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DUBAI DESERT CONSERVATION RESERVE

Insect Biodiversity and Distribution in the Dubai Desert Conservation Reserve.

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Emirates

IUCN | Member

Content:

Introduction.

A leader and legend on the discovery field of modern natural science once said,

> "***We can allow satellites, planets, suns, universe, nay whole systems of universes, to be governed by laws, but the smallest insect, we wish to be created at once by special act."***
>
> Charles Darwin

The world of insects has not been discovered full as there are so many species that I encounter within the reserve and around the UAE, this this brought me to the idea of doing a survey of the Insects species of the reserve, not only the Presence/absence but the distribution of the species found on the reserve.

Three different methods were used in this Distribution survey, the least effective method that has been used was the Malaise-trapping, the trap had a target group of the diurnal flying insects such as the Diptera, Hymenoptera and that of the Lepidoptera. The Second method that I have used I the Pit-fall trapping with a target group of the terrestrial species. This method has proven to be successful and collected several new species that was new to the reserve. The third method was a simple light trap. The target group of this method was that of the Nocturnal flying insects, a large number of insects mainly of the Hemiptera Order were trapped. Some of these Bugs are yet to be identified.

A present/absence study has been done on the reserve, (Roosenschoon, P. 2011) were the main focus was on five terrestrial species and there activity throughout the year, these five species were Arabian Darkling (*Pimelia arabica*), Churchyard beetle (*Blaps kollari*), Firebrat (*Thermobia domestica*), Rack beetle (*Tentyrina palmeri*) and the Urchin beetle (*Prionothecha coronata*). This study was mainly done by using the Pit-fall trapping method.

The following study that have been done is the distribution of the Biodiversity of the insects and not only the terrestrial species but also the flying species, this has proven to be an interesting survey as I collected several new species that not yet been identified within the reserve and several species that are pending identification.

The objective of this particular survey was to identify the habitat preferences of each of the species collected. Data that have been collected over this period of 3months was entered into a program ArcMap 10©. The data fields that were use were that of Shannon Index (Index of Biodiversity), Simpson Index (Index of Probability) and further the Important Value Index was used for each species and this shows the distribution of each species and their

preferred habitats. These are all used for the Density and abundance of each species on the reserve. A photo gallery shows the variety of species found in the survey period.

Abstract.

This Arthropod study was conducted in the Dubai Desert Conservation Reserve (DDCR). The reserve is located on the border between Sharjah and Abu Dhabi. The habitats of the reserve are dominated mainly by low-to-medium size sand dunes and interspersed gravel plains. This reserve is a perfect site to observe and collect different Arthropod species. Although this survey was aimed on the biodiversity and the distribution of the species found on the reserve has indicated that the Dominant species of the reserve is that of the Hymenoptera Order and more specific Short-wing wasp (Komarowia concolor). The IVI, Important Value Index. 65.26% this recorded over a trapped 140 trap-nights period. The Co-dominant species was of the Order Coleoptera and of the Family of Tenebrionidae, the Rack beetle (Tentyrina palmeri) with an IVI of 61.91%. The survey indicated that the trapping success of the three methods, the Light trapping, Pitfall-trapping and Malaise trapping, thus the Light trapping was most successful and the Malaise trapping the least.

Objective.

Over the last few years working on the reserve I found that there are research done on the vegetation and only recently research been done on larger herbivores animals, but no intensive research had been done on the small-to-minute fauna.

In 2011 a Presence/Absence study was done, and results of Five indicator species was analysed and results shown that certain insect species are more prevalent than others species, indicated that there are insects more active during the colder period of the year.

The result of that allowed me to develop a survey of the insect's species and their distribution and the abundance during the autumn.

Objective was to target the different Insects groups as per their activity times, and also keeping in mind that their movement patterns. The target groups was Terrestrial insects, this group includes Orders such as; Hymenoptera, Coleoptera, Hemiptera, Dermaptera, Neuroptera and Isoptera. Some of the Orders that have been mentioned are flying insects but has a terrestrial, or fossorial habits thus incorporated in this survey. A nocturnal Flying insect that was included to this survey was of the Orders Hemiptera, Lepidoptera, Diptera, Coleoptera and Hymenoptera. The third target group

was that of the Diurnal flying insects, including of the Orders Lepidoptera, Coleoptera, Hymenoptera but more so the Diptera.

Obtaining the Diversity and Distribution could be useful in future research and insect are part of the dietary sources of the Hedgehogs, Birds, Reptiles, Canines and Felines, thus the objective is to see what the Abundance of insects can influence the predator species regards to distribution.

Study area.

The Dubai Desert Conservation Reserve (DDCR) is remotely located in the unspoiled ecosystem, which is protected over the last thirteen years; a unique management plan was use with great success.

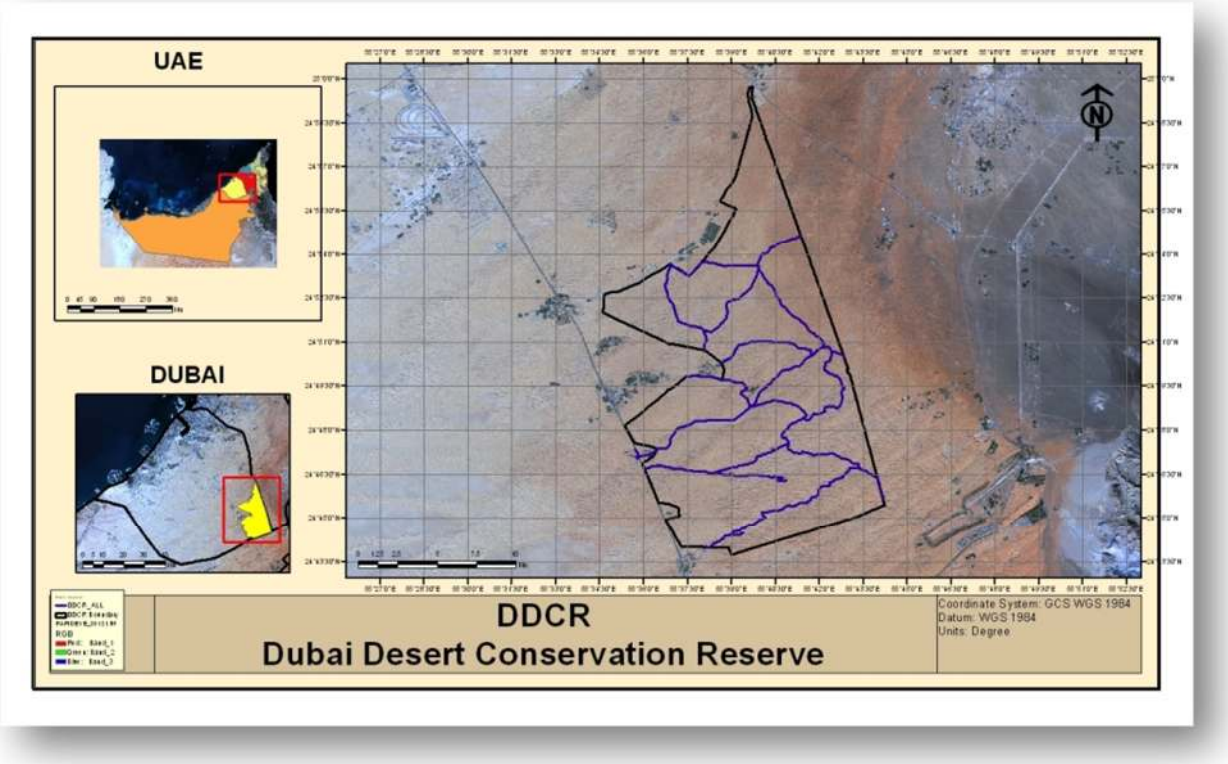


Figure 1: Location of the survey region.

The reserve with a 5% surface area that of the Emirate of Dubai, is locate in the south-east corner of the emirate which borders are made up of the Emirate of Abu Dhabi to the south and Emirate of Sharjah to the east, unfortunately there is roads on both the northern and western borders.

The DDCR has been protected from the general public since 2003, with a pilot project known as the AL MAHA Reserve since 1999 which is now incorporated into the DDCR. The total surface area of the reserve is 225km^2; the reserve was an ideal site for the two surveys that has been done. A distribution of Gravel plains is about 4% of the reserve, the remaining areas has a range of different habitats, they range from vegetated sand dunes to bare and moving sand dune, with no evidence of vegetation on the later.

Method and Materials.

The study was divided into three categories and these were focus on different groups of Insects. For the terrestrial (ground dwelling) insects Pit-fall trapping was used. For the Nocturnal flying species that are attracted to lights a Funnel Light trap was used, for the Diurnal frying species a Malaise trap (van Noort, S. 2009) was set up on the ground in between the vegetation.

A basic pitfall trap was used as it gave best results in the field. The target group of the Arthropods was the terrestrial (ground dwelling) species. This method that was decided on, as this method gave the most result on previous studies done within the reserve. (Roosenschoon, P. (2011). "Arthropods: A Presence/ Absence Study in an Arid Desert Environment." Internal document).

The method that was used for the Pit-fall trapping was: Simple canvas barriers were placed in at the pre-selected sites, the length of which was 6m with a height of 15cm. three buckets were placed in line with the barrier (fig.1). Each trap that was placed out was left for a total of 7 days, collecting of the specimens and the clearing out of the traps where done daily before the temperature got to hot. The use of an ATV (Rhino) to travel from site to site was used mainly to reduce environmental impact and the accessibility of these vehicles made it much more time efficient. All records of species collected were kept. A data base was created for the easy access and for future requirements.

The method for the attracting the Nocturnal flying insects, a Funnel Light trap was used. Each trap was left out in the same site for two different nights, of which the specimens that was collected were counted and discarded off. The setup was place in the open with a clear white lamp. (fig.2) Trapping site was calculated on the distance that the light made a ring on the ground.

The last trapping method that was directed to the collecting of the Diurnal flying species was the Malaise trap. I decided on the Mini-Malaise trap due to the vegetation in the open desert is not more than a meter high, and other factor that I took in consideration was that of the winds. These traps were left out for a period of 7 days. The trap was set up in between or nearby vegetation.

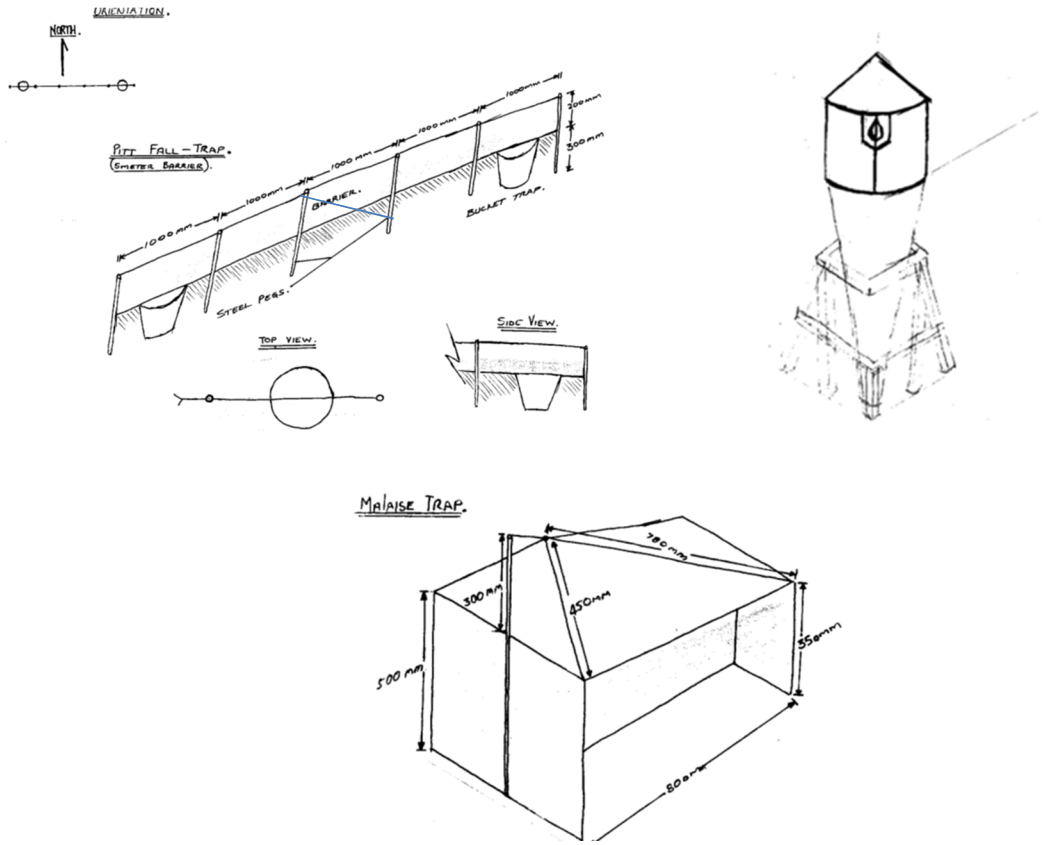


Figure 2: Pitfall-trap, Light-trap and Malaise-trap diagrams.

The following parameters were measured for each species in every single plot (Density, Relative Density, Frequency, Relative Frequency, Abundance and Relative Abundance). By calculating these parameters, the Important Value Index **(IVI)** could be determined. The species with the highest IVI were considered to be the dominant species of the site and the second highest species of **IVI** considered being the co-dominant species.

Diversity indices were also used to quantitatively assess the diversity of the insect communities and to compare different parts of the reserve, due to high disturbance, medium disturbance and low disturbance. Many quantitative values have been developed by leading ecologist to measure the spatial and temporal changes of species richness and diversity of ecosystems and also to compare between different habitats.

Simpson's Diversity Index (*Kerbs, J. C. 1999*) is a measure of diversity. In ecology, it is often used to quantify the biodiversity of a habitat. It takes into account the number of species present, as well as the abundance of each species.

$$\mathbf{D = \Sigma\ (n\ /\ N)^2}$$

n = the total number of individuals of a particular species
N = the total number of organisms of all species

Sampling Sites.

Total sampling area for the Pit-fall trap survey was about $30m^2$ per trap site and there were 100 site used this equals to $3000m^2$ that has been randomly been distributed by ArcMap 10© throughout the DDCR.

Random sampling is usually carried out when the study area has basically the same habitat, very large with a very limited time frame. When using random sampling techniques, large numbers of samples/records are taken from different positions within the habitat. This is done many times at different points within the habitat to give a large number of different samples.

Of witch a total study region size is $225Km^2$. The total percentage area that was surveyed equates to 0.0675% of the reserve. Each trap that was place into the position was left out for amount of 7 days. Thus over the period of this study the total of trapping days were 700 trapping days. (7days X 100 sites)

Total sampling area of the Light-trapping survey was about $1256m^2$ per trap site, a total of twenty sites were selected to place these light traps. Light traps were not set up near to cultivated areas. Thus the total area of all the sites equate to $25120m^2$. The total percentage of the trapping survey was 5.787% or the study region.

Data analysis.

Three different surveys were conducted at the same time Light-trapping, Pitfall-trapping and Malaise-trap survey. Each survey that was conducted had a target group in mind. To follow will be the results that have been found to be of interest.

- ## Result and Findings of Light-trapping Survey.

