A comparison of the Insects Biodiversity and Population Sizes of the Dune Slopes and the Sandy Plains around NaDEET Centre

Final In-service Training 1 Project Report

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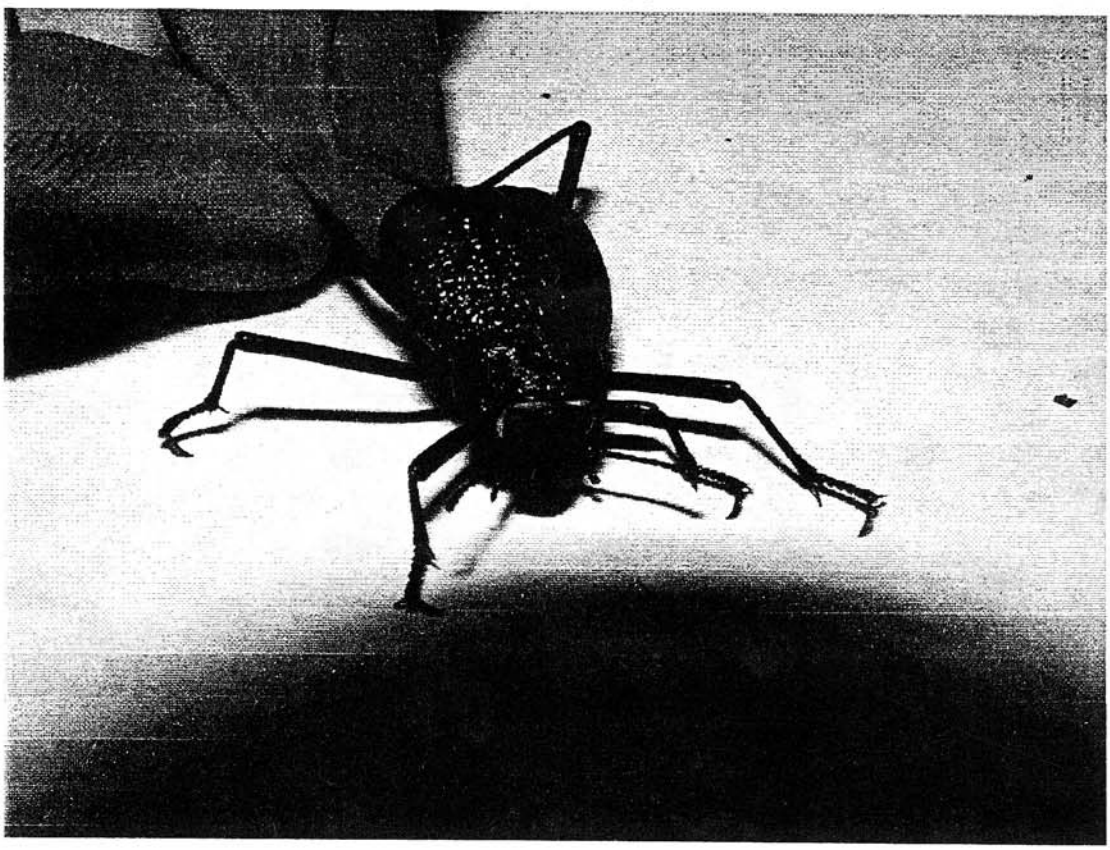

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I. INTRODUCTION

This report covers my research conducted at the Namib Desert Environmental Education Trust (NaDEET) on the NamibRand Nature Reserve. The aim of the research was to compare the insect biodiversity and population sizes of the dune slopes and the sandy plains around NaDEET Centre.

Decomposers such as bacteria, protozoa fungi and nematodes are playing a big role in the ecosystem by breaking faeces and dead plants materials into smaller pieces which can used by plants. These processes of decomposion have been reduced or completely stopped due to the extreme temperature in the Namib Desert. Therefore nutrients are "locked" and not available to fertilise the soil. With the help of insects such as Tenebrionid and fishmoth that feed on the wind-brown detritus nutrients are "unlocked" and are available to the plants. They help the transformation of nitrogen that is in the detritus into the soil and allow the nitrogen cycle to be completed (Lovegrove, 1993).

The detritivores provide a protected, moist environment for the enzymes to proceed with the breaking down of the material into smaller pieces (Seely, 1992).

