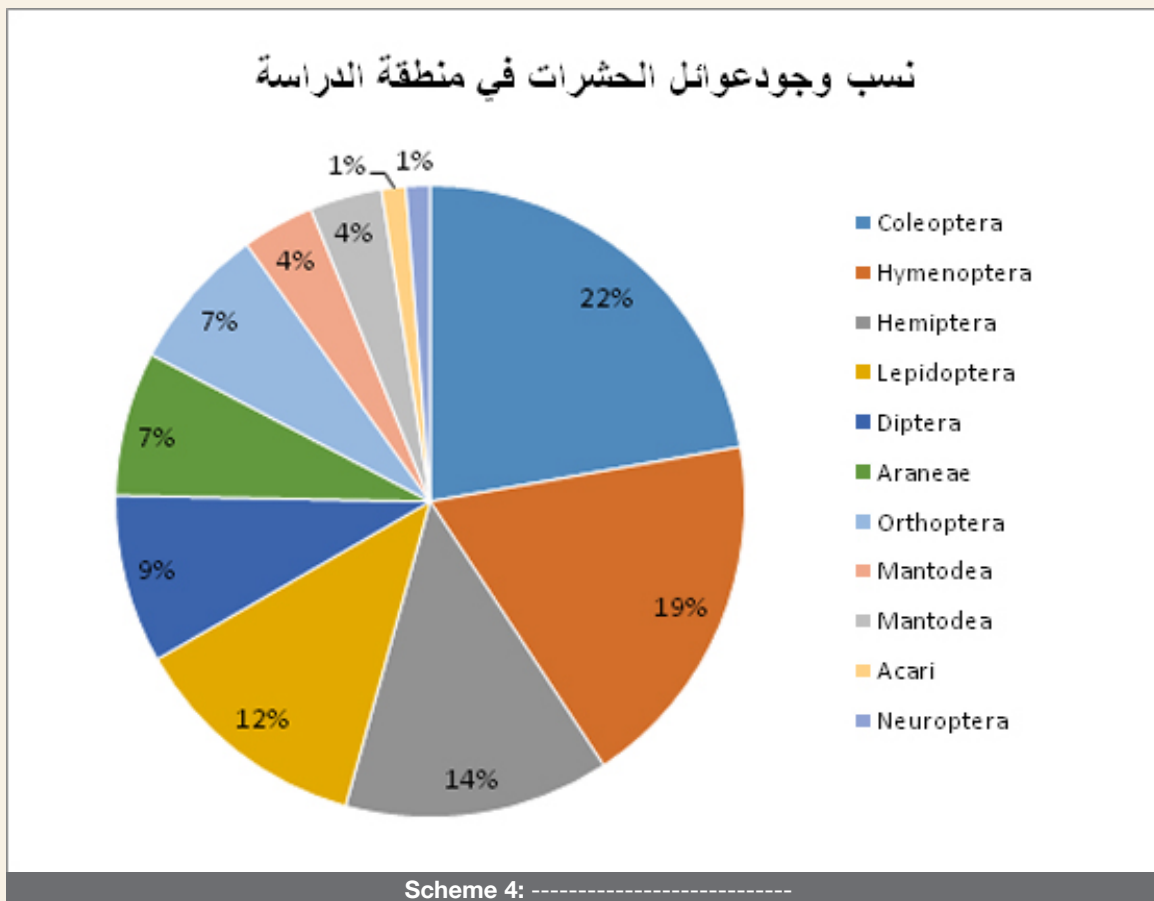
Some species of multi-leg crustaceans and were also recorded. But they were not classified because they needed specialized references to be defined.



picture 21: -----

It is expected that the number of insects and other arthropods will exceed 500 species in the area. It is when the surveys would be intensified and various traps spread during the spring season between February and April, as well after the rains.

As for other arthropods, such as scorpions, spiders, etc, it was observed that they are from two scorpion families. There are also five families of spiders and two spider-like insects such as Soliphuge, Mite. All other arthropod groups are predators and feed on various other arthropod groups, In addition to some small lizards, most of them caught with yellow water traps. Accordingly, more than 130 species of insects, scorpions, and spiders have been classified. It is worth mentioning that many of the species discovered were not scientifically recorded in the Sultanate. They also showed the size of the existing environmental diversity which developed due to the intermingling relationships between these species. But these species could not be tracked due to shortage of time required for survey and required tools for them. Some insects required particular way for collection and dealing while hunting them and keeping them for study and classification.



* (Appendix 3: Table of Insect Diversity in the Nimr area)