The target group of this survey was that of the nocturnal Insects that would be active by light during the survey period. The predominant species that has been found and collected was that of the Order Hymenoptera and species Short-wing Wasp (*Komarowia concolor*) with a total of 776 individuals. The highest recorded was that of the Hemiptera Order, this species yet to be identified with numeral value of 860 individuals.

Light-trapping resulted in a total of 15 species trapped over a number of 20trapping nights over a period of 3 months. List of all Species collected (*table 1*).

	Species:	Number of individuals:
1	Hemiptera Green bug.	860
2	*Short-wing Wasp(Komarowia concolor)*	776
3	Lepidoptera Unknown	540
4	Coleoptera (Scarabea) Unknown	483
5	*Xyletinus calypterus*	63
6	*Perissomastix versicolor*	30
7	*Staurdingeria partitella*	29
8	Streaky Wing Antlion *(Lopezus fedtschenkoi)*	16
9	Auger Beetle *(Calopertha truncatula)*	10
10	*Flatidae, Phantia*	4
11	*Dicronychus wittmeri*	2
12	*Melanophthalma proximulata*	2
13	*Xyletinus vanharteni*	1
14	*Cardiophuros skulei*	1

Table 1: Total of individuals collected during light-trap survey.

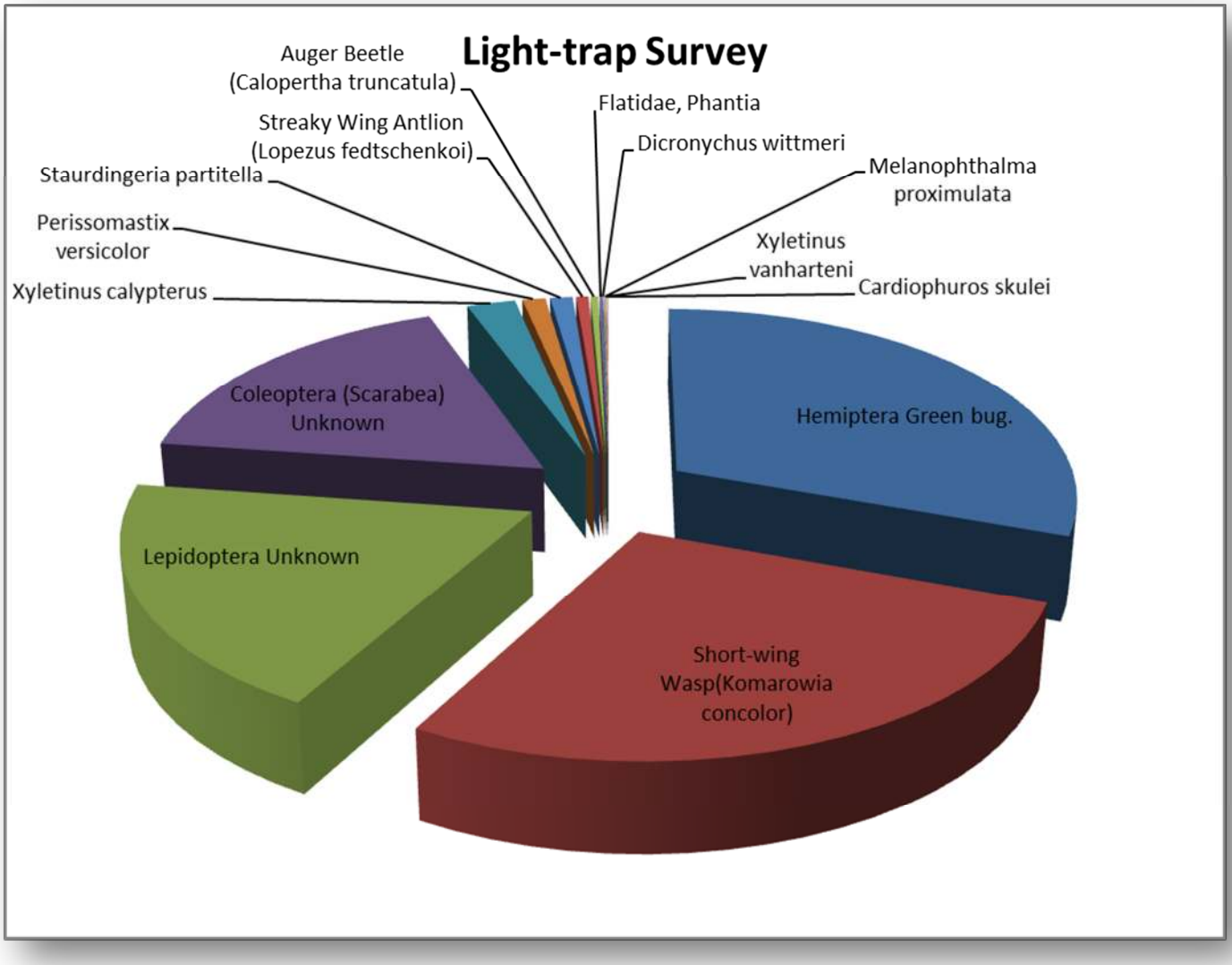


Chart 1: Individuals trapped during light-trap survey.

Light-trapping diversity indices are summarized in the table below the two diversity index that I have used in the survey was that of Simpson's and Shannon Diversity Indices. (Kerbs, *J. C. 1999*)

Site:	X	Y	Simpson:	Shannon-Wiener:
1	55.70403	24.86799	0.7955	2.725
2	55.62674	24.80904	0.6815	1.965
3	55.63461	24.79071	0.7735	2.45
4	55.71206	24.78681	0.7305	2.11
5	55.63328	24.76901	0.801	2.57
6	55.66903	24.93706	0.6775	2.03
7	55.65668	24.88837	0.555	1.625
8	55.64442	24.75938	0.694	2.035
9	55.68097	24.77444	0.7415	2.13
10	55.67321	24.89368	0.8185	2.665

Table 2: Biodiversity Values of the Light-trapping.

Simpson's Index

Simpson's Index (D) measures the probability that two individuals randomly selected from a sample will belong to the same species (or some category other than species).

As seen on the table (Tab.2) the Simpson's Indices indicates that there are a range of between 0.513 and 0,843 the lower the numeral value the lower the diversity. These values are calculated per trap-site.

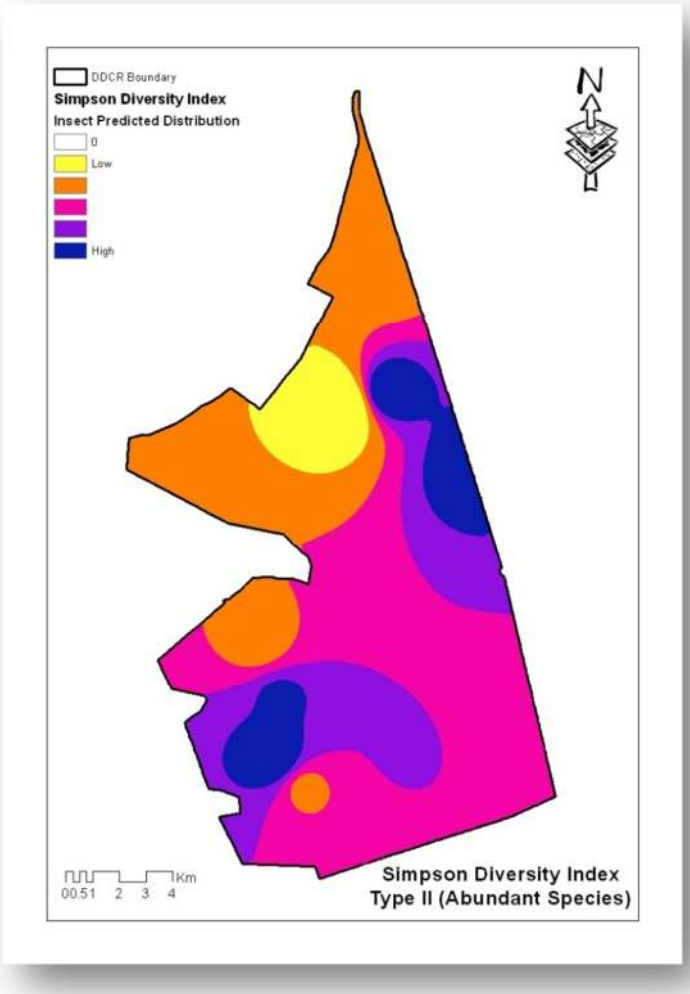
Calculating all the trap-site individuals and species collected gave indices for the Simpson's Index with an overall value of 0,804.

In the North the diversity is of the lower as to the comparison to the Southern parts of the reserve. In the Northern parts of the reserve there a Selected Tour operators that is operating and conducting daily desert safaris and therefor the vegetation is limited due to overuse and high disturbance within those areas, having said that that there are certain species that is more abundant in the north as there preferred vegetation is that of the Firebush (*Leptadenia pyrotechnica*), most of these you will find in the central and northern part of the reserve. In the south the number of these Firebushes is limited.

It was observed that areas where there was no or hardly any disturbance the biodiversity increased. The largest hotspot of diversity was observed to be on the Eastern border, this is clearly visible on the Simpson's Diversity Map. (Map 1)

Just to indicate that the area have a large number of activity from other herbivores animals such as Oryx (*Oryx leucoryx*), Rheem (*Gazella subgutturosa marica*) and Mountain Gazelle (*Gazella gazella cora*), as there have been average rain fall over the last two years and therefore lot more vegetation. Proven that the vegetation host a higher diversity of insects than that of lower vegetated areas.

Second hotspot with a high diversity is in the South Western part of the reserve, with in this area there is a dense population of wild Arta (*Calligonum comosum*). There is a large cultivated farm in the same area where Alpha-alpha (*Medicago sativa*) is cultivated throughout the whole study period. As it is green and real possible good food source for most of the trapped species.



Map 1: Simpson's Diversity Index map for the Light-trapping.

Shannon's Index.

Shannon Index (H') measures the overall biodiversity; this index will be higher if all species recorded has the same number of individuals.

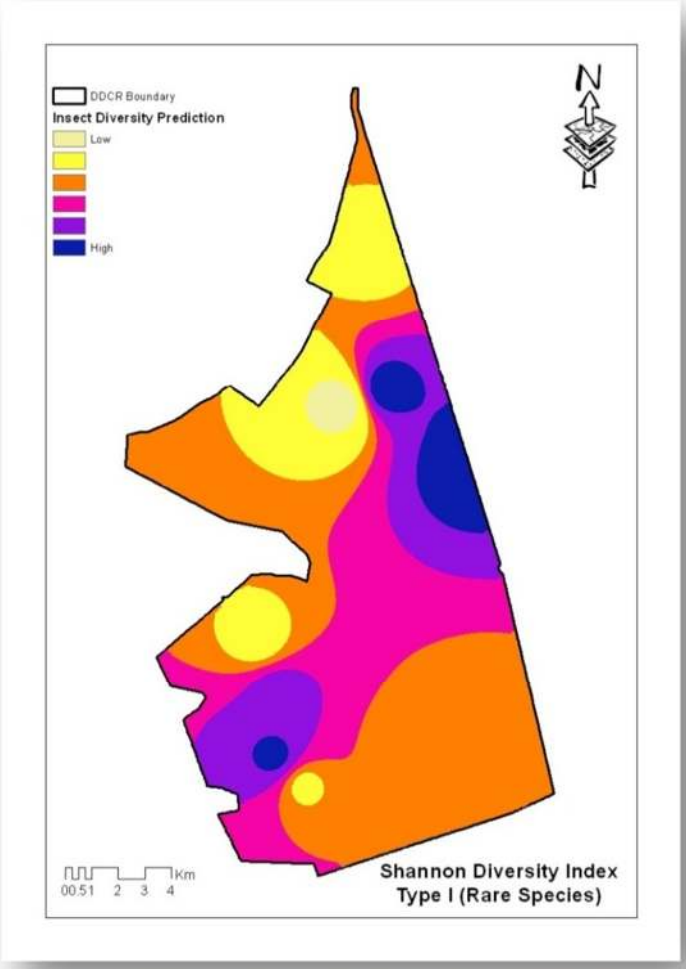
As seen on the below table (Tab.2) the Shannon Indices indicates that there are a range of between 1, 57 and 3. The lower the numeral value the lower the diversity. These values are calculated per trap-night.

Number of equally-common species with an avg. of 2.75.

There are three major hotspots in the areas similar to that of the Simpson Indices; once again the highest biodiversity is around the areas where there was more sustainable vegetation. Thus there is not as much competition for food, unlike in the areas with less or low vegetation availability. These areas are indicated on the Shannon Index map (Map 2) with that of the lighter colours.

The areas that are very light in colour is just that there are less biodiversity in result of less availability of food, The limited amount of vegetation/food is largely due to the high disturbance factor.

On the Southern part of the reserve there is a low diversity shown as well even though that there are not a high disturbance level, but observing those areas during the survey was more sparse in vegetation due to lack of rain and majority of the area is vegetated sand dunes.

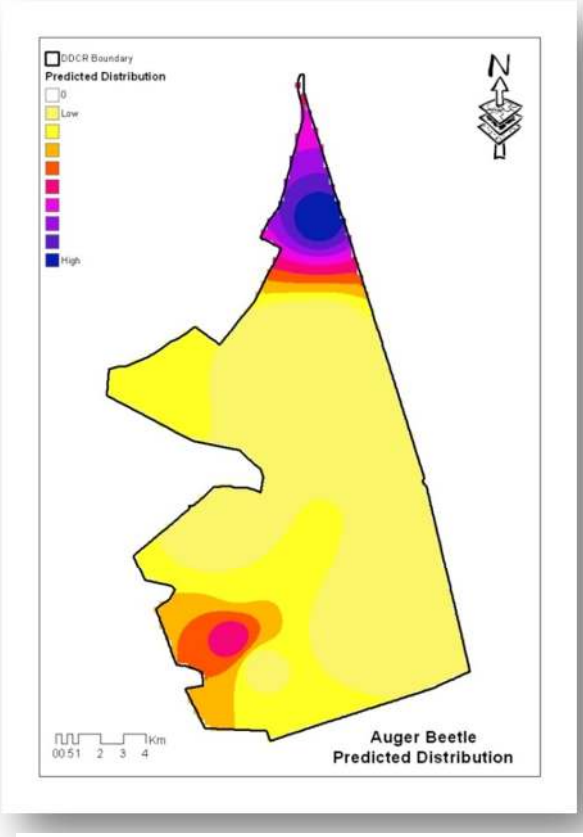


Map 2: Shannon Diversity Index map for the Light trapping.

Individual Species Predicted Distribution (Light trapping).