During the NaDEET Centre programme, participants are learning about biodiversity and adaptations. To do this they have a dune walk where they identify different insect species. Learners are also classifying insects after catching them in traps. To help increase the knowledge about the insects in the area around NaDEET Centre more intensive insects studies must be done. This project therefore primarily looks at the biodiversity of insect life around NaDEET Centre. It will also compare two different localised habitats, a dune slope and sandy plain. Some deductions will be made of the relative population size of the insects. By comparing insects on the dune and the insects on the sandy plain it will allow NaDEET to know if they should have insect traps in both habitats to increase the biodiversity of insects seen by learners.

II. OBJECTIVES

PROJECT OBJECTIVES

My project had the following objective:

1. To compare the insect biodiversity and population sizes of the dune slopes and the sandy plains around NaDEET centre.

PERSONAL OBJECTIVES

Here are my personal objectives, which I want to achieve:

1. To learn more about different insect species.
2. To gain experience on how to trap insects.
3. To gain experience in learning how to identify different insects species.
4. To gain experience in using a computer.
5. To learn how to enter data on the computer.

II. METHODS AND MATERIALS

To compare the insects biodiversity and population sizes of the dune slopes and the sandy plains around NaDEET centre.

Methods and Materials:

I used the indices sampling method, whereby I compared the relative population of insects in different habitats (Joubert, 2004). Both the sandy plain study area and the dune slope study area are 4-metres wide and 15 metres long. I put sticks around the study area to warn people about the research area.

I dug 10 yoghurt containers into the dune slope and 10 yoghurt containers into the sandy plain. In the line each yoghurt container has been spaced out two metres from each other .The research have been conducted three times a week and it was done for 24 hours per trapping. It was flexible due to the NaDEET environmental education programmes. The container was uncovered for 24 hours then I checked for any trapped insects, I recorded the data and then released the insects. I removed the containers when I was not trapping to prevent insects from falling in and dying. Weather conditions were also recorded on a regular basis, as it might influence the investigation. On the data sheets there is the following information: date, names of the species, number of the individuals per species and the area.(See Appendix 1)

I used a potassium cyanide killing bottle to kill the insects. I put the insects in the killing bottle and than after they died I have pined them vertically through the body. After pinning them, I push the pin with insects into the card platform and I arrange the legs with antennae in a natural position. I placed the scientific names close to the specimen (Vivienne, & Rosalind, 1996). I preserved the insects because I'm not completely satisfied with their names and I also wanted to show the insects on my presentation for the people who want to see the insects.

To compare the insect biodiversity and the population sizes on the dune slope to that living on the sandy plain. I will analyse the data based on the total number of insects I trapped.

IV. RESULTS

A total of 39 samples were conducted during the in-service training. Below is the result of insect's population and biodiversity on different habitat.