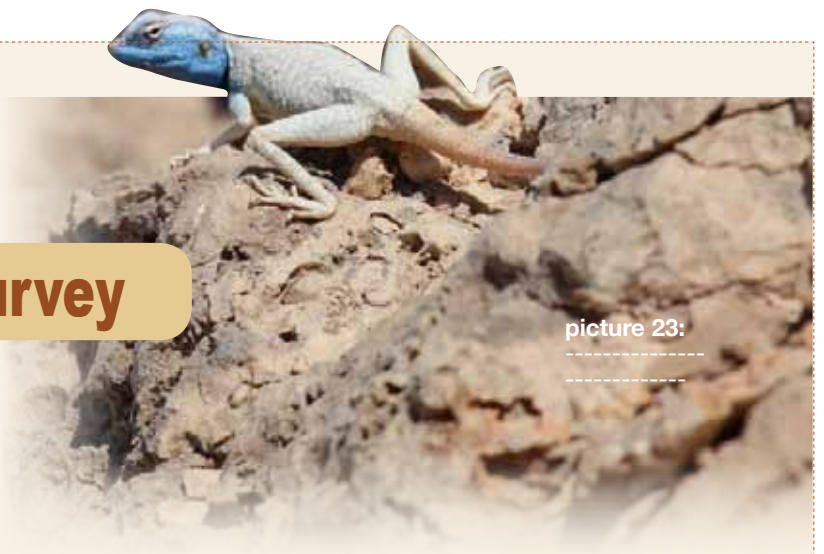


picture 22: -----

► Reptiles survey

1. Method and tools of survey

The field survey in Nimr area also covered reptiles. They are considered cold blooded. This is because they become active only during sunny days, particularly during summer. The team relied on observations to record the types of reptiles and identify the footprints of some species.



picture 23: -----

2. Results

The team recorded approximately seven types from four different families. During the process, Omani lizard was observed in wadi Shibon. It is known for its small size 15 cm. Its colour is dark color and its tail is in semicircle. No species of the snake family were recorded here. However, the team found traces of its presence. Observations of wildlife watchers also confirmed presence of snake species in the area. Perhaps the most important reason which prevented this was that the time period for the survey was not in the summer, as some creatures were in their winter slumber. The table indicates the species which were recorded in the study area.



picture 24: -----

* (Appendix 4: Reptile Diversity Table in Nimr area)

Recommendations:

Based on the field surveys in the area, outcome of the study of biodiversity and in view of the importance of the preservation of the ecosystem as well as preservation of life, the team recommends:

- **Coordination with the local community to put in place a mechanism for regulating grazing in the area, especially in the Omani Ghaf Forest region. This is because the Ghaf trees suffer from greater pressure as a result of grazing of livestock. It was found that newly developed Ghaf trees were scarce, as well as existing trees in the area are affected by grazing. Newly developed trees have to be fenced to prevent animals from reaching to it. This is as an appropriate solution.**
- **Conducting intensive surveys on a regular basis during different periods of in a year to identify biological diversity more accurately. This is because as some living organisms adapt to the nature of the weather and are in hibernation and are difficult to monitor in some seasons. This is especially since the environmental factors in wadi Roneb, such as shelters and food, are attractive to many species, such as deer and foxes.**
- **Installing hidden cameras for longer periods of time to increase the opportunities for recording large mammals, recording their numbers, and monitoring their behaviors in the region.**
- **Increase the level of environmental awareness of the society, make educational charts of the environmental elements found in the area, and warn against wrong behaviors which directly or indirectly harm and damage wildlife such as hunting and overgrazing.**

References

1. Jens Eriksen, Oman bird list, Oman, squsqu
 2. Helen Pickering and Annette Patzelt, wild plants of Oman, Oman, kew publishing
 3. Anthony J. Miller and Miranda Morriso, Dhofar Plants, Office of the Advisor of Environmental Conservation
 4. Directorate General of Livestock, Ministry of Agriculture and Livestock in cooperation with ACSAD, Field Guide of Wild Plants in the Sultanate of Oman, Development Information Department of the Ministry of Agriculture and Fisheries
 5. Jens Eriksen & Hanne, Common bird in Oman, Oman, ministry of Tourism
 6. <http://omanflora.myspecies.info/ar>
 7. <https://www.wildscreen.org/arkive-closure/>
 8. Abdul Rahman bin Rashid Al Hinai, 31 / 5 / 2019, a plant specialist. Oman Botanical Garden
- * Ali bin Abdullah Al-Jahdhami, 21 / 1 / 2019, plant protection specialist, Ministry of Agriculture and Fisheries

Appendices

1. Table of vegetation diversity in the Nimr area

M	Scientific Name of the Plant	Condition	Arabic Name
1	<i>Abutilon pannosum</i>	-	منقى
2	<i>Acacia ehrenbergiana</i>	-	-
3	<i>Acacia spp</i>	common	-
4	<i>Acacia tortilis</i>	-	-
5	<i>Aerva artemisoides batharitica</i>	-	-
6	<i>Aerva javanica (Burm. F) Juss. ex Schult</i>	common	الري - الرء
7	<i>Aizoon canariense L.</i>	-	شحمة الأرض - شحيمة
8	<i>Anabasis setifera Moq</i>	-	شعر - شعران
9	<i>Anticharis glandulosa</i>	-	-
10	<i>Arnebia hispidissima (Lehm.) A.DC.</i>	common	حماط، هابرك، -كحل، مليم
11	<i>Asphodelus sp</i>	-	-
12	<i>Astragalus fasciculifolius</i>	-	-
13	<i>Blepharis ciliaris</i>	rare + threatened	-
14	<i>Blepharis linariaefolia</i>	common	-
15	<i>Boerhavia elegans</i>	-	-
16	<i>Boerhavia rubicunda Steud</i>	-	حدمدان - كشة الراعي
17	<i>Calotropis procera</i>	-	-
18	<i>Capparis cartilaginea</i>	common	رصراص
19	<i>Cassia senna</i>	-	-
20	<i>Chrozophora oblongifolia (Del.) A. Juss</i>	-	المشربية - تنوم
21	<i>Citrullus colocynthis</i>	-	-
22	<i>Citrullus colocynthis (L.) Schard</i>	-	حنضل - علقم
23	<i>Cleome amblyocarpa</i>	-	-
24	<i>Cleome scaposa</i>	-	-
25	<i>Cocculus balfourii Schweinf</i>	common	-
26	<i>Cocculus pendulus</i>	-	-
27	<i>commicarpus stenocarpa</i>	common	-
28	<i>Convolvulus cephalopodus Boiss -</i>		الرخامي رخامه