Auger Beetle
(Calopertha truncatula)

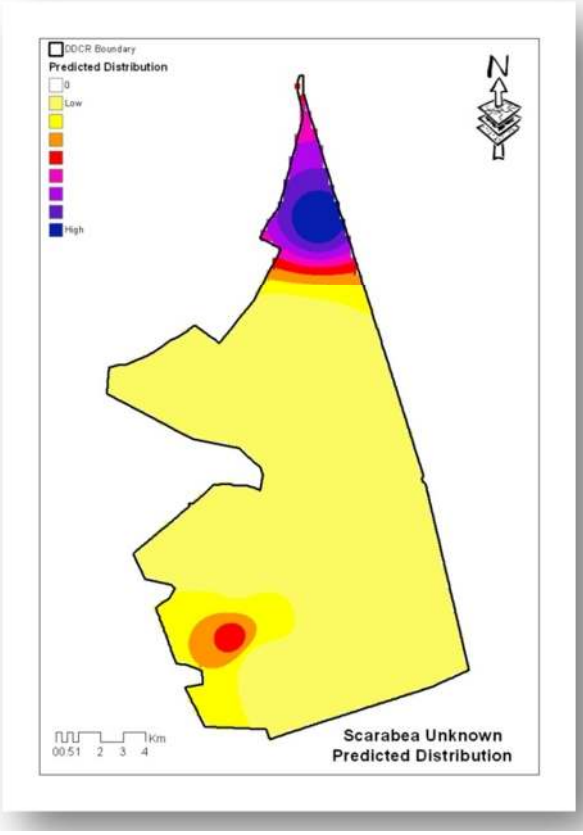
Auger beetle is one of the smaller species of the Family Bostrichidae. This species was found in large numbers around Acacia trees, as seen on the map alongside. The Northern parts of the reserve there is a rocky outcrop with a large population o acacia trees. The characteristics of these species are the bore in to wood and their presence with affect the growth of the tree or even allow it to die. Dry tree branches are the preferred habitat for this species of borer beetles.



Predicted distribution 1 (LT): *Calopertha truncatula.*

Scarabea sp.

This small brown scarab beetle was found in several areas throughout the reserve, and as is indicated on the map alongside there is a major hot spot on the Northern part of the reserve. This is possibly due to the high density of *Leptadenia pyrotechnica* that grows in this particular area. The lesser of the hotspots in the South-West of the reserve is due to a high density of *Leptadenia pyrotechnica* and *Calligonum comosum* and an Alpha-Alpha farm where fresh produce is planted to sustain the wild animal population of the reserve.



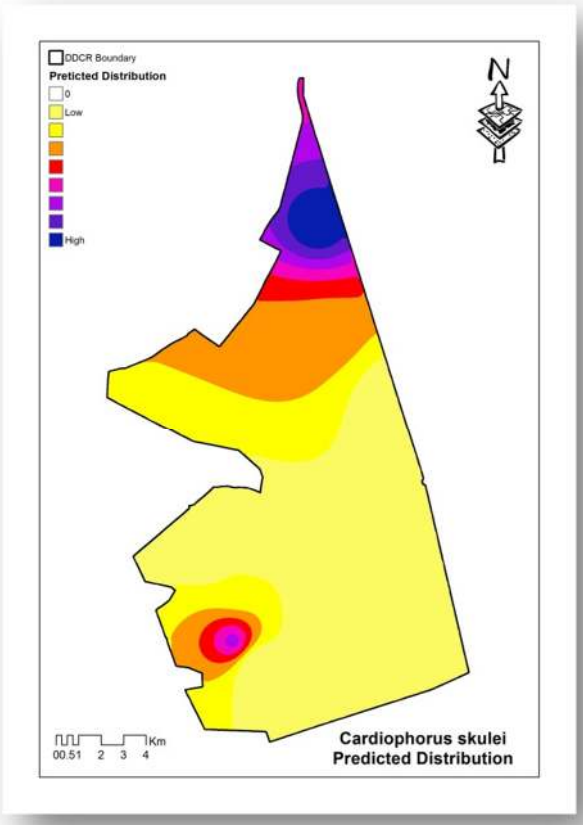
Predicted distribution 2 (LT): *Unknown species of Scarabea Family.*

Click beetle 1.
(*Cardiophorus skulei*)

This species is of the Family Elateridae, the Click-beetle family. This specimen was found in the traps fairly seldom but the predicted distribution indicates that would be wound throughout the reserve. These species are Crepuscular thus highly attracted to lights.

Once again "Hotspots" in the North that reaches little bit towards a large man-made lake with planted trees that supply this species with food. The food consists of foliage, flower pedals and pollen.

Often bore into dry or rotten tree matter.

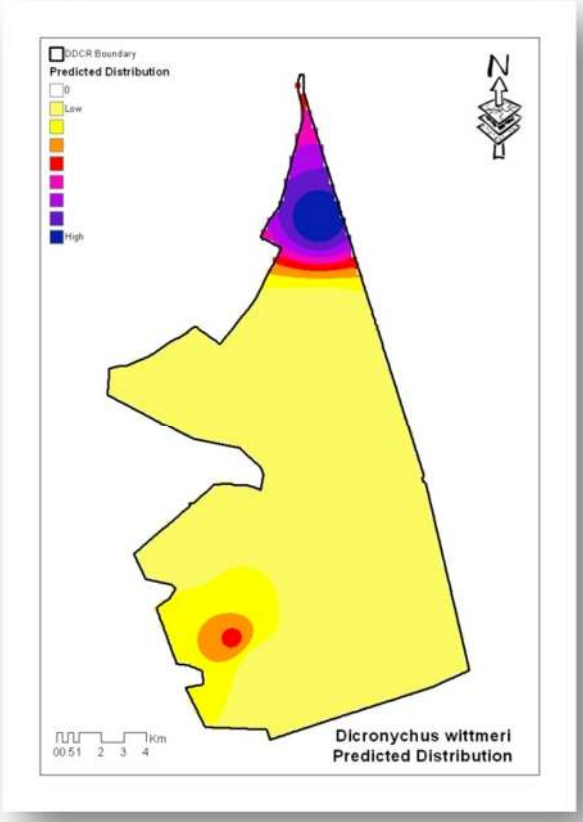


Predicted distribution 3 (LT): *Cardiophorus skulei.*

Click beetle 2.
(*Dicronychus wittmeri*)

This species is of the Family Elateridae, the Click-beetle family. This specimen was one of specimens that were often seen at the areas with permanent lights such as the Entry gates and settlements. But during the light trap survey these points were not used and the species was encountered only twice out of the 20 trapping nights. Once again as indicated areas where there are more trees and vegetation. (Annex 1, Khafaga, T. (2009))

The food consists of foliage, flower pedals and pollen. Often bore into dry or rotten tree matter.

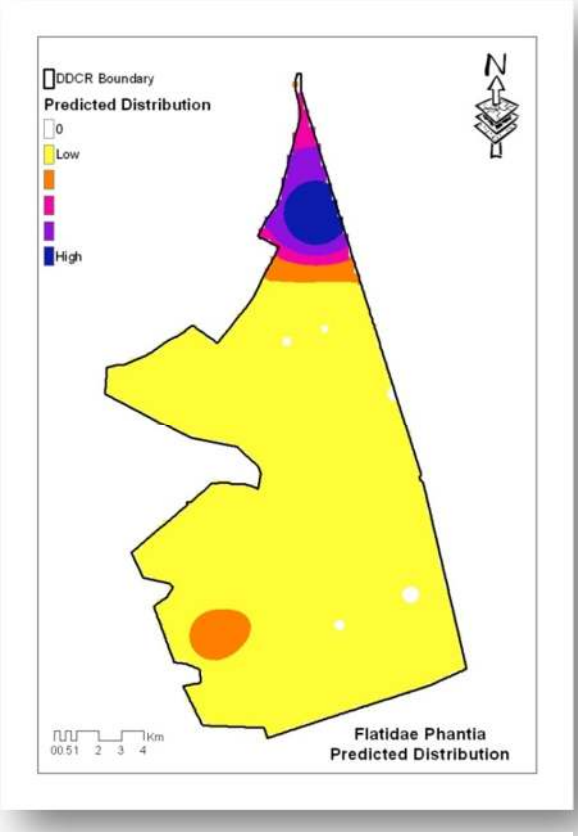


Predicted distribution 4 (LT): *Dicronychus wittmeri*

Moth bugs.
(Phantia sp.)

This species found on the reserve is of the Family Flatidae. Better known as Moth bugs. They are generally found of milkweed plants. A Survey done in 2009 on the *Leptadenia pyrotechnica* (Khafaga, T. (2009) indicates that there is a low population of these plants in the North but over the last 3 years the *Lep. Pyrotechnica* has grown into a sustainable population thus the predicted distribution map indicates that the Northern Part of the reserve will be more suitable for this Hemiptera species.

Several Genera have been recorded in the UAE.

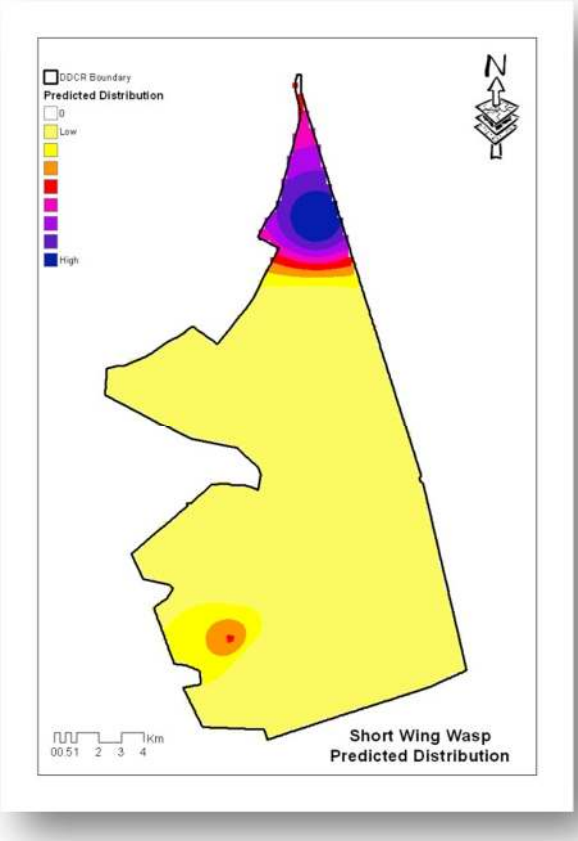


Predicted distribution 5 (LT): Family Flatidae, *Phantia spec.*

Short-wing Wasp.
(*Komarowia concolor*)

The Short-wing wasp is of the Order: Hymenoptera of the Family Thynnidae. During the light trapping a total of 776 individuals been trapped of which all of the individuals were males, of this species of wasps the females has underdeveloped wings thus not able to fly.

This species was found throughout the reserve thus is the most Abundant Hymenoptera species on the reserve, and often found where there is well vegetated areas. These insects male and females are highly attracted to lights.



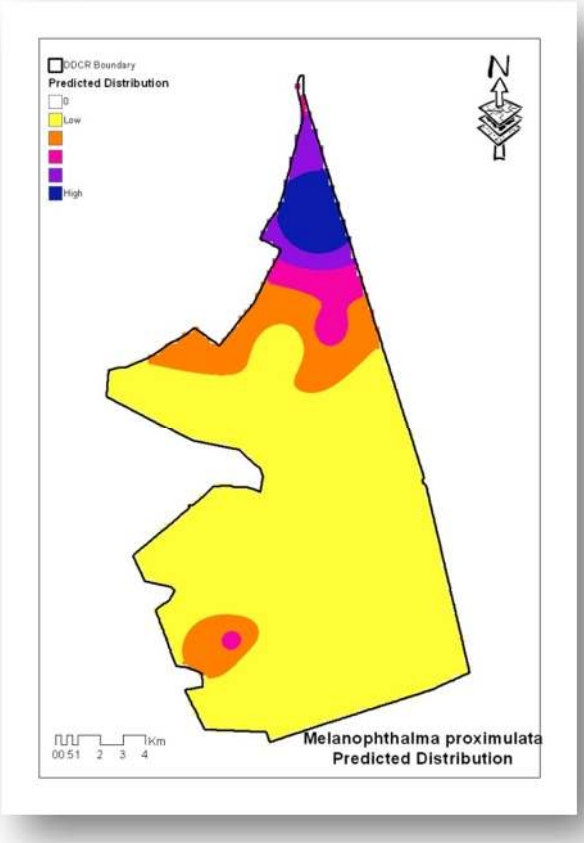
Predicted distribution 6 (LT): *Komarowia concolor.*

Scavenger beetle.
(*Melanophthalma proximulata*)

Scavenger beetle are tiny beetles from the Family Latridiidae. Only two individuals were trapped during the survey. The highest concentration of this species was around the vegetation, indicated alongside the species was found in the more dense vegetation areas.

These beetles feed on fungi, the reserve have two types of mushrooms of identification is not certain which are predominately found during the rainy season?

Attracted to lights and often seen at human settlements and these beetles are so small seeing them with your bare eyes is virtually impossible.

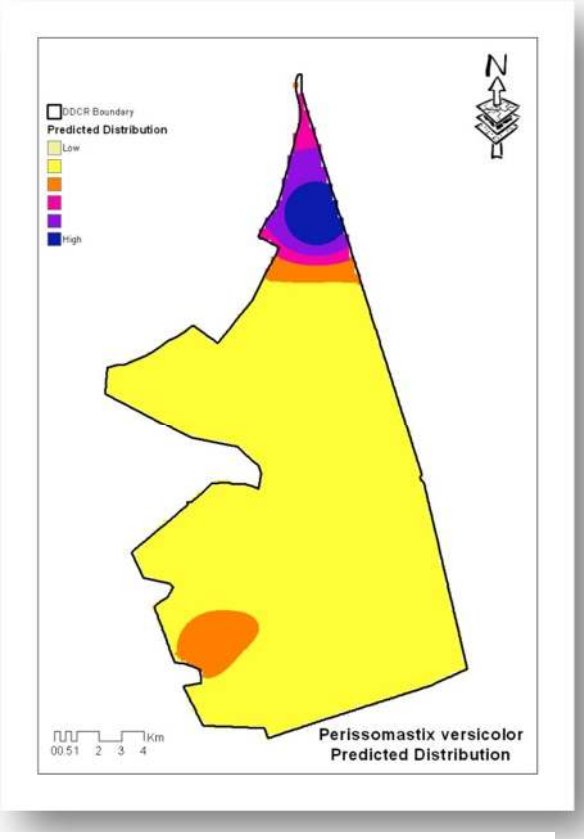


Predicted distribution 7 (LT): *Melanophthalma proximulata.*

Clothes Moth.
(*Perissomastix versicolor*)

This tiny moth belongs to the Family Tineidae. A distribution is indicated throughout the reserve and is attracted by light and most of the trapping sites. 30 individuals have been recorded in the 20trap-night period.

These moths and often found in or near bird nest or in fox dens, as they feed mainly on feathers and fur, hense the name Cloths moths.



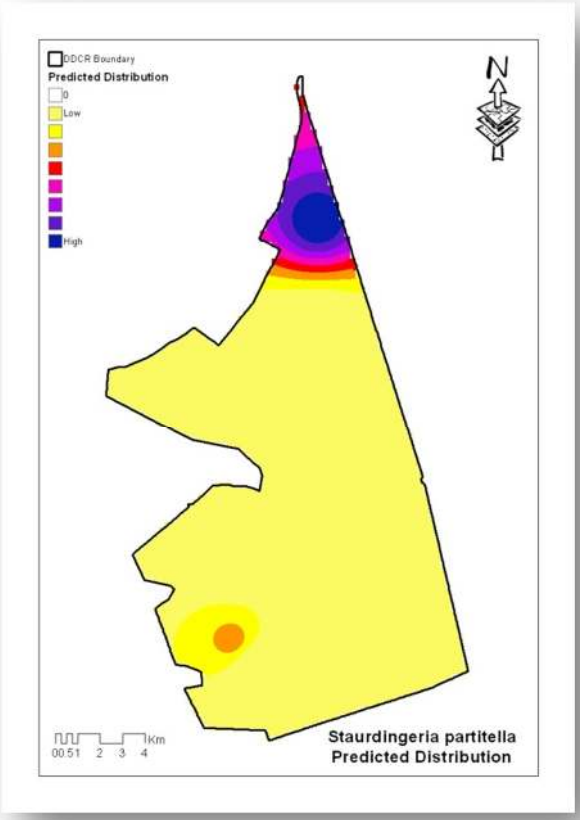
Predicted distribution 8 (LT): *Perissomastix versicolor.*

Snout moth sp.
(*Staudingeria partitella*)

This species is a fairly small moth of the Family Pyralidae. The Predicted Distribution indicates that there is a high abundance on the Northern parts of the reserve and then a lesser hot spot more to the south-west, with a general distribution of this species through the whole reserve.