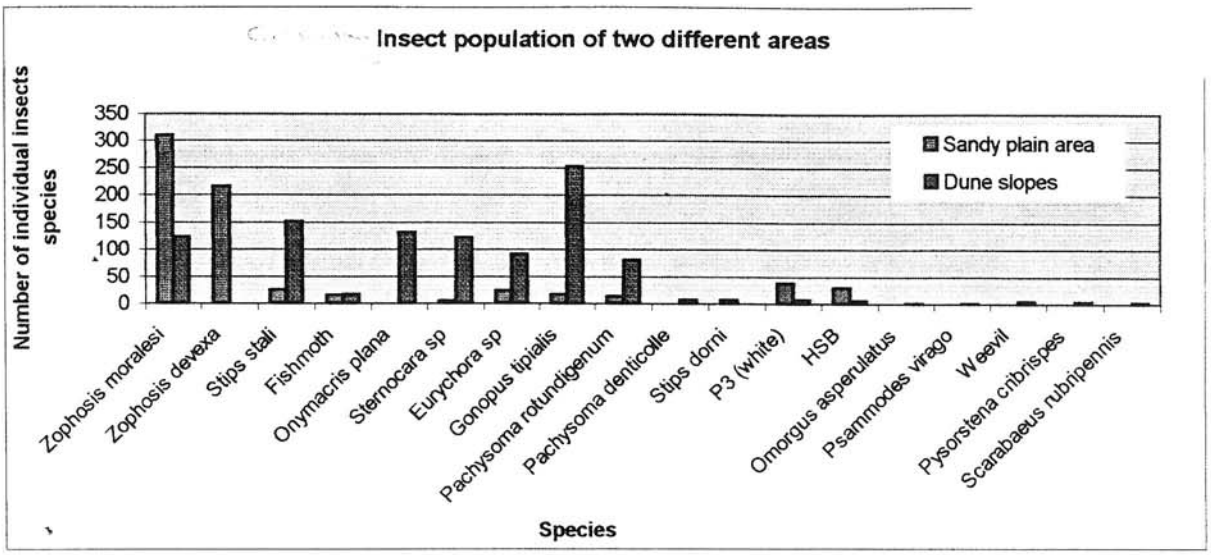

Figure 1. Shows the insect population on the sandy plain study site compared to the dune slope study site.

Table 1. Comparison of the insect biodiversity on the sandy plain and dune slope area.

Species	Sandy plain area	Dune slopes area
Zophosis moralesi	P	P
Zophosis devexa	P	A
Stips stali	P	P
Stips dohrni	P	A
Fishmoth	P	P
Onymacris plana	A	P
Sternocara sp	P	P
Eurychora sp	P	P
Gonopus tipialis	P	P
Pachysoma rotundigenum	P	P
Pachysoma denticolle	A	P
P3 (white)	P	P
HSB	P	P
Omorgus asperulutus	A	P
Psammodes virago	A	P
Weevil sp	A	P
Pysorstena cribrispes	A	P
Scarabaeus rubripennis	A	P

Table 1 Key
P= Present (green)
A= Absent (red)

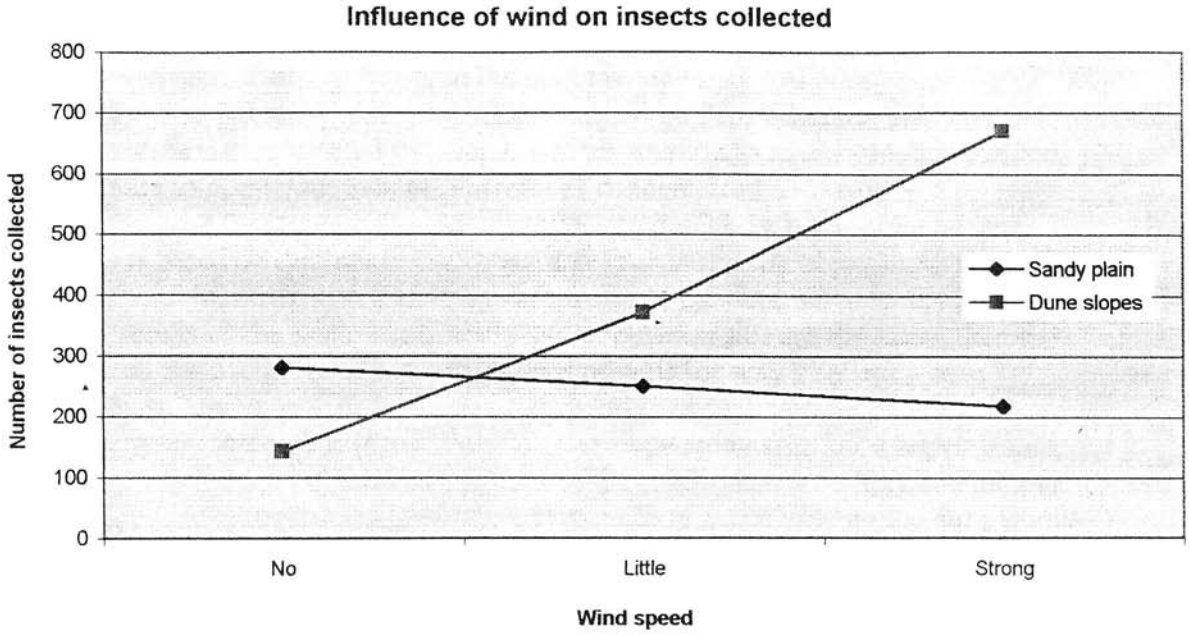

Figure 2. Shows the influence of wind on the insects collected.