M	Scientific Name of the Plant	Condition	Arabic Name
29	<i>Convolvulus hystrix</i>	endemic	-
30	<i>Convolvulus oppositifolius</i>	-	-
31	<i>Convolvulus virgatus boiss</i>	-	-
32	<i>Convolvulus virgatus Boiss</i>	near endemic	هباب ريشة
33	<i>Cucumis prophetarum</i>	common	-
34	<i>Cymbopogon schoenanthus</i>	-	-
35	<i>Cymbopogon schoenanthus (L.) Spreng</i>	-	صخبير - الاذخر
36	<i>Cynodon dactylon (L) Pers</i>	-	-
37	<i>Cyperus conglomeratus rottb</i>	-	-
38	<i>Desmidorchis penicllata</i>	-	-
39	<i>Dipterygium glaucum Decne</i>	common	علقة
40	<i>Echinops spinosissimus freyn</i>	-	-
41	<i>Ephedra pachyclada</i>	-	-
42	<i>Eragrostis papposa</i>	-	-
43	<i>Euphorbia granulata</i>	common	-
44	<i>Euphorbia larica</i>	-	-
45	<i>Euryops arabicus steud</i>	-	-
46	<i>Fabaceae Lotus Taverniera</i>	-	-
47	<i>Fagonia bruguieri</i>	-	شويكة
48	<i>Fagonia indica burm</i>	-	مشكاع
49	<i>Fagonia indica</i>	common	اللتب
50	<i>Ficus cordata thumb</i>	common	-
51	<i>Ficus salicifolia</i>	-	-
52	<i>Forsskaolea tena cissima</i>	-	اللزاق
53	<i>Glossonema varians</i>	rare	-
54	<i>Glossostemon bruguieri</i>	-	-
55	<i>Grewia tenax</i>	-	-
56	<i>Helichrysum glumaceum DC</i>	-	شجرة البابو - رعل
57	<i>Heliotropium longiflorum</i>	common	-
58	<i>Helitoropium bacciferum</i>	common	ههفه
59	<i>Hyoscyamus galleri</i>	endemic	-
60	<i>hysorhynchus chamaerapistrum</i>	-	-
61	<i>Indigofera arabica Jaub. & Spach</i>	common	نيلة - شجرة الارنب - نبتة الزلل

M	Scientific Name of the Plant	Condition	Arabic Name
62	<i>Indigofera coerulea</i>	-	-
63	<i>Indigofera intricate</i>	common	-
64	<i>Indigofera oblongifolia</i>	-	-
65	<i>Indigofera semitrijuga</i>	-	-
66	<i>kohautia retrorsa</i>	-	-
67	<i>Launaea almaharhensis</i>	common	-
68	<i>Launaea nudicaulis</i>	regional endemic	-
69	<i>Launaea spinosa</i>	-	-
70	<i>Limonium axillare</i>	not common	-
71	<i>Limonium stocksii</i>	-	-
72	<i>Lindenbergia Arabica</i>	-	-
73	<i>Lotus garcinii</i>	-	-
74	<i>Lotus garcinii</i>	-	-
75	<i>Louts garcinii DC</i>	-	لوتس - قرط
76	<i>Merremia somalensis</i>	-	-
77	<i>Nannorrhops ritchieana</i>	-	غصف
78	<i>ndigofera cordifolia</i>	-	-
79	<i>Nerium oleander</i>	common	-
80	<i>neurada procumbens</i>	-	-
81	<i>Ochradenus arabicus</i>	not common	-
82	<i>Ochradenus baccatus</i>	-	-
83	<i>Oxalis corniculata</i>	-	-
84	<i>Panicum turgidum Forssk</i>	-	التمام - عجلة
85	<i>Pdicosepalus acacia</i>	-	-
86	<i>Pentatropis spiralis</i>	-	-
87	<i>Phagnalon viridifolium decne</i>	-	-
88	<i>Physorhynchus chamaerapistrum</i>	-	-
89	<i>Pluchea arabica</i>	regional endemic	-
90	<i>Pluchea Pulicaria</i>	-	-
91	<i>Pluchea Vernonia</i>	-	-
92	<i>Polycarpaea spicata</i>	common	-
93	<i>Polygala erioptera</i>	-	-
94	<i>Polygala mascatensis</i>	-	-