The snout moths are attracted to light and during the survey only 29 individuals were captured in the 20 trap nights.

These moths feed on all types of vegetation and can be pest in the cultivated farms with in the reserve.

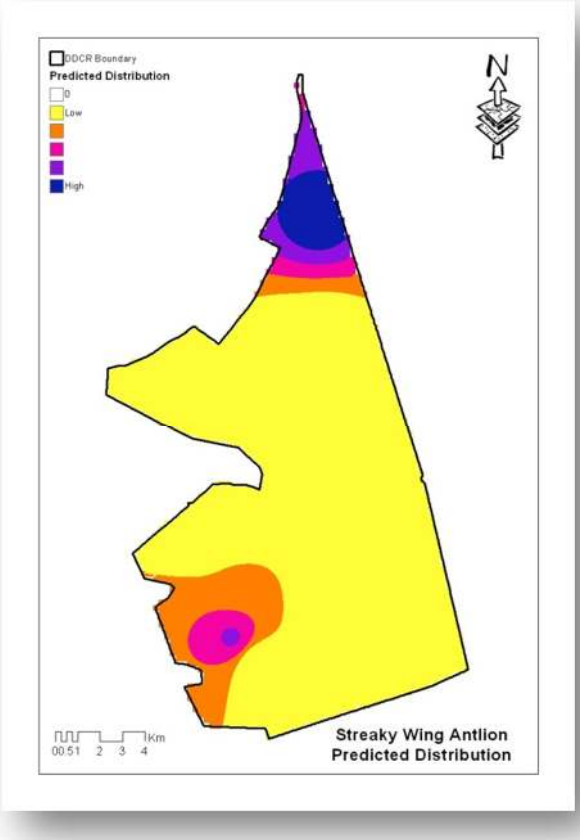


Predicted distribution 9 (LT): *Stauringeria partitella.*

Streaky Wing Antlion.
(*Lopezus fedtschenkoi*)

This Antlion species belongs to the Family Myrmeleontidae. These are insects that are associated with well vegetated areas, especially in the north and south-west as the density of the vegetation is much higher in these areas. Even though the rest of the reserve seemed to have but not in large numbers.

The flight pattern is weak and this species was attracted to light. The total of individuals that was trap over the 20 trap night period was 16.



Predicted distribution 10 (LT): *Streaky Wing Antlion.*

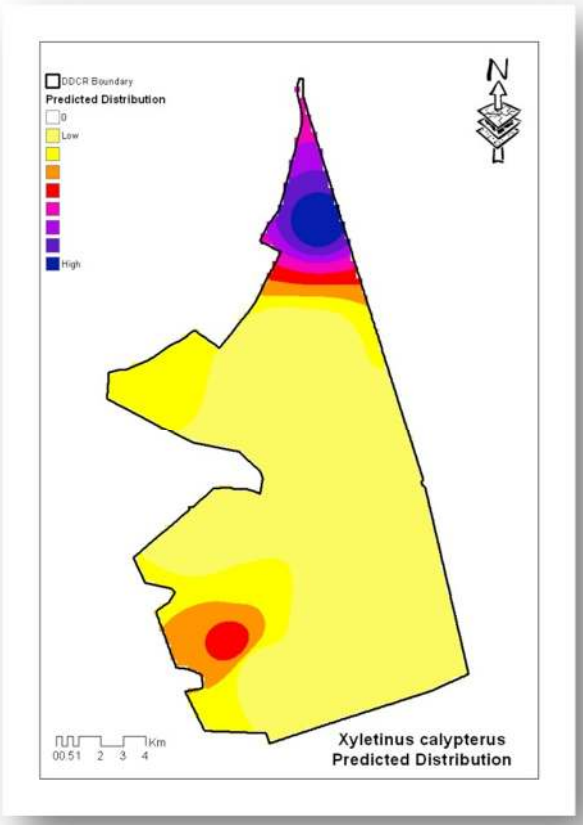
Spider beetle.
(*Xyletinus catypterus*)

This minute species of the Order Coleoptera which belongs to the Family Ptinidae. Size less than 2 mm.

Found on all types of vegetation as the will feed on dry plant material and the scavenge on animals matter including dung and carrion.

These beetle will be found in animal dens and bird nests.

During the survey 63 individuals were found in the traps, thus of the two species of this particular Family is the most common. They are easily attracted to the white lights that has been used.

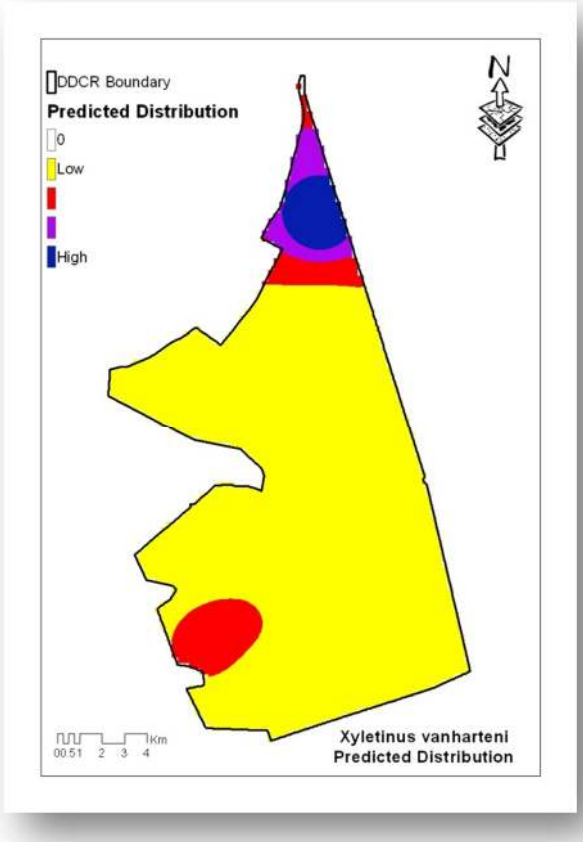


Predicted distribution 11 (LT): *Xylentinus calypterus.*

Spider beetle 2.
(*Xyletinus vanhateni*)

One of the smallest scavenger beetle found on the reserve that is described to be of the Family Ptinidae,

During the trapping period was the only 1 trapped in 20 nights, there abundance are much lower than the previous species.



Predicted distribution 12 (LT): *Xylentinus vanharteni.*

Important Value Index results.

Short-wing Wasp (*Komarowia concolor*) ***65.26*****,** Hemiptera *Green bug* ***56.43***, Coleoptera (Scarabea) Unknown ***42.54*****,** Xyletinus *calypterus* ***25.86*****,** Hemiptera, *Reddish pink bugs.* ***22.91***, *Craspedostethus flavescens* ***13.35*****,** *Staurdingeria partitella* ***11.22***, *Dicronychus wittmeri* ***9.96*****,** Auger Beetle (*Calopertha truncatula*) ***9.11*****,** *Perissomastix versicolor* ***8.50***, *Melanophthalma proximulata* ***8.33***, Streaky Wing Antlion (*Lopezus fedtschenkoi*) ***7.81***, *Corethrella buettikeri* ***7.55***, Lepidoptera Unknown ***7.27*****,** *Flatidae, Phantia* ***2.44*****,** *Xyletinus vanharteni* ***1.47***.

The Short-wing wasp (*Komarowia concolor*) species has the Highest index value thus is the most dominate species on the reserve whereas the Green bug (Hemiptera spec.) is the Co-dominate species within the reserve. The once that is not as abundant on the DDCR will show a much lower IVI result, for example Species *Xyletinus vanharteni* with a **IVI** of 1.47.

- ## Results and Findings of the Pit-fall trapping Survey.

The target group of the Pit-fall trapping survey where that of the ground dwelling insects, this group includes insects of the Orders Coleoptera, Hymenoptera, and Neuroptera. The use of the pit-fall barrier trap system had a great deal of success.

Pitfall-trapping resulted in a total of 15 species trapped over a number of 100trapping sites over a period of 3 months. List of all Species collected during trapping. (*table 3*).

	Spiecies:	Number of individuals:
1	Rack beetle (*Tentyrina palmeri*)	1327
2	Fire brat (*Thermobia domestica*)	1140
3	Urchin beetle (*Prionothecha coronata*)	913
4	Desert Runner (*Cataglyphis niger*)	614
5	Churchyard beetle (*Blaps kollari*)	202
6	Arabian Darkling (*Pimelia arabica*)	191
7	Giant Desert Ant (*Camponotus xerxes*)	141
8	Fat-bodied Darkling (*Apentandes arabicus*)	115
9	Seven Striped beetle (*Paraplatyope popovi*)	57
10	Tapered brown beetle. (*Ammogiton omanicum*)	52
11	False Urchin (*Thriptera kraatzi*)	37
12	Velvet ant (*unknown*)	26
13	Velvet ant (*Tricholabiodes aegytiacus*)	14
14	Dung beetle (*Scarabaeus sacer*)	1

Table 3: Total of individuals collected during Pitfall-traps survey.

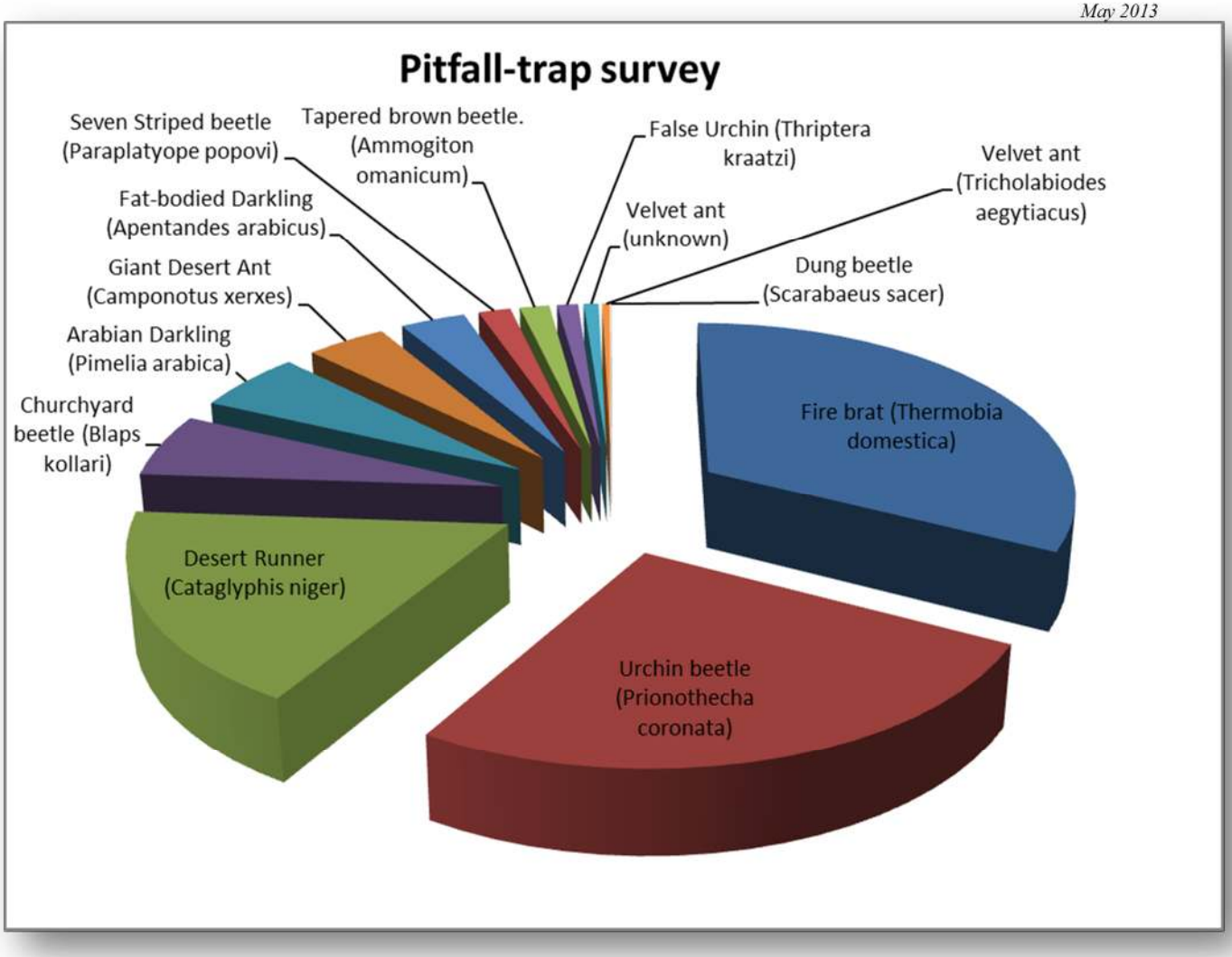


Chart 2: Individuals trapped during pitfall-trap survey.