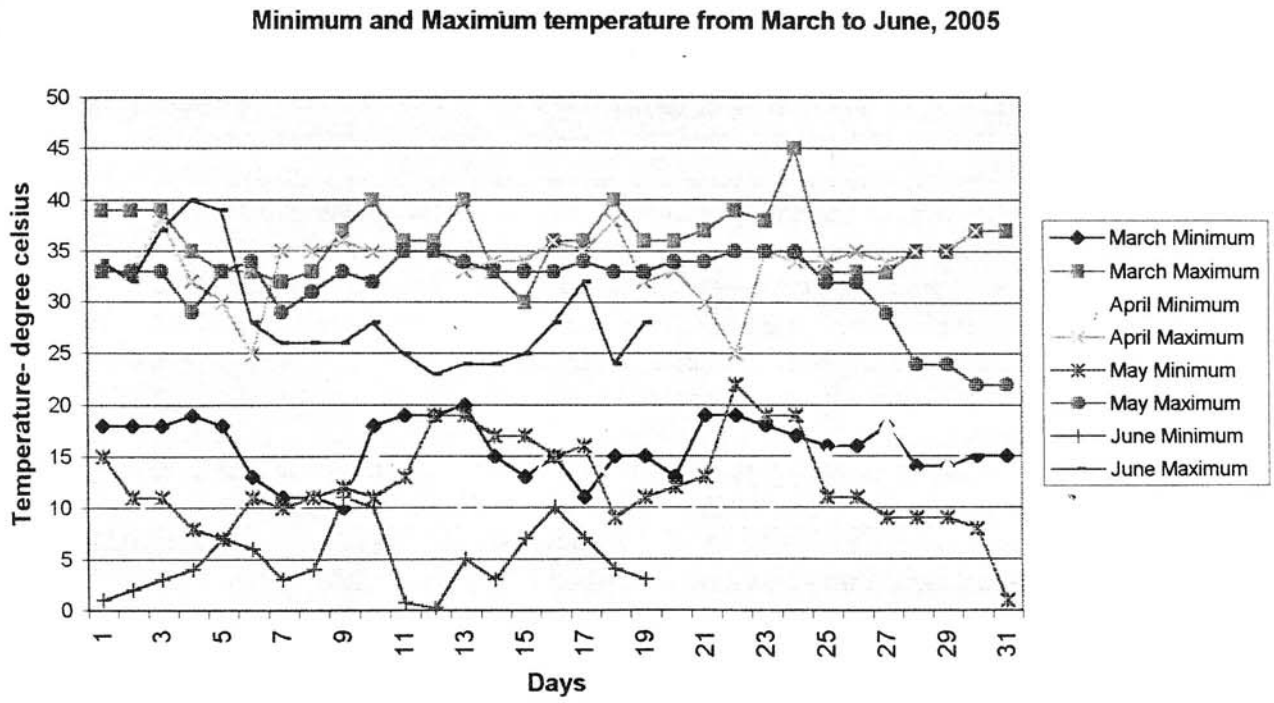

Figure 3. Show the maximum and minimum temperature from March to June 2005.

V. Discussion

My original objective was to compare the insect biodiversity and population size of the dune slope to the sandy plain, but when I started implementing the project I realised that the methodology I'm using is not appropriate to all insects. The method is appropriate to non-flying insects. Therefore I concentrated on the order Coreptera beetle (only those that cannot fly) and order Thasanura. Therefore my results and discussion is based on the orders Coreptera and Thasanura. My objective was to compare the insect biodiversity and population size of the dune slope to sandy plain area. The results of the insect biodiversity and population size are the same, therefore I will discuss them together. There are several reasons for why I believe I have obtained these results.

According to my research it seems that the dune slope study area has a higher insect population and insect biodiversity compared to the sandy plain area (fig1 and table1). According to my observation I think there is more food availability on the dune slopes area compared to the sandy plain. The more food that is available the greater the insect population is. The dune slopes most likely have more food because the food source is blown into the dune by the winds on the regular basis (Lovegrove, 1996). I think the habitat is also playing a big role on the dune slopes, because the dune have different habitat (Slipface, upper slopes, middle slopes, vegetation, lower slopes and interdune valley) that are occupied by insects. My study area on the dune is on the middle vegetation dune slope.