M	Scientific Name of the Plant	Condition	Arabic Name
95	<i>Prosopis cineraria</i>	-	الغاف
96	<i>Prosopis juliflora</i>	-	غاف بحري
97	<i>Pulicaria glutinosa</i> Jaub	common	مهتدي
98	<i>Pulicaria samhanensis</i>	-	-
99	<i>Reichardia tingitana</i> (L.) Roth	-	حواء - نكد - مرار
100	<i>Reichardia tingitana</i>	-	-
101	<i>Reseda aucheri</i> boiss	-	-
102	<i>Rhazya stricta</i> decne	-	حرمل
103	<i>Rumex vesicarius</i>	-	حماض
104	<i>Salvadora persica</i>	endemic	الراك
105	<i>Salvia sp.nov.affinne</i>	-	-
106	<i>Schweinfurthia imbricate</i>	-	-
107	<i>Schweinfurthia papilionacea</i>	-	-
108	<i>Schweinfurthia spinosa</i>	near endemic	-
109	<i>Seddera glomerata</i>	-	-
110	<i>Seetzenia lanata</i>	-	-
111	<i>Senna holosericea</i>	common	-
112	<i>Seripidium herba-alba</i>	-	-
113	<i>Sesuvium verrucosum</i>	-	-
114	<i>Stipagrostis uniplumis</i>	-	-
115	<i>Suaeda aegyptiaca</i>	-	-
116	<i>taverniera lappacea</i>	common	-
117	<i>Tephrosia purpurea</i>	-	الظفرة
118	<i>Tetraena alba</i>	-	-
119	<i>Tetraena decumbens</i>	common	-
120	<i>Tetraena hamiensis</i>	not common	-
121	<i>Tetraena qatarensis</i>	rare	هرم
122	<i>Tetraena simplex</i>	common	ثرمد
123	<i>Teucrium stocksianum</i>	-	-
124	<i>Tribulus pentandrus</i>	-	-
125	<i>Tribulus terrestris</i>	-	-
126	<i>vernonia arabica</i>	common	-

2. Table of Chart of the Species of Birds in Nimr Area

M	Species	Arabic Name	Species of Birds
1	<i>long-eyed buzzard</i>	الباز	<i>Desert</i>
2	<i>Spotted Flycatcher</i>	الذبابي	<i>Gardens/Farms</i>
3	<i>cream -coloured courser</i>	الكروان الرملي	<i>Desert</i>
4	<i>red-tailed wheatear</i>	أبلق أحمر الذيل	<i>Desert</i>
5	<i>red -tailed wheatear</i>	أبلق أحمر الصدر	<i>Desert</i>
6	<i>isabelline whwatear</i>	أبلق أشهب	<i>Desert</i>
7	<i>arabian wheatear</i>	أبلق عربي	<i>Desert</i>
8	<i>Black-Winged Stilt</i>	أبو المغازل	<i>Gardens/Farms</i>
9	<i>Collared Pratincole</i>	أبو اليسر مطوق	<i>Gardens/Farms</i>
10	<i>Northern Shoveler</i>	أبو مجرفة شمالي	<i>Gardens/Farms</i>
11	<i>Glossy Ibis</i>	أبو منجل اللماع	<i>Marine</i>
12	<i>North Pintail</i>	بط	<i>Marine</i>
13	<i>Indian Pond Heron</i>	بلشون البرك الهندي	<i>Marine</i>
14	<i>Western Reef Heron</i>	بلشون الصخر	<i>Marine</i>
15	<i>Western Cattle Egret</i>	بلشون القطعان	<i>Gardens/Farms</i>
16	<i>Little Egret</i>	بلشون أبيض صغير	<i>Marine</i>
17	<i>little heron</i>	بلشون أخضر الظهر	<i>Marine</i>
18	<i>Purple Heron</i>	بلشون أرجواني	<i>Marine</i>
19	<i>Grey Heron</i>	بلشون رمادي	<i>Marine</i>
20	<i>little owl</i>	بومة أم قويق	<i>Marine</i>
21	<i>desert whitethroat</i>	بياض الصحراء	<i>Desert</i>
22	<i>purple sunbird</i>	تمير آسيوي	<i>Gardens/Farms</i>
23	<i>Eurasian Scops Owl</i>	ثبع أوروبي	<i>Desert</i>
24	<i>Tree Pipit</i>	جشنة الشجر	<i>Gardens/Farms</i>
25	<i>Tawny Pipit</i>	جشنة الصحراء	<i>Desert</i>
26	<i>arabian partridge</i>	حجل عربي	<i>Mountain</i>
27	<i>Rock Dove</i>	حمام جبلي	<i>Mountain</i>