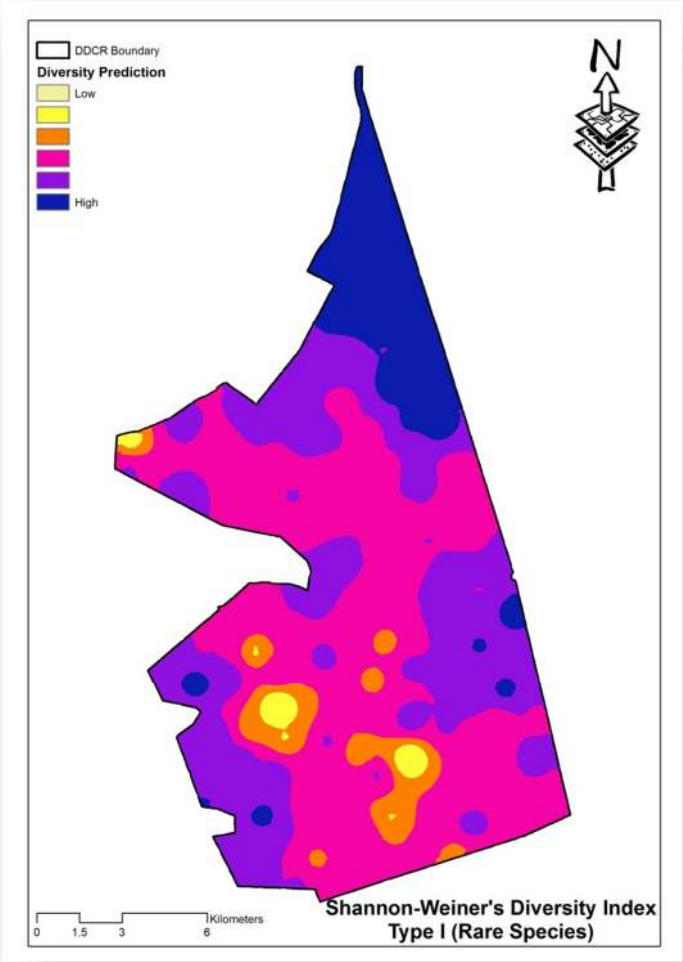
Pitfall-trapping diversity indices are summarized in the table below the two diversity index that I have used in the survey was that of Simpson's and Shannon Diversity Indices. (Kerbs, *J. C. 1999*)

Site:	X	Y	Simpson:	Shannon:	Site:	X	Y	Simpson:	Shannon:
1	55.66628	24.96214	0.831	2.67	**51**	55.69701	24.74453	0.639	1.35
2	55.65414	24.95020	0.831	2.63	**52**	55.68515	24.74815	0.679	1.67
3	55.66688	24.95042	0.852	2.9	**53**	55.67508	24.75589	0.417	0.986
4	55.67781	24.94208	0.848	2.78	**54**	55.66459	24.75035	0.732	1.96
5	55.66903	24.93706	0.816	2.67	**55**	55.65915	24.73455	0.732	1.94
6	55.65925	24.92786	0.856	2.89	**57**	55.62206	24.73485	0.785	2.3
7	55.68262	24.92083	0.871	3.12	**58**	55.64254	24.73457	0.808	2.13
8	55.66944	24.91584	0.892	3.15	**59**	55.64885	24.74253	0.667	1.42
9	55.67098	24.90543	0.777	2.59	**60**	55.64442	24.75938	0.74	1.88
10	55.68729	24.90511	0.842	2.86	**61**	55.62996	24.75636	0.843	2.78
11	55.68756	24.89404	0.838	2.71	**62**	55.62084	24.76170	0.799	2.46
12	55.67321	24.89368	0.864	2.9	**63**	55.60984	24.75902	0.831	2.66
13	55.67996	24.88284	0.836	2.72	**64**	55.60799	24.76961	0.815	2.41
14	55.67186	24.86723	0.678	1.77	**65**	55.62232	24.77445	0.808	2.37
15	55.69016	24.88113	0.853	2.95	**66**	55.63328	24.76901	0.809	2.55
16	55.70403	24.86799	0.689	1.73	**67**	55.64909	24.76922	0.725	1.96
17	55.69387	24.86781	0.705	1.87	**68**	55.63735	24.78103	0.525	0.989
18	55.68233	24.86585	0.798	2.47	**69**	55.61275	24.78119	0.802	2.49
19	55.69513	24.85724	0.673	1.97	**70**	55.59865	24.79181	0.803	2.54
20	55.67708	24.85139	0.721	1.94	**71**	55.62604	24.78422	0.667	1
21	55.68674	24.84502	0.751	2.09	**72**	55.63461	24.79071	0	0
22	55.70217	24.84548	0.727	2.06	**73**	55.63437	24.80174	0.703	2.07
23	55.69107	24.82473	0.768	2.26	**74**	55.61697	24.79967	0.803	2.55
24	55.70451	24.82944	0.764	2.07	**75**	55.60628	24.79836	0.876	2.94
25	55.71630	24.82282	0.863	2.79	**76**	55.60830	24.81008	0.762	2.06
26	55.70459	24.81150	0.81	2.65	**77**	55.61753	24.81617	0.762	2.07
27	55.71395	24.79712	0.855	2.78	**78**	55.62674	24.80904	0.315	0.926
28	55.72544	24.78866	0.735	2.01	**79**	55.64067	24.81728	0.746	2.01
29	55.71206	24.78681	0.652	1.79	**80**	55.64580	24.82598	0.805	2.41
30	55.70926	24.77437	0.605	1.65	**81**	55.62318	24.82590	0.737	2.04
31	55.72226	24.77540	0.754	2.23	**82**	55.65078	24.86645	0.691	1.69
32	55.72394	24.75591	0.806	1.89	**83**	55.66624	24.84793	0.77	2.08
33	55.70269	24.75423	0.809	2.38	**84**	55.65369	24.83765	0.784	2.35
34	55.69994	24.79641	0.806	2.29	**85**	55.64631	24.84993	0.632	1.83
35	55.69326	24.78500	0.81	2.15	**86**	55.63968	24.85848	0.729	2.11
36	55.68100	24.78718	0.72	2.46	**87**	55.62049	24.85415	0.693	1.93
37	55.65754	24.79246	0.667	1.79	**88**	55.59983	24.85646	0.788	2.42
38	55.66772	24.80016	0.644	1.36	**89**	55.58162	24.86588	0.763	2.15
39	55.68085	24.80398	0.829	2.23	**90**	55.58242	24.97627	0.267	0.723
40	55.67175	24.81238	0.53	1.3	**91**	55.59856	24.88075	0.738	2.25
41	55.66110	24.81333	0.681	1.84	**92**	55.61655	24.87156	0.684	1.91
42	55.65059	24.80705	0.766	2.33	**93**	55.62586	24.88143	0.778	2.23
43	55.66566	24.82452	0.755	1.91	**94**	55.63185	24.86785	0.712	2
44	55.67502	24.83201	0.735	2.06	**95**	55.64768	24.87634	0.791	2.49
45	55.65205	24.78009	0.735	2.19	**96**	55.66522	24.87858	0.726	1.78
46	55.66300	24.77689	0.533	1.24	**97**	55.65668	24.88837	0.75	1.87
47	55.66978	24.76934	0.757	2.17	**98**	55.63774	24.89365	0.771	2.17
48	55.68097	24.77444	0	0	**99**	55.65705	24.90077	0.802	2.09
49	55.69768	24.76507	0.712	1.79	**100**	55.65512	24.91574	0.89	2.75
50	55.69159	24.75597	0.774	2.08					

Table 4: Biodiversity Values of the Pitfall-trapping.

Shannon's Index.

Shannon Index (H') measures the overall biodiversity; this index will be higher if all species recorded has the same number of individuals.



Map 3: Shannon-Weiner's Diversity Index for Pitfall-trapping.

The areas that are very light in colour is just that there are less biodiversity, The hotspots that are indicated by the dark blue is the higher the diversity of insects, even though the vegetation survey in 2009 (Khafaga, T. 2009) indicates that there is more disturbance in the north, thus can say that the insects are adapting to that environment, evolving and increasing their population simultaneously with the recovering vegetation.

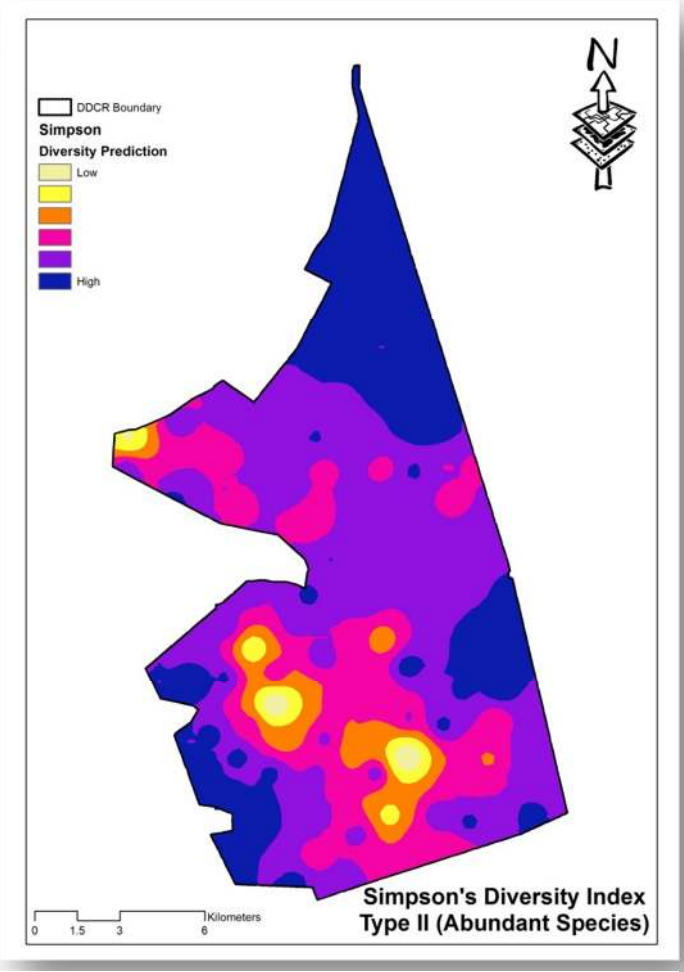
As seen on the table (Tab.4) the Shannon Indices indicates that there range between 0 being the lowest and the second lowest indices is 0.723 and 3.15. The lower the numeral value the lower the diversity.

These values are calculated over a period 3 months and over a total of 100 sites within the study area of 225km^2.

The map shows that there is a good distribution of all the target species on the DDCR.

Simpson's Index

Simpson's Index (D) measures the probability that two individuals randomly selected from a sample will belong to the same species (or some category other than species).



Map 4: Simpson's Diversity Index maps for Pitfall-traps.

In the North the diversity is of this target group is higher as there are more vegetation as to lower as to the comparison to the Central-Southern parts of the reserve. Although there is a high impact of Tour operators in the North, they are limited to operating within allocated areas. These areas is classed as void areas, of which there is little or no vegetation but the vegetation outside the allocated areas recovered relatively well thus the ground-dwelling insects is shown to be more

diversify than areas where there is naturally less vegetation. Areas such as rolling sand dunes with no vegetation are less likely to have any insect fauna.

Just to indicate that the area have a large number of activity from other herbivores animals such as Oryx (*Oryx leucoryx*), Rheem (*Gazella subgutturosa marica*) and Mountain Gazelle (*Gazella gazella cora*), there have been average rain fall over the last two years and therefore lot more vegetation has settled. Proven that the vegetation host a higher diversity of insects than that of lower vegetated areas.

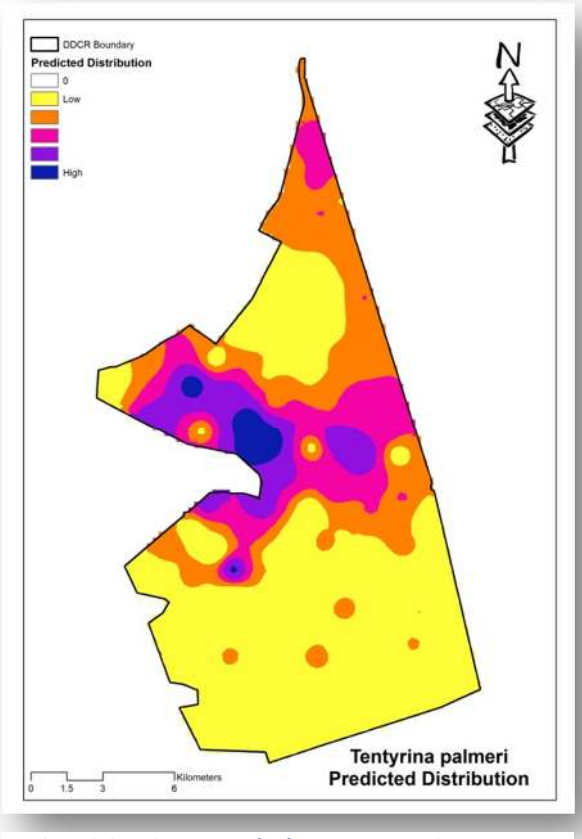
These Dark blue "Hotspots" of insect distribution can be over laid on the map of a survey done on the *Leptadenia pyrotechnica*. (Khafaga, T. 2009) (map6). This is not the only plant species there are several other plant species more abundant in the sample area,(map5) this is an indication that a high diversity in insect fauna rely on a high diversity of flora. Other "Hotspots" on the Western border of the reserve, these areas has a dense population of wild Arta (*Calligonum comosum*). There is a large farm where Alpha-alpha (*Medicago sativa*) is cultivated throughout the whole survey period.

Individual Species Predicted Distribution (Pit-fall traps).

Rack beetle.
(Tentyrina palmeri)

The Rack beetle is the Dominate ground dwelling species during the period of the survey. Even though the map indicates only a few "Hotspots" this simply means that the areas that is darker in colour will be more likely to find these insect in larger numbers but areas that is light in colour does not indicate the absence of these species but mere a lower number was reordered.

These beetles are predominately nocturnal scavengers that will feed on carrion and will prey on other insect when opportunity arises.

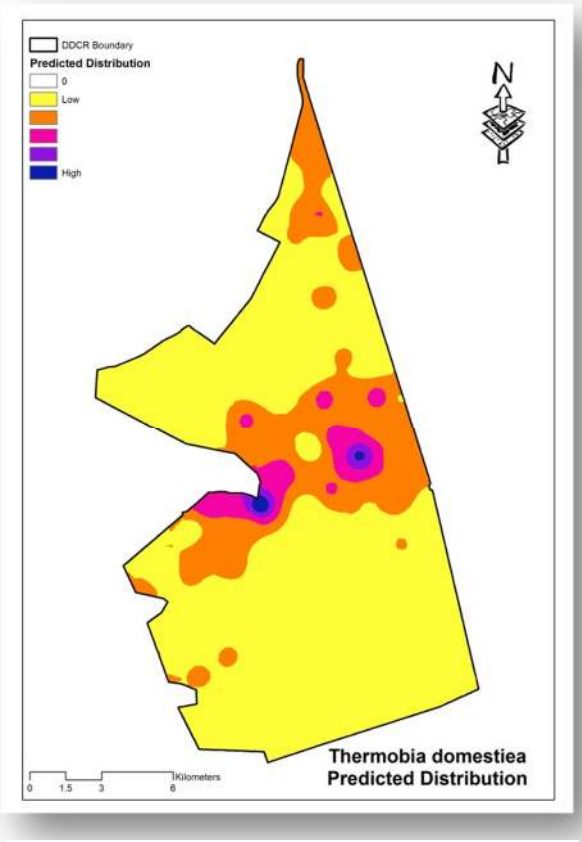


Predicted distribution 13 (PT): *Tentyrina palmeri.*

Fire brat.
Thermobia domestica.

The Fire brat is the Co-dominant ground dwelling species on the DDCR. The area in the centre of the reserve is where the most of the individuals been trapped, illustrated by the dark blue areas. There was a continuous occurrence of this species throughout the reserve and during the period of the reserve.

This species of Family Lepismatidae is known as fish-moths and is generally associated with human settlements.