Detritus accumulates on the lee of the dune, on the slipface. As a result the slipface has evolved into one of the most densely inhabited parts of the dune ecosystem (Seely, 1992). However, as the insects trapped in the dune slope study site are in the middle of these habitats in the dunes, food availability in general is higher and this will perhaps increase the population compared to the sandy plain.

To support this finding one will look at resources partitioning that lead to population distribution. "The beetle species, although different, all seem to feed on the wind-brown detritus and dead insects, displaying minimal 'resource partitioning' (they don't avoid competition by eating different food)". In order to prevent interference competition they partition their habitat into microhabitats. Their territory is more precisely defined in term of structure (Lovegrove, 1996). According to figure 2 strong wind affecting the insects collected on the sandy plain area is more then on dune slopes. There is less vegetation on the sandy plain area compared to dune slopes that can act as the barrier to prevent strong wind. The landscape is also playing a big role by preventing wind. The dunes slow down the wind speed compared to the open flat sandy plain. I think this is one of the impacts on the insect population on the sandy plain area because the windier it was, the more insects I collected in the dune slopes compared to sandy plain area (figure 2). According to figure 3 the temperature decreased in June, which I think caused some decline to the insect population. I think the decline in temperatures effect the insect population because they are cold blooded and are therefore less active. Wind direction is inconclusive, because there was different wind coming in different directions in one day therefore it is not easy to compare which wind direction was the dominant, because I didn't have the appropriate equipment to show the wind direction. Little rainfall was recorded during the project period but it is also inconclusive, because it did not show much affect on the insects collected during or after those days.

Conclusion

In conclusion higher insect biodiversity and population size was found on the dune slopes compared to sandy plain area. Here are the possible reasons which I think caused the difference: there is more food availability on the dune slopes compared to sandy plain area. Strong wind also has some decrease on the insect population on the sandy plain area as it shifts food availability.

Project Limitations

1. The method I proposed in my project proposal was not appropriate to all the insects; therefore I could only trap certain orders of insects.
2. Strong wind blows the sand in my insect traps and when the container is full the insects can escape before I can record them.
3. Rain kills some of the insects in the traps.
4. It was difficult to identify insects and it took me a lot of time to get the right name from the expert.
5. Perhaps the project should not have focussed only on "insects" but all living things that fall in the trap as the learner at NaDEET are looking at everything.
6. Although not originally specified in the project proposal, participants at NaDEET are trapping everywhere in the dunes. Although there is scientific evidence that dunes have different habitats these was not relevant to my study.

Recommendations

I recommend to NaDEET to put their insect traps on the sandy plain area as well because according to my research it seems that there is some insect species that occur only on the sandy plain and not the dune slopes. The possibility of finding different insect species is there. My project was based only on certain orders of insects (non flying) and I'm strongly recommending NaDEET to use another method of catching insects if they want to increase the biodiversity &population of all the insects trapped. I think NaDEET needs to specify to the participants what types of insects you can catch in pitfall ~~insect~~ traps.

References

Joubert, D. 2004. Ecology 2, study Guide. Windhoek: Polytechnic of Namibia.

Lovegrove, B. 1993. The Living Desert of Southern Africa. Vlaeberg: Fernwood Press.

Seely, M. 1992. The Namib (Second Edition). Windhoek: Shell Namibia.

Uys, V.M. & Urban, R.P (editor). 1999. How to Collect and Preserve Insects and Arachnids. Pretoria: Plant Protection Research Institute.

Insects trapped data sheet at NaDEET

APPENDIX 1

Name of species	Date	Sandy plain area/number	Dune slopes area/number

Monthly weather data sheet at NaDEET

APPENDIX 2

Month							
1	Min	Max	Rain	16	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
2	Min	Max	Rain	17	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
3	Min	Max	Rain	18	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
4	Min	Max	Rain	19	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
5	Min	Max	Rain	20	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
6	Min	Max	Rain	21	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
7	Min	Max	Rain	22	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
8	Min	Max	Rain	23	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
9	Min	Max	Rain	24	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
10	Min	Max	Rain	25	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
11	Min	Max	Rain	26	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
12	Min	Max	Rain	27	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
13	Min	Max	Rain	28	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
14	Min	Max	Rain	29	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	
15	Min	Max	Rain	30	Min	Max	Rain
	Wind (d)	**Wind (s)**			**Wind (d)**	**Wind (s)**	