M	Species	Arabic Name	Species of Birds
28	<i>black redstart</i>	حميراء دبساء	<i>Desert</i>
29	<i>Red breasted Flycatcher</i>	خاطف الذباب أحمر الصدر	<i>Gardens/Farms</i>
30	<i>sandwich tern</i>	خرشنة سندويتشية	<i>Marine</i>
31	<i>Saunders's Tern</i>	خرشنة سوندرزية	<i>Marine</i>
32	<i>Little Tern</i>	خرشنة صغيرة	<i>Marine</i>
33	<i>Whiskered Tern</i>	خرشنة هجينة	<i>Marine</i>
34	<i>Barn Swallow</i>	خطاف المخازن	<i>Gardens/Farms</i>
35	<i>White winged Tern</i>	خطاف أبيض الجناح	<i>Marine</i>
36	<i>Upcher's Warbler</i>	خنشع الشجر	<i>Gardens/Farms</i>
37	<i>common moorhen</i>	دجاجة الماء خضراء	<i>Marine</i>
38	<i>Common Moorhen</i>	دجاجة الماء	<i>Gardens/Farms</i>
39	<i>Common Whitethroat</i>	دخلة بيضاء الحنجرة	<i>Gardens/Farms</i>
40	<i>Rufous tailed Scrub Robin</i>	دخلة حمراء	<i>Gardens/Farms</i>
41	<i>Ortolan Bunting</i>	درسة الشعير	<i>Gardens/Farms</i>
42	<i>striolated bunting</i>	درسة مخططة	<i>Mountain</i>
43	<i>Temminck's Stint</i>	درجة تمنكية	<i>Gardens/Farms</i>
44	<i>Ruff</i>	درجة شرسة	<i>Gardens/Farms</i>
45	<i>Little Stint</i>	درجة صغيرة	<i>Gardens/Farms</i>
46	<i>Broad-Billed Sandpiper</i>	درجة عريضة المنقار	<i>Gardens/Farms</i>
47	<i>Curlew Sandpiper</i>	درجة كروانية	<i>Gardens/Farms</i>
48	<i>white wagtail</i>	ذعرة بيضاء	<i>Gardens/Farms</i>
49	<i>Grey Wagtail</i>	ذعرة رمادية	<i>Gardens/Farms</i>
50	<i>Yellow Wagtail</i>	ذعرة صفراء	<i>Gardens/Farms</i>
51	<i>Grey Plover</i>	رسول الغيث الرمادي	<i>Marine</i>
52	<i>European Nightjar</i>	سبد أوروبي	<i>Gardens/Farms</i>
53	<i>rufous tailod rock thrush</i>	سمنة الصخور	<i>Desert</i>
54	<i>Sand Martin</i>	سنونو الرمل	<i>Desert</i>
55	<i>Garganey</i>	شرشير صيفي	<i>Desert</i>
56	<i>European Roller</i>	شقراق أوروبي	<i>Gardens/Farms</i>

M	Species	Arabic Name	Species of Birds
57	<i>Indian Roller</i>	شقراق هندي	<i>Gardens/Farms</i>
58	<i>Pintailed Snipe</i>	شنقب رفيع الذيل	<i>Marine</i>
59	<i>Common Snipe</i>	شنقب شائع	<i>Gardens/Farms</i>
60	<i>southern grey shrike</i>	صرد رمادي كبير	<i>Desert</i>
61	<i>isabelline shrike</i>	صرد محمر الذنب	<i>Desert</i>
62	<i>Eurasian Golden Oriole</i>	صفير ذهبي	<i>Gardens/Farms</i>
63	<i>long legged buzzard</i>	صقر جراح	<i>Desert</i>
64	<i>Amur Falcon</i>	صقر عمورية	<i>Gardens/Farms</i>
65	<i>Eurasian Wigeon</i>	صوأي أوراسيا	<i>Marine</i>
66	<i>Wood Sandpiper</i>	طيوطي الغياط	<i>Marine</i>
67	<i>Marsh Sandpiper</i>	طيوطي المستنقع	<i>Gardens/Farms</i>
68	<i>Green Sandpiper</i>	طيوطي أخضر	<i>Marine</i>
69	<i>Common Greenshank</i>	طيوطي أخضر الساق	<i>Marine</i>
70	<i>Common Sandpiper</i>	طيوطي شائع	<i>Marine</i>
71	<i>Terek Sandpiper</i>	طيوطي نكات	<i>Marine</i>
72	<i>House Sparrow</i>	عصفور دوري	<i>Gardens/Farms</i>
73	<i>Steppe Eagle</i>	عقاب السهوب	<i>Desert</i>
74	<i>golden eagle</i>	عقاب ذهبية	<i>Desert</i>
75	<i>boot eagle</i>	عقاب مسيرة صغرى	<i>Desert</i>
76	<i>western osprey</i>	عقاب نساري	<i>Desert</i>
77	<i>Common Nightingale</i>	عندليب	<i>Gardens/Farms</i>
78	<i>common kestrel</i>	عوسق شائع	<i>Desert</i>
79	<i>great cormorant</i>	غاقاة كبيرة	<i>Marine</i>
80	<i>socotra cormorant</i>	غراب البحر السقطري	<i>Marine</i>
81	<i>Brown necked Raven</i>	غراب أحيمر العنق	<i>Gardens/Farms</i>
82	<i>Laughing Dove</i>	فاختة النخيل	<i>Gardens/Farms</i>
83	<i>Red-Necked Phalarope</i>	فلروب أحمر الرقبة	<i>Gardens/Farms</i>
84	<i>desert lark</i>	قبرة صحراوية	<i>Desert</i>
85	<i>desert wheatear</i>	أبلق صحراوي	<i>Desert</i>