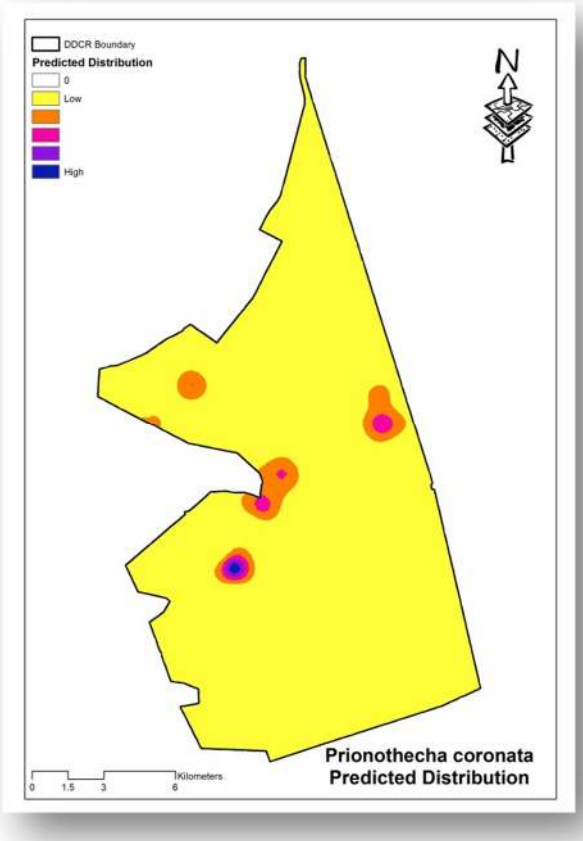
Predicted distribution 14 (PT): *Thermobia domestica.*

Urchin beetle.
Prionothecha coronata

The Urchin beetle is the largest of the ground dwelling beetle that was found during the survey period.

There was large number of individuals found in certain areas and only a few in areas where there were a minimal growth of vegetation. As indicated that the Predicted Distribution is very low throughout the reserve and there are a few "Hotspots" indicated a rise in individuals trapped, generally in a well vegetated area.

This beetle is of the Order Coleoptera and Family Tenebrionidae.

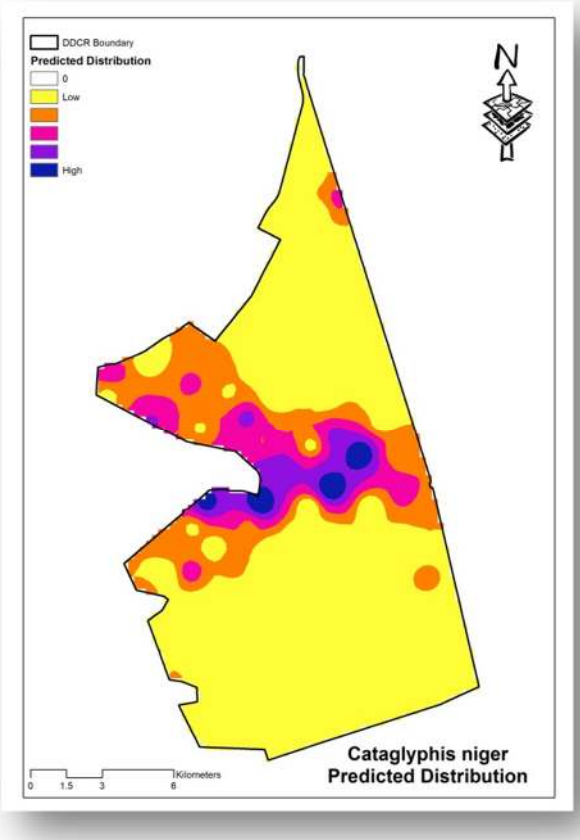


Predicted distribution 15 (PT): *Prionothecha coronata.*

Desert Runner.
Cataglyphis niger

Of the two Formicidae species trapped during the survey the Desert runner was the most abundant throughout the reserve, the map will indicate the highest concentration of these ands as this is once again the most vegetated area of the DDCR. (*map6*)(Khafaga, T. 2009).

You will find this species making their nest underneath the Fire bush (Leptadenia pyrotechnica) as the roots are moist and most suitable for reproduction of the species.

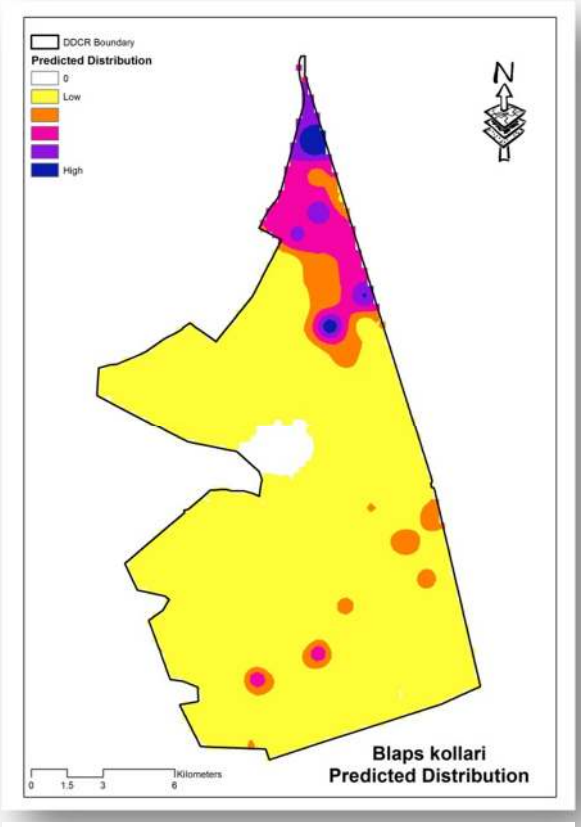


Predicted distribution 16 (PT): *Cataglyphis niger.*

Churchyard beetle.
Blaps kollari

This beetle is known to be gregarious and was found in large numbers in the northern traps, though individuals were trapped in this survey the species of the Tenebrionidae Family is more dominant species in the reserve during the winter months. (Roosenschoon, P. 2011).

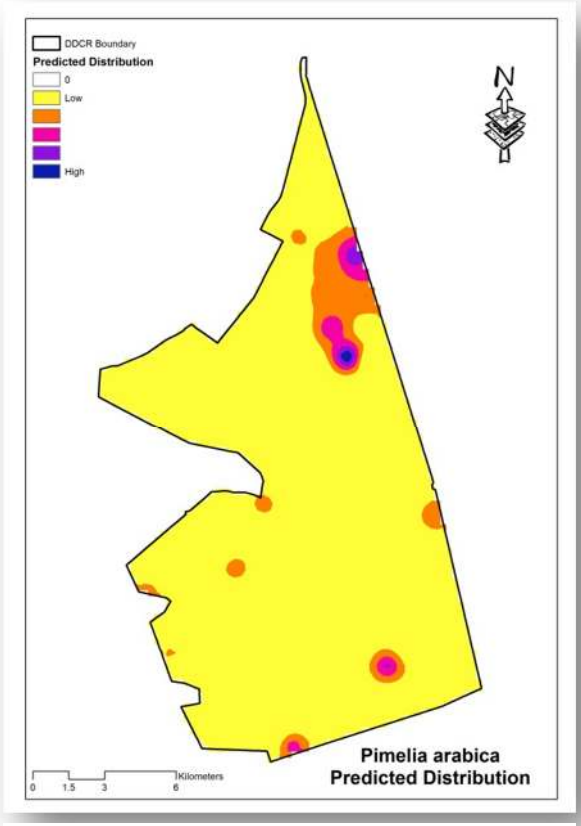
There are few areas where this species was not trapped as indicated in the central of the reserve, these are the area where no records of individuals that was trapped.



Predicted distribution 17 (PT): *Blaps kollari.*

Darkling beetle.
Pimelia arabica.

These beetles are solitary beetles and were located throughout the DDCR, the Predicted distribution indicates a low distribution of this species and the abundance is fairly low as well.

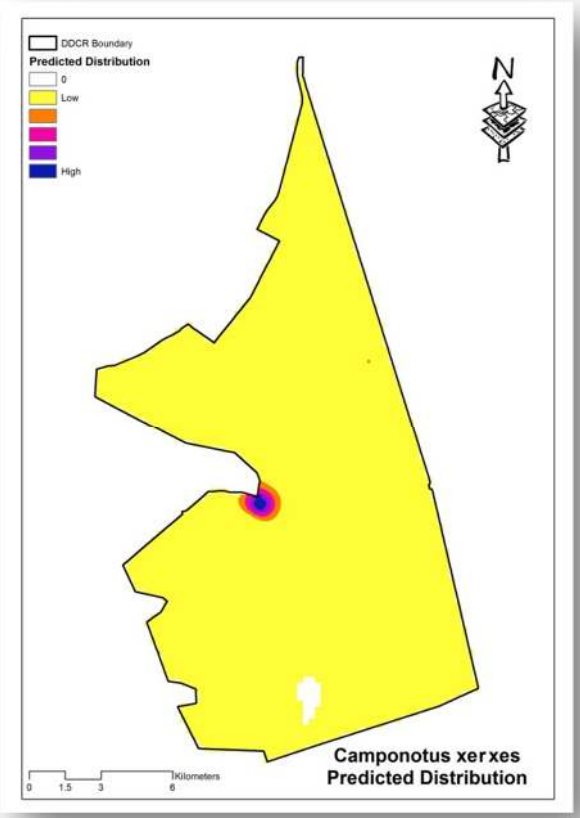


Predicted distribution 18 (PT): *Pimelia arabica.*

Giant Desert Ant.
Camponotus xerxes.

This species were located mainly in the areas where there were settlements and gates nearby. But during the trapping survey a low number of individuals where trapped in the south of the reserve and on the Eastern side of the reserve with the one indicator close to the entrance gate where a settlement is located just outside the reserve.

Although individuals have been seen in these low indicated areas there was no real trapping success on this species.

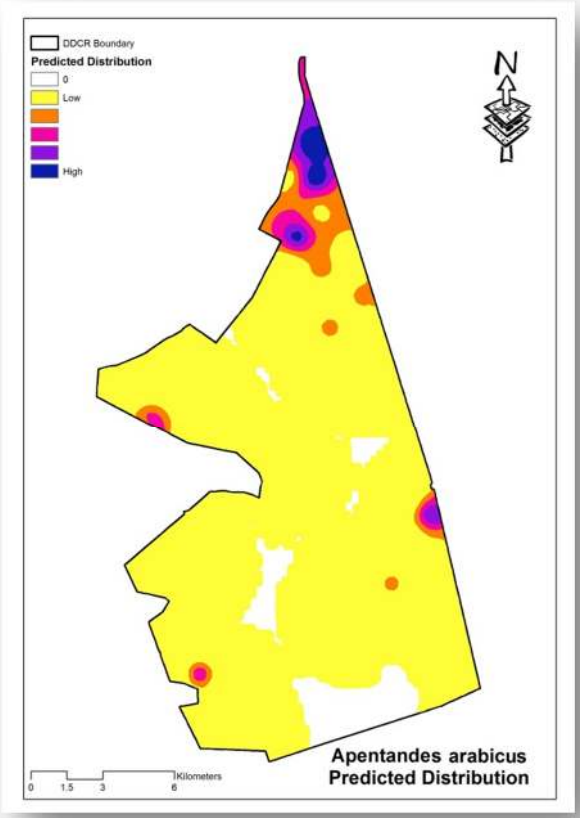


Predicted distribution 19 (PT): *Camponotus xerxes.*

Fat-bodied Darkling.
Apentandes arabicus.

The "Hotspots" indicated that there are a high abundance of this species in the north of the reserve, this is due to the well vegetated areas, these beetles are mainly herbivorous but have been seen feeding of carrion and feathers.

The areas were the lowest number of vegetation populations were, were the number of this species considerably lower.

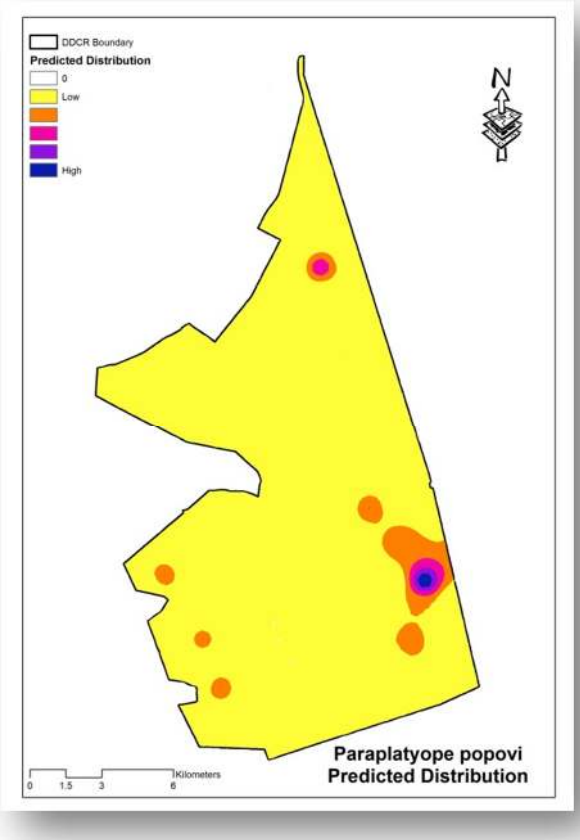


Predicted distribution 20 (PT): *Apentandes arabicus.*

Seven-striped beetle.
Paraplatyope popovi.

Even though the Predicted distribution suggest that there are only a few Hotspots on the reserve indicates that they are only trapped in those areas, buts as a hole you will find them mostly around vegetated areas and Human settlements

The will feed on almost anything that includes plant material and remains of animals, during the trapping survey the beetle were found feeding on a Arabian Sand Gecko (Stenodactylus arabicus).



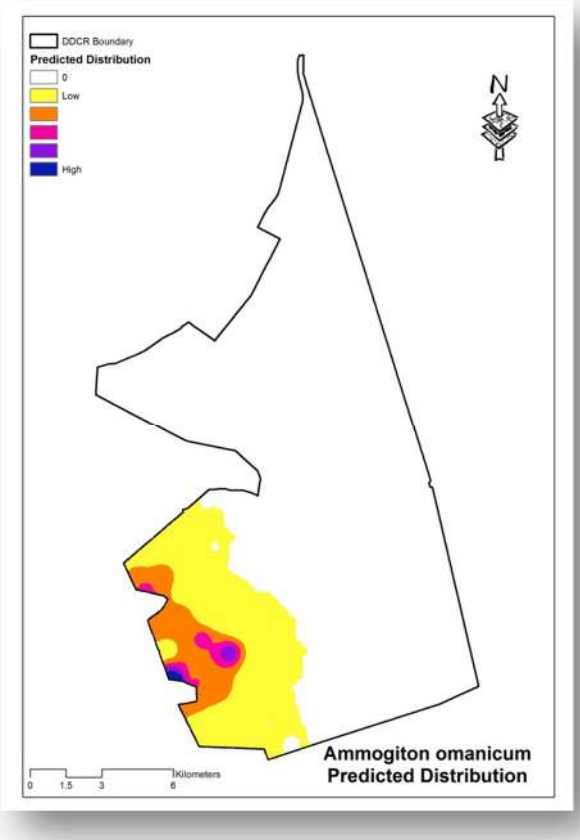
Predicted distribution 21 (PT): ***Paraplatyope popovi.***

Tapered beetle.
Ammogiton omanicum.

This species was only found in certain areas of the reserve as indicated in the map alongside.

This is a species of Tenebrionidae or ground darkling beetles that will feed mainly on plants but have been seen feeding on carrion. The main plant species Arta (*Calligonum cosomum*).

There is a high abundance of the Arta in this region of the reserve. The rest of the reserve have a little distribution of these plants therefore a limited number of the Ammogiton species were recorded.

