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***TOPIC:*** *To determine the biodiversity and the population size of nocturnal small mammals*

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## **ABSTRACT**

A live trapping study using Sherman traps was conducted at the Namib Desert environmental Education Centre (NaDEET). The primary objective of the study was to find out the biodiversity and population sizes of nocturnal small mammals. Sample methods consisted of 30 Sherman live traps placed in two habitats found around the NaDEET Centre; the grassy plains and the sand dunes and the mark and recapture technique was used. It is a simple technique where animals are captured, marked and then recaptured. Two rodent species; the four (4) striped mouse (*Rhabdomys pumilio*) and the Hairy footed dune gerbil (*Gerbillurus tytonis*) were continuously trapped through out the study in both the 2 habitats. The Dune gerbils were more abundant on both of the sampled habitats than the striped mouse, in total 296 gerbils and 134 striped mice were captured throughout the study but of which 24 of the hairy footed dune gerbils were dead. The Lincoln index was used to calculate the population sizes and on average the total population of Striped mice is 14 on the dune sand habitat and nothing on the grass plains and the population of hairy footed gerbils is 43 on the grass plains and 27 on the dunes. These figures represent only 10 000meter squares of each habitat

## **1. INTRODUCTION**

A Biodiversity and Population size of nocturnal small mammals was undertaken around the Namib Desert Environmental Education Trust (NaDEET) Centre for 30 nights between August, September and early October 2006. This study was done as part of fulfilling my In- Service Training requirements. The main aim of the study was to investigate or find out what small mammals are awake at night and what their population size is. "One of the activities done with the school groups at NaDEET is live animal trapping. Since 2003 NaDEET has done pitfall trapping with yoghurt containers which are used to trap insects. In March 2006 NaDEET received 50 Sherman traps from the Wildlife Society, this has helped NaDEET and the school groups to know what else is out there apart from insects" (Keding, 2006). This study was done concentrating on 2 habitats only; the Sand dunes and the Grass plains. The climate during the study was typical of a desert climate; hot days and cold nights.

### **1.1. STUDY AREA**

This project was done at the Namib Desert Environmental Education Trust (NaDEET) Centre. NaDEET is located on the NamibRand Nature Reserve (NRNR); (FIG. 1), 100km south of Sesreim in the Hardap region. NaDEET was formed in 2002 with the aim of providing non-profit environmental education in order to empower the Namibian youth for a sustainable future. The Centre's approach to education is sustainable living and biodiversity education. The NamibRand Nature Reserve is the largest private nature reserve in southern Africa with an area of 172,200ha and it borders the Namib Naukluft National Park. It is made up of 13 former livestock farms which have been rehabilitated to allow the land to return to its natural state. The aims of NamibRand Nature Reserve are conservation, sustainable utilization and economic stability. The reserve's desert ecology has five distinct habitats; mountain ranges, rocky slopes, grass plains, Aeolian dunes and clay pans. Each habitat has its own dominant vegetation and associated fauna. Large mammals include: Oryx, Giraffe, Kudu, Springbok, Hartman's and Burchell's Zebra, Klipspringer, Steenbok, Red Hartebeest, Aardwolf and Baboon. Predators include; Leopards, Spotted and Brown Hyena, Black backed Jackal, Bat Eared Fox, Cape Fox, African Wildcat, Caracal and Genet. Over 100 bird species occur on NRNR

which include Sociable Weavers, Ostriches, Dune Larks, Namaqua Sand-Grouse and Ruppell