M	Species	Arabic Name	Species of Birds
86	<i>Greater Short-Toed Lark</i>	قبرة قصيرة الأصابع	<i>Gardens/Farms</i>
87	<i>Crested Lark</i>	قبرة متوجة	<i>Desert</i>
88	<i>greater hoopoe- lark</i>	قبرة هدهدية	<i>Desert</i>
89	<i>chestnut-bellied sandgrouse</i>	قطا كستنائي البطن	<i>Desert</i>
90	<i>crowned sandgrouse</i>	قطا متوج	<i>Desert</i>
91	<i>lichtensteins sandgrouse</i>	قطا مخطط	<i>Desert</i>
92	<i>Kentish Plover</i>	قطقاط اسكندراني	<i>Marine</i>
93	<i>lesser sand plover</i>	قطقاط الرمل الصغير	<i>Marine</i>
94	<i>Greater Sand Plover</i>	قطقاط الرمل الكبير	<i>Marine</i>
95	<i>Little Ringed Plover</i>	قطقاط مطوق صغير	<i>Marine</i>
96	<i>European Turtle Dove</i>	قمري	<i>Gardens/Farms</i>
97	<i>Turnstone</i>	قنبرة الماء	<i>Marine</i>
98	<i>Black crowned Sparrow Lark</i>	قنبرة سوداء متوجة	<i>Desert</i>
99	<i>Whimbrel</i>	كروان الماء صغير	<i>Gardens/Farms</i>
100	<i>Eurasian Wryneck</i>	لواء أوراسي	<i>Gardens/Farms</i>
101	<i>Sanderling</i>	مدروان	<i>Gardens/Farms</i>
102	<i>Western Marsh Harrier</i>	مرزة المستنقعات الغربية	<i>Marine</i>
103	<i>Greater Flamingo</i>	نحام أكبر	<i>Gardens/Farms</i>
104	<i>Willow Warbler</i>	نقشارة	<i>Gardens/Farms</i>
105	<i>Heuglin's Gull</i>	نورس	<i>Gardens/Farms</i>
106	<i>soot gull</i>	نورس أسخم	<i>Marine</i>
107	<i>Caspian Gull</i>	نورس قزويني	<i>Marine</i>
108	<i>Slender-billed Gull</i>	نورس مستدق المنقار	<i>Marine</i>
109	<i>Marsh Warbler</i>	هازجة البطائح	<i>Gardens/Farms</i>
110	<i>Eurasian Reed Warbler</i>	هازجة الغاب	<i>Gardens/Farms</i>
111	<i>Eurasian Hoopoe</i>	هدهد أوراسي	<i>Gardens/Farms</i>
112	<i>Blue-cheeked Bee-eater</i>	وروار أزرق الخد	<i>Gardens/Farms</i>
113	<i>Common Cuckoo</i>	وقواق شائع	<i>Gardens/Farms</i>
114	<i>Eurasian collared Dove</i>	يمامة مطوقة أوراسية	<i>Desert</i>

3. Table of diversity of insects in Nimr area

Class	Order	Family	Scientific name
Hexapoda (Insecta)	Hymenoptera	Crabronidae	<i>liris c.f. agilis</i>
			<i>Trypoxylon splendidum</i>
			<i>Tachysphex c.f. quasifugas</i>
			<i>Miscophus mimeticus</i>
			<i>Miscophus ctenopus</i>
			<i>Cereceris sp</i>
			<i>Bembix oculata</i>
		Pompilidae	<i>Ceropales dubaica</i>
			<i>Agenioideus gentilis</i>
			<i>Ceropales sp 2</i>
			<i>Tachyagetes c.f. zonsteini</i>
			<i>Aporinellus c.f. rhodesianus</i>
			<i>Gonaporus c.f. omanicus</i>
			<i>Tachyagetes c.f. arabicus</i>
			<i>cf. Aporinellus sp</i>
			<i>Lampetis sp</i>
		Apidae	<i>Amegilla sp</i>
			<i>Xylocopa aestuans</i>
		Halictidae	<i>Halictus sp</i>
			<i>Lasioglossum sp</i>
			<i>Anthidium sp</i>
		Bethylidae	<i>cf. Formosiepyris sp</i>
			<i>Epyris sp</i>
			<i>Holeyris sp</i>
		Mutilidae	<i>Physetopoda c.f. vanharteni</i>
		Sphecidae	<i>Ammophila dubia</i>
		Perilampidae	<i>Perilampus sp</i>
		Ichneumonidae	<i>Anomalon sp</i>
		Formicidae	<i>Cataglyphis sp 1</i>
			<i>Cataglyphis sp 2</i>
			<i>Tetramorium sp</i>
			<i>Camponotus sp</i>

Class	Order	Family	Scientific name
<i>Hexapoda (Insecta)</i>	<i>Hymenoptera</i>	Formicidae	<i>Monomorium sp</i>
			<i>Solenopsis sp</i>
		Braconidae	<i>Phanerotoma sp</i>
			<i>Doryctinae</i>
		Chrysididae	<i>Chrysis sp</i>
		Tiphiidae	<i>Meria sp</i>
		Chalcididae	<i>Brachymeria sp</i>
		Colletidae	<i>Colletes sp</i>
		Ampulicidae	<i>Dolichurus arabicus</i>
		Vespidae	<i>Eustenancistrocerus sp</i>
	<i>Coleoptera</i>	Meloidae	<i>Hycleus graciosus</i>
		Tenebrionidae	<i>Pachycera cf. pygmaea arabica</i>
			<i>Mesostena puncticollis</i>
			<i>Adesmia cf. cothurnata</i>
			<i>Trachyderma philistina</i>
			<i>Adesmia cf. arabica wittmeri</i>
			<i>Opatroides vicinus</i>
			<i>Apentanodes arabicus</i>
			<i>Thriptera kraatzi</i>
			<i>Adesmia c.f. cancellata</i>
			<i>Oxycara hansbremeri</i>
			<i>Cheirodes sp</i>
		<i>Cyphostethe sp</i>	
		Melyridae	<i>Melyris bicolor</i>
			<i>Attalusinus sp</i>
		Dermastidae	<i>Attagenus posticalis</i>
			<i>Attagenus vanharteni</i>
			<i>Anthrenus fulvipes</i>
		Bruchidae	<i>Brucidius buettikeri</i>
			<i>Spermophagus sp</i>
	Buprestidae	<i>Julodis euphratica</i>	
		<i>Meliboeus margotanus</i>	
<i>Anthaxia sp</i>			