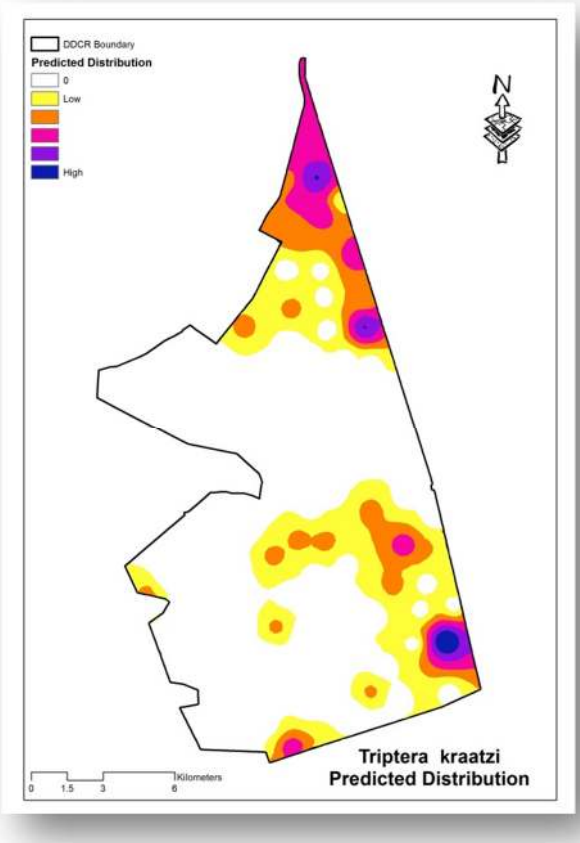


Predicted distribution 22 (PT): ***Ammogiton omanicum.***

False Urchin.
Triptera kraatzi.

This beetle is a slow moving beetle of the Family Tenebrionidae. The trapping success was limited to certain trap sites thus the Predicted Distribution only highlights in a few areas. The total number of individuals collected during the survey was 37 out of 700 trapping days.

This species is largely omnivores of nature and will be found around human settlement such as the case on the Northern parts of the reserve as there is a village called Nazwa.

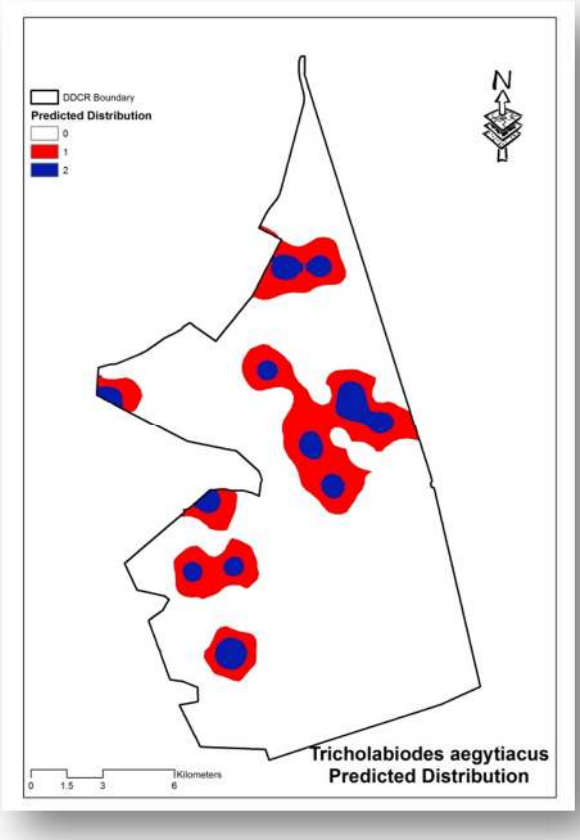


Predicted distribution 23 (PT): *Thriptera kraatzi.*

Velvet Ant.
Tricholabiodes aegytiacus.

This species of the Order Hymenoptera, Family Mutillidae was found in the areas indicated in dark blue, thus pro-dominantly found in these areas.

A total of individuals trapped were 14. This species has a low IVI of 3.84 thus one of the rarest species trapped. The insects with lower indices where that of the Dung beetle (*Scarabaeus sacer*) and Moth-bugs (*Phantia species*.)



Predicted distribution 24 (PT): *Tricholabiodes aegytiacus.*

Important Value Index results.

Rack beetle (*Tentyrina palmeri*) ***61.91***, Fire brat (*Thermobia domestica*) ***55.44***, Urchin beetle (*Prionothecha coronata*) ***47.38***, Desert Runner (*Cataglyphis niger*) ***36.06***, Arabian Darkling (*Pimelia arabica*) ***17.79***, Churchyard beetle (*Blaps kollari*) ***17.57***, Giant Desert Ant (*Camponotus xerxes*) ***14.37***, Fat-bodied Darkling (*Apentandes arabicus*) ***12.78***, Tapered brown beetle. (*Ammogiton omanicum*) ***10.32***, Seven Striped beetle (*Paraplatyope popovi*) ***8.77***, False Urchin (*Thriptera kraatzi*) ***6.60***, Velvet ant (*unknown*) ***5.59***, Velvet ant (*Tricholabiodes aegytiacus*) ***3.84***, Dung beetle (*Scarabaeus sacer*) ***1.52.***

The Rack beetle (*Tentyrina palmeri*) has the highest index value thus is the dominant ground dwelling insect on the reserve. The Firebrat (*Thermobia domestica*) is the co-dominant species on the DDCR. The Dung beetle (*Scarabaeus sacer*) show the lowest IVI as only one specimen was trapped in the 100trap sites, ***1.52***.

- ## Results and finding of the Malaise trap Survey.

  The target group of this survey was the diurnal flight insects. This group included Diptera, Odonata, Hymenoptera and some of the Lepidoptera species. Having completed 20 sites of 7 days each thus equates to a total of 140 trapping days. The success rate of these trapping was not great and the results proven to be really undesirable. The species that was trapped was Desert Runner (*Cataglyphis niger*) ***6*** individuals, Zebra bee (*Pseuapsis nilotica*) ***3*** individuals and Highwayman (*Apociea fermoralis*) ***1*** individual.

  Shannon Index H' = 1.3 and Simpson Index 1-D= 0.6 shows that the biodiversity is very poor, but in actual fact the reason for this lo results was that the Malaise trap was not that effective in catching specimens of this target group.

Species information found during light trap and Pit-fall trap survey.

Tentyrina palmeri (Crotch,1872)

Rack beetle.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Tenebrionidae
Genus:	*Tentyrina*
Species:	*palmeri*

Description:
Smallish beetle, reaching 12mm. Body elongated with thorax and head well distinguish. Head is a triangular shape with protruding eyes and long antennae. Elytra are fused together and this beetle is terrestrial. Mostly shiny-black in colour but can be some-what duller.

Biology.
These beetles are nocturnal scavengers, feeding on all carrion remain it can find. A female lays egg in decaying matter. Larvae hatches and will feed on decaying animal matter. Pupates in the sand below the carcass, or even in the carcass.

Geographic range.
Libya, Egypt, Near East and the Arabian Peninsula.

Komarowia concolor. (Bartalucci, B. 2004)

Short-wing wasp.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Hymenoptera
Family:	Thynnidae
Genus:	*Komarowia*
Species:	*concolor*

Description:
Small ground dwelling wasp, size about 12-14mm. Head and mandible are well developed. Small black compound eyes on either side of head. Short hairy wings witch make them unable to fly. Abdomen is elongated, with three tone brown stripes and sting present. Hind legs fairly long and hairy on the joints. Antennae are short and segmented.

Biology.
Not much known about this species. Main diet of these insects is other arthropods.

Geographic range.
Oman, Saudi Arabia and New to the UAE.

Calopertha truncatula. (Ancey, 1881)

Augur Beetle.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Bostrichidae
Genus:	*Calopertha*
Species:	*truncatula*

Description.

Cylindrical black body with characteristic Elytra that is flattened and angled rear with a curled up point on the dorsal side. Elytra are covered with fine golden colour hair. Pronotum strongly domed, concealing the downward pointed head. Antennae end with three segments that are brownish in colour.

Biology.

There is not known about exact breeding but its known that these species are associated with Acacia trees (Mimosaceae) and there predator will be the Histerid beetle (*Teretriosoma intrusum*) (Mateu, 1975). These beetles size range between 3-4.5mm.

Geographic range.

Ranging from Yemen (Lesne, 1924), Africa (Fairmaire, 1877) and is a new species to the UAE (Kanaar, 2007)**.**

Thermobia domestica. (Packard)

Firebrat.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Thysanura
Family:	Lepismatidae
Genus:	*Thermobia*
Species:	*domestica*

Description:

Small to fairly large. (Body length up to 10mm). Metallic and greasy feel caused by the tiny overlapping scales that cover the body. Scales rubs off easy when touched. Three long appendages on the last segment of the body. Two short antennae. Small compound eyes. Light-brown pattern on body.

Biology.

Food consist of dry organic matter, Firebrats got the ability to absorb water from the atmosphere, so can survive easily in the humid conditions of the UAE. They have a simple life cycle, eggs gets laid with in the host plant's organic matter. A-Metabolic lifecycle. Firebrats moult every 9-12days depending on the weather.

Geographic range.

Saudi arabia, Yemen, Oman and UAE.

Prionothecha coronata. (Ancey, 1881)

Urchin beetle.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Tenebrionidae
Genus:	*Prionothecha*
Species:	*coronata*

Description:

Large beetle. Blackish oval body. Long legs. Head and thorax much smaller than abdomen. Elytra covered with spikes. Antennae are longer than the head and thorax.

Biology.

To protect them self they stick their head in the sand and hold their hardened elytra up with the spikes exposed. Larvae feeds on seeds and leaves of any kind. Adults will feed on Mole crickets (*Grylloptalpa gryliotalpa*) (Linnaeus,1758) and Long horn beetles (*Derolus iranensis arabicus*) (Sama, 2008). A female lays egg in decaying matter. Larvae hatches and will feed on decaying plant matter.

Geographic range.

Northern Africa, Arabian Peninsula and Mesopotamia.

Cataglyphis niger. (Andre)

Dessert Runner.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Hymenoptera
Family:	Formicidae
Genus:	*Cataglyphis*
Species:	*niger*

Description.

This species characteristically folds its abdomen over its thorax to avoid contact with the baking ground. Body reddish brown or dark brown, with their abdomen a dark brown to black. Only adults (queens and kings) have wings.

Biology.

There are several different castes of an ant life, generally only the queen lays eggs. Other female's acts as workers in the nest, where they undertake construction work, fetch food and tend to the young. Soldiers have got well-developed mandibles for defending the nest. Diurnal even active at midday. These ants are predominantly sub-terrestrial although can occur in timber, mainly carnivorous and have been seen killing and eating their own kind.

Geographic range.

Arabian Peninsula.

Xyletinus calypterus. (Illiger,1807)

Spider beelte.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Hymenoptera
Family:	Formicidae
Genus:	*Xyletinus*
Species:	*bucephalus*

Description.

Males are elongated and have a cylindrical, body with a length of about 1-2mm. The colour range from light-brown to Yellowish-brown that includes the antennae. Legs are slender but the hind leg is slightly thicker. Body cover is short sparse hair. Eye convex and simple eye easily recognisable.

Biology .

Both the larvae and the adults are scavengers. They reproduce at the rate of two to three generations per year.

Geographic range.

Mediterranean region and Arabian Peninsula. New to the UAE (2005)

Blaps kollari. (Seidlitz, 1896)

Churchyard beetle.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Tenebrionidae
Genus:	*Blaps*
Species:	*kollari*

Description.

Medium to large beetle. Size up to 40mm. Elongated body, elytra fused. Thorax oval in shape and slightly covering the head. Long legs and short antennae. Adult has an opening in the vicinity of the anal projection from which they can discharge a jet foul-smelling liquid to defend it.

Biology.

Active during the cooler times of the year. September to April. Feeds on plant materials. Larvae's first in star do not eat, after the molt the can consume anything from other larvae to plant material. Nocturnally active and can be found in human settlements and oasis. Female lays her egg during the cooler temperatures, lays eggs under plant material or in the organic layer of the soil. Larvae hatch and rapidly go through the moulting stages.

Geographic range.

Northern Africa, Near East and Arabian Peninsula which includes the gulf islands.

Pimelia arabica. (Klug, 1830)

Arabian darkling.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Tenebrionidae
Genus:	*Pimelia*
Species:	*arabica*

Description.

Medium sized beetle 15-30mm. Legs longer than other beetles. Distinguished by rows of protrusions on the elytra witch is surmounted by hair. Fast moving beetles. Beetles are mainly Nocturnal.

Biology.

To protect them self they stick their head in the sand and hold their hardened elytra up with the spikes exposed. Seeds and leaves fall under the main diet. Breeding: Females lays egg in decaying matter. Larvae hatches and will feed on decaying plant matter.

Geographic range.

Egypt, Near East, Iraq and Arabian Peninsula.

Camponotus xerxes (Forel)

Giant Desert ant.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Hymenoptera
Family:	Formicidae
Genus:	*Camponotus*
Species:	*xerxes*

Description.

Large body, (workers body lengths up to 14mm and soldiers up to 18mm) Workers black, slender head and thorax. Soldiers have enlarged heads, with massive mandibles, that releases formic acid, for digestion purposes.

Biology.

Nest in soil under large bushes and under rocks and even found making nest under the foundation of buildings. Giant ants are mostly carnivores, and also seen taking carrion to the nest. Release large number of winged male and females, which forms nuptial swarms, after mating queens break of their wings and establish new nest. Males die soon after mating. Queen store large number of sperms that she will use to fertilize the egg.

Geographic range.

Arabian Peninsula but more Coastal regions.

Cardiophorus skulei (Platia & Schimmel, 1997)

Click beetle.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Elateridae
Genus:	*Cardiophuros*
Species:	*skulei*

Description.

Small click beetle, sizes vary from 4-6mm. Elongated, parallel-sided body. Brownish in color. Head deeply inserted under the pronotum. Antennae are thread-like. Characteristic clicking movement of the adult when turned on their back, owing to a special spine and notch mechanism on the underside between the pro- and meso-thorax. Laud click is generated.

Biology.

Adults feed on foliage and flower and pollen. Larvae can course damage to crops, as they feed on roots, bulbs and tubers, even feeds on stomach contents of dead animals (Roosenschoon 2011). Eggs are laid in soil or in rotting plant material.

Geographic range.

Saudi Arabia, Kuweit, Oman, and Yemen. New recordings in the UAE(1997)

Apentandes arabicus (Kirschberg, 1877)

Fat-bodied darkling.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Tenebrionidae
Genus:	*Apentendes*
Species:	*arabicus*

Description:

Small beetle reaching sizes up to 9mm. Males are smaller and only get to 6mm in size. Black in color with row of golden hair between the thorax and the head. Antennae end in a club-like shape. Thorax and elytra generally fused together. The body rounded.

Biology.

Feeding on anything from plant material to animal remains. These beetles are fast moving. Active during day. Males will copulate females for a few hours at a time. Female will carry on feeding while carrying male. Eggs will be deposited under the soil close to the roots of plants. Larvae will scavenge on almost anything.

Geographic range.

Arabian Peninsula.

Ammogiton omanicum (Schawaller, 1990)

Tapered brown beetle.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Tenebrionidae
Genus:	*Ammogiton*
Species:	*omanicum*

Discription.
Small light brown beetle. Size about 4-5mm. Pronotum covered in hair. Often transparent when out in the sun as it is a nocturnal beetle.
Biology.
Not much known about the breeding and diet.
Geographic range.
Oman and New to the UAE.