Class	Order	Family	Scientific name
Hexapoda (Insecta)	Coleoptera	Buprestidae	<i>Lampetis sp</i>
		Chrysomelidae	<i>Euryope subserricornis</i>
		Curculionidae	<i>Nematocerus omanicus</i>
		Scraptidae	<i>Pentaria sp</i>
		Coccinellidae	<i>Hyperaspis cf. vinciguerra</i>
	Lepidoptera	Lasiocampidae	<i>Streblote sive</i>
		Nymphalidae	<i>Hypolimnas misippus</i>
		Pieridae	<i>Colotis phisadia</i>
		Lycaenidae	<i>Freyeria trochylus</i>
		Sphingidae	<i>Hyles livornica</i>
		Lymantriidae	<i>Casama innotata</i>
		Hesperiidae	<i>Spialia sp</i>
		Noctuidae	<i>Heliothis cf. nubigera</i>
	Mantodea	Mantidae	<i>Sphodromantis trimacula</i>
			<i>Microthespis dmitriewi</i>
		Eremiaphillidae	<i>Eremiaphila braueri</i>
		Empusidae	<i>Hypsicorypha gracilis</i>
	Neuroptera	Chrysopidae	<i>Chrysoperla carnea</i>
		Chrysopidae	<i>C.f. Saurius alistor</i>
		Myrmeleontidae	<i>Myrmeleon sp</i>
		Ascalphidae	<i>Gen. (larvae specimen)</i>
	Orthoptera	Acrididae	<i>Schistocerca gregaria</i>
			<i>poekilocerus bufonius</i>
			<i>Sphingonotus rubescens</i>
			<i>Sphingonotus savignyi</i>
			<i>Pyrgomorpha conica tereticornis</i>
		Gryllidae	<i>Acheta sp</i>
	Hemiptera	Miridae	<i>Phytocoris sp</i>
			<i>Campyloneuropsis pygmaea</i>
			<i>Reuterista demeter</i>
		Reduviidae	<i>Holotrichius sp</i>
			<i>Coranus aegyptius</i>
Cicadellidae		<i>Nealiturus inscriptus</i>	

Class	Order	Family	Scientific name
Hexapoda (Insecta)	Hemiptera	Cicadellidae	<i>Aconurella prolixa</i>
			<i>Austroagallia sp</i>
		Oxycarenidae	<i>Leptodemus minutus</i>
		Alydidae	<i>Nariscus conpurcatus</i>
			<i>Tenosius proletarius</i>
		Rhyparochromidae	<i>Anepsiocoris encaustus</i>
		Lygaeidae	<i>Spilostethus longulus</i>
			<i>Nysius sp</i>
	Pentatomidae	<i>Sciocoris sp</i>	
		<i>Peizodorus sp</i>	
	Diptera	Bombyliidae	<i>C.f. Spogostylum sp</i>
			<i>C.f. Anthrax sp</i>
		Syrphidae	<i>Eristalinus aeneus</i>
		Muscidae	<i>Atherigona sp</i>
			<i>Musca domestica</i>
		Calliphoridae	<i>Chrysomya marginalis</i>
		Culicidae	<i>Culex sp</i>
		Asilidae	<i>Apoclea inarticulata</i>
		Asilidae	<i>Saropogon pseudojugulum</i>
		Mydidae	<i>Rhopalia oliveri</i>
Therevidae	<i>Acathrito robusta</i>		
Arachnida	Araneae	Saltacidae	<i>Plexippus paykaulli</i>
			<i>Heliophanillus fulgens</i>
		Gnaphosidae	<i>Drassodes sp</i>
			<i>cf. Pterotricha sp</i>
			<i>cf. Cebrennus sp</i>
	Sparrasidae	<i>cf. Araneus sp</i>	
	Araneidae	<i>cf. Araneus sp</i>	
	Thomcidae	<i>Thomisus sp</i>	
	Scorponoidea	Buthidae	<i>Orthocirus sp</i>
		Diplocentridae	<i>Nebo sp</i>
Solifugae	Galeodidae	<i>Galodes arabs</i>	
Acari	Trombidiidae	<i>Dinothrombium sp</i>	

4. Table of diversity of reptiles in Nimr area

Class	Order	Family	Scientific name
Reptilia	Squamata	Agamidae (Chisel-teeth lizards)	<i>c.f. Phrynocephalus sp</i>
			<i>c.f. Pseudotrapelus sinaitus</i>
			<i>Uromastyx thomasi</i>
		Gekkonidae (Geckos)	<i>Pristurus c.f. minimus</i>
			<i>Pristurus c.f. carteri</i>
		Lacertidae (Wall and Sand lizards)	<i>Acanthodactylus sp</i>
		Scincidae (Skinks)	<i>Scincus mitranus</i>

4. Table of the points of the sites for the biodiversity survey in Nimr Area

Sites of the study of samples in Nimr area

M	Sites of samples	X	Y
1	Wadi Roneb	56.3431644	18.80308184
2	Amal area	55.97072765	18.19793618
3	Reed farm	55.77393919	18.65801558
4	Omani Ghaf Forest - Southern Ghobra	56.02564268	18.6365581

Shirman traps

M	Sites	X	Y
1	Wadi Shibon - Amal	55.97042409	18.3248803
2	Wadi Shibon - Amal	55.98892472	18.26916535
3	Wadi Shibon - Amal	55.99342204	18.25697068
4	Wadi Shibon - Amal	56.00717475	18.25205392
5	Wadi Shibon - Amal	55.98082803	18.20900654
6	Reed Farms	55.78800582	18.6502994
7	Reed Farms	55.77851985	18.64452699
8	Reed Farms	55.77649479	18.64535421
9	Reed Farms	55.76546236	18.65691185
10	Reed Farms	55.76291442	18.66052769
11	Omani Ghaf Forest - Southern Ghobra	55.97985103	18.61126069
12	Omani Ghaf Forest - Southern Ghobra	56.00166911	18.62439086
13	Omani Ghaf Forest - Southern Ghobra	56.0224439	18.63820905
14	Omani Ghaf Forest - Southern Ghobra	56.03231519	18.63603701
15	Omani Ghaf Forest - Southern Ghobra	56.03347018	18.64636321
16	Wadi Roneb	56.37443225	18.82373135
17	Wadi Roneb	56.35382574	18.81184015
18	Wadi Roneb	56.35207086	18.81163525
19	Wadi Roneb	56.34958058	18.80770435

Samples of vegetation cover

M	Sites	X	Y
1	<i>Wadi Shibon - Amal</i>	55.96326056	18.32336845
2	<i>Wadi Shibon - Amal</i>	55.98725684	18.26805398
3	<i>Wadi Shibon - Amal</i>	55.99560744	18.26019039
4	<i>Wadi Shibon - Amal</i>	55.99452321	18.24148657
5	<i>Wadi Shibon - Amal</i>	55.96688895	18.2171378
6	<i>Reef Farm</i>	55.79478823	18.62953212
7	<i>Omani Ghaf Forest - Southern Ghobra</i>	56.01593153	18.62993337
8	<i>Omani Ghaf Forest - Southern Ghobra</i>	56.00412343	18.63428126
9	<i>Omani Ghaf Forest - Southern Ghobra</i>	56.00489699	18.60722869
10	<i>Omani Ghaf Forest - Southern Ghobra</i>	56.0248336	18.63973064
11	<i>Omani Ghaf Forest - Southern Ghobra</i>	56.04234778	18.65071026
12	<i>Omani Ghaf Forest - Southern Ghobra</i>	56.02322908	18.62356417
13	<i>Omani Ghaf Forest - Southern Ghobra</i>	56.0095732	18.61644395
14	<i>Omani Ghaf Forest - Southern Ghobra</i>	56.02209382	18.64306009
15	<i>Omani Ghaf Forest - Southern Ghobra</i>	55.97631901	18.56945478
16	<i>Omani Ghaf Forest - Southern Ghobra</i>	55.96646094	18.56683454
17	<i>Omani Ghaf Forest - Southern Ghobra</i>	55.9668146	18.6040595
18	<i>Wadi Roneb</i>	56.37021382	18.81984913
19	<i>Wadi Roneb</i>	56.36065032	18.81654505
20	<i>Wadi Roneb</i>	56.35415174	18.81096465
21	<i>Wadi Roneb</i>	56.34538056	18.8042193
22	<i>Wadi Roneb</i>	56.34186631	18.80257117

Insects› traps (according to types)

ID	Type of traps	Sites	X	Y
1	<i>Falling cups</i>	<i>Wadi Shibon - Amal</i>	<i>55.99308</i>	<i>18.25625</i>
2	<i>Light traps</i>	<i>Wadi Shibon - Amal</i>	<i>55.98988</i>	<i>18.26979</i>
3	<i>Yellow Plats</i>	<i>Wadi Shibon - Amal</i>	<i>55.96402</i>	<i>18.19720</i>
4	<i>Falling cups</i>	<i>Wadi Shibon - Amal</i>	<i>55.96203</i>	<i>18.19730</i>
5	<i>Falling cups</i>	<i>Reed Farm</i>	<i>55.77778</i>	<i>18.64424</i>
6	<i>Light traps</i>	<i>Reed Farm</i>	<i>55.77771</i>	<i>18.67382</i>
7	<i>Yellow Plats</i>	<i>Reed Farm</i>	<i>55.77767</i>	<i>18.64425</i>
8	<i>Falling cups</i>	<i>Reed Farm</i>	<i>55.77573</i>	<i>18.64477</i>
9	<i>Yellow Plats</i>	<i>Reed Farm</i>	<i>55.77578</i>	<i>18.64507</i>
10	<i>Light traps</i>	<i>Omani Ghaf Forest - Southern Ghobra</i>	<i>56.02056</i>	<i>18.64085</i>
11	<i>Malise trap</i>	<i>Omani Ghaf Forest - Southern Ghobra</i>	<i>56.02034</i>	<i>18.64029</i>
12	<i>Falling cups</i>	<i>Wadi Roneb</i>	<i>56.33434</i>	<i>18.79918</i>
13	<i>Malise traps</i>	<i>Wadi Roneb</i>	<i>56.34482</i>	<i>18.80372</i>
14	<i>Yellow Plats</i>	<i>Wadi Roneb</i>	<i>56.34483</i>	<i>18.80254</i>
15	<i>Yellow Plats</i>	<i>Wadi Roneb</i>	<i>56.36029</i>	<i>18.81681</i>