Staudingeria partitella (Rangonot,1887)

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Lepidoptera
Family:	Pyraloidea
Genus:	*Staudingeria*
Species:	*partitella*

Description.
Wingspan 13-20mm. Forewing 3 x longer than wide. Ground colour dirty yellow or deep dark brown with all intermedial tones possible. Hind wing whitish, semi-hyaline.
Biology.
Diet and breeding unknown. (Asselbergs, 2007)
Geographic range.
North Africa, Arabian Peninsula, Syria, Iraq, Ural region, Central Asia and New to the UAE.

Paraplatyope popovi (Koch, 1965)

Seven-striped beetle.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Tenebrionidae
Genus:	*Paraplotyope*
Species:	*popovi*

Description:
Medium sized beetle. Size reaching up to 20mm. Head and thorax almost the same width. Well-developed mandibles. Fronts legs outer edges looks like combs. Antennae brownish-black and tips are somewhat lighter. Elytra have ridges on the side and in the centre the elytra is smooth and fused together. Body stocky and a brownish-black colour.

Biology.
Feeds on plant material and other invertebrates. Females lay eggs underground in between the roots of the of the Ghaff trees.

Geographic range.
Arabian Peninsula and New to UAE.

Lopezus fedtschenkoi (Mclachlan)

Streaky Wing Ant-lion

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Neuroptera
Family:	Myrmeleontidae
Genus:	*Lopezus*
Species:	*fedtschenkoi*

Description.
Marking on the adults wings are really easy to recognize. The forewings have black streaks on the outer parts of the wings. The membranous wing has a few black spots. Large compound eyes, antennae longer than the head. Grey abdomen with a darker grey upper part.

Biology.
Normally nocturnal creatures, adult ant-lions rest on dry twigs during the day. At night they hang on the twigs, with raised wings. Mating is a rather acrobatic affair. As the female clings to a twig, the male attaches his tail to hers. He then hangs below her, suspended only by his genital apparatus. Egg lying, occurs in the sand. When a female finds a suitable warm place, she repeatedly taps the sand surface with the tip of the abdomen. She then inserts the abdomen into the sand and lays an egg.

Geographic range.
Kuwait, Qatar and the UAE.

Thriptera kraatzi (Haag-Rutenberg, 1876)

False Urchin

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Tenebrionidae
Genus:	*Thriptera*
Species:	*kraatzi*

Description.

Medium sized beetle, reaches up to 21mm. Body is covered with soft short hair. Sometimes confused for an Urchin beetle. (*Prionotheca cornata*) Black in colour. Body slightly elongated. Antennae about the length of the head and thorax. Elytra fused together. Mandibles are well developed, can deliver a nasty bite.

Biology.

These beetles got a nocturnal habit. Adults feed on other insects and plant material. Larvae omnivorous. Females lay egg in decaying matter. Larvae hatches and will feed on decaying plant matter.

Geographic range.

Arabian Peninsula.

Tricholabiodes aegyptiacus (Radoszkowski, 1876)

Velvet ant

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Hymenoptera
Family:	Mutillidae
Genus:	*Tricholabiodes*
Species:	*aegyptiacus*

Description.

These Velvet ants are actually wasps, get their name from the white bristle-like hairs that cover their body and they resembles ants. Females are flightless. This species size range from 6-10mm.

Biology.

Males have wings but no stingers, while females have stingers but lack wings. They retreat from high ground temperatures in the middle of the day by burrowing under debris or climbing into plants. Larvae will predate on other wasps and bees, whereas the adults diet consist of nectar. Occasionally large aggregations form for courtship and mating. Velvet ants are loners with males generally flying low to the ground seeking the wandering females

Geographic range.

Egypt and New to the UAE.

Perissomastix versicolor (Gaedike)

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Pyraloidea
Genus: *Staudingeria*
Species: *partitella*

Description.
Wingspan 16-19mm. Head and palpi dark brown. Antennae longer than forewings. Thorax and tugulae yellowish-brown. Fringe of forewings are pale yellow whereas wings range from dark brown to purple-iridescent. (*Versicolor*-shimmering, iridescent).
Biology.
Not much known about breeding and life-cycle.
Geographic range.
Sudan, Yemen, Oman, Saudi Arabia and UAE.

Phantia spec. (Fieber,1866)

Moth-bugs

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Hemiptera
Family: Flatidae
Genus: *Phantia*
Species:

Description.
Have large tent like forewings, which pale brown in colour. Large compound eyes and antennae are characteristicly cylinder-like end with a flagellum and darker brown to the rest of body. The hind wings may be almost as large as the forewings.
Biology.
Females will rake the sand prior to laying her eggs, might lay eggs in decaying plant matter of in the soft stems of plants. Feeds on Milkweed plants. (*Leptadenia pyrotechnica*)
Geographic range.
Arabian Peninsula and New to UAE.

Discussion.

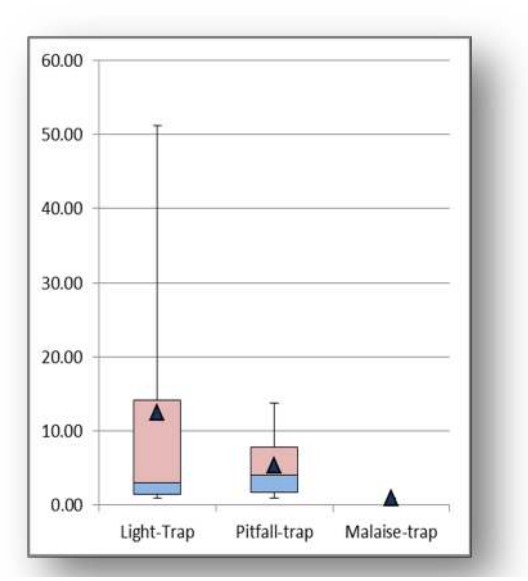


Figure 3: Boxplot and Whisker diagram for trapping methods.

It is clearly noticeable that there are considerable differences in the results of the three trapping methods. The Range of the light-trapping is much higher than that of the Pitfall-trapping, and the Malaise trapping has been proven to be inadequate results for this short period survey.

This Box plots are based on the Abundances of the individual species trapped throughout the survey. The Highest recorded Species of the Light-traps are and Unknown Hemiptera species and the second highest species and with the highest IVI of 65.26% is that of the Short-wing wasp (*Komarowia concolor*) thus based on the IVI is the Dominant species on the DDCR.

Pitfall-trapping had results of the specific target group. The Rack beetle (Tentyrina palmeri) was the most abundant of this group and the IVI of 61.91% making it the Co-dominant species on the DDCR.

Various other species was trapped and the Predicted Distribution of the specific species indicated that most of the species collected had a distribution throughout the reserve.

Even though three different trapping methods were used the objective of the survey was to obtain an understanding in the Biodiversity and Distribution of Insects on the DDCR and their movements.

Conclusion.

The results of the survey indicated that the Light-trap was the most successful method to capture a high diversity of insect mainly of that of Hymenoptera, Coleoptera, Lepidoptera and Neuroptera. It is recommended that several Light-trap needs to set up throughout the reserve for a major collection of species new to the reserve and possible new to science. The insect that will be collected needs to be collected and preserved.

Pitfall-trapping proved to be as successful as the light-trapping and is good idea to have some of the traps placed out on regular intervals throughout the reserve to collect as many specimens as possible. The Malaise trapping was the least effective method for a short period survey (Van Noort. 2009) and the ideal for this trapping to be effective it to incorporate Lures and possible black-lights to attract more species making it more efficient.

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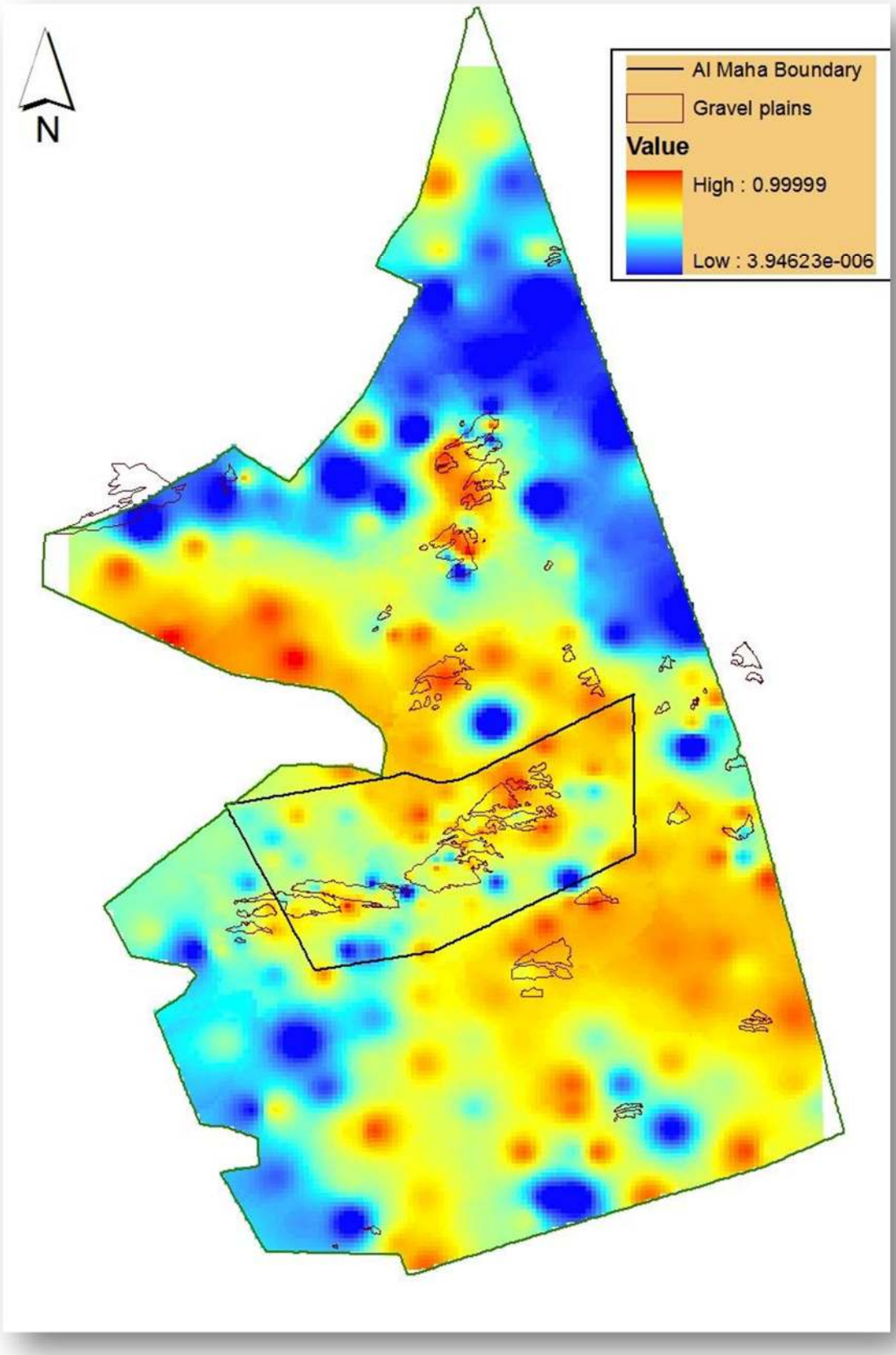
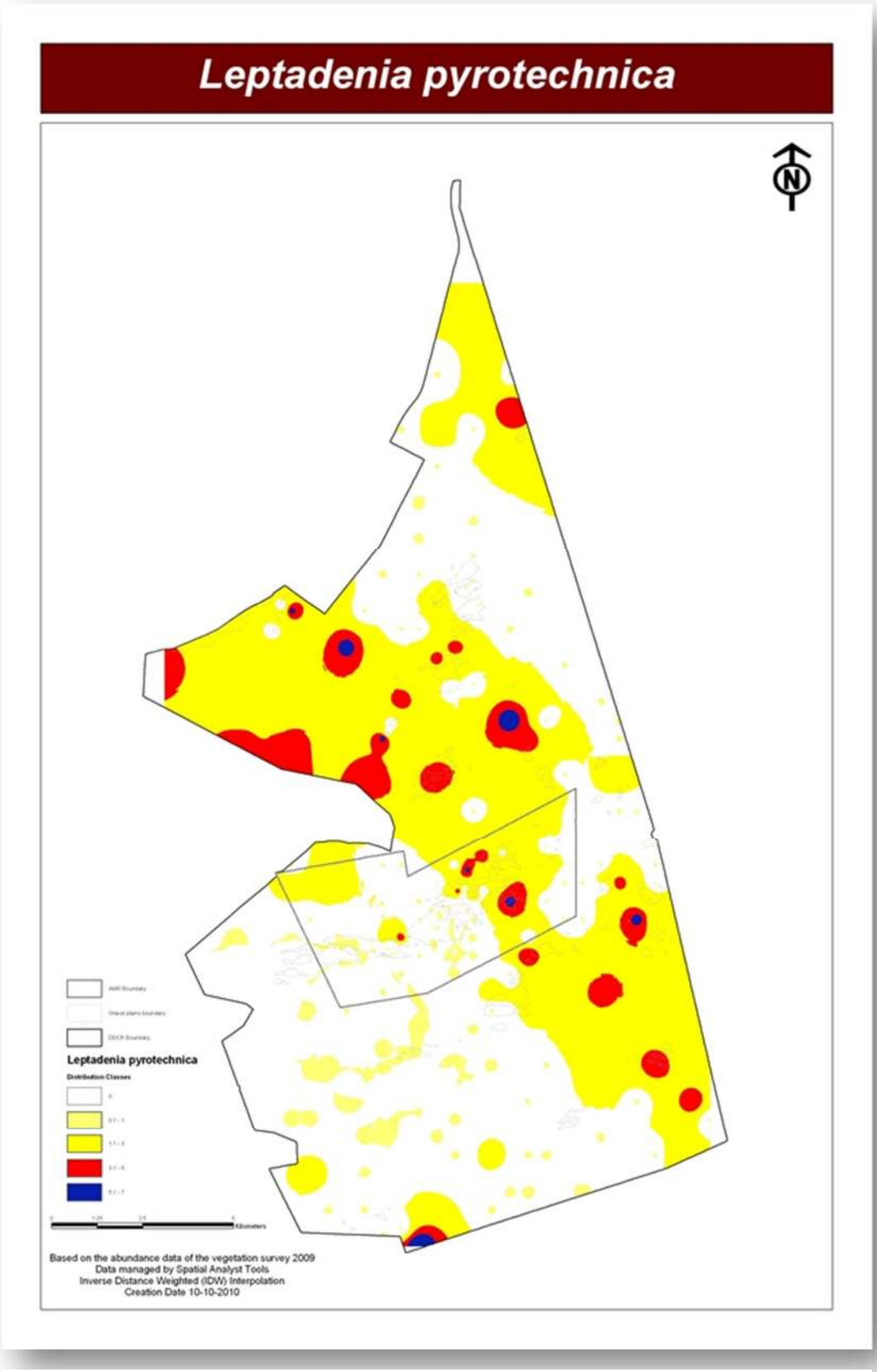
Annex 1.



Map 5: Simpson map of Vegetation Survey. (2009)

Annex 2.



Map 6: *Leptadenia pyrotechnica* Survey (2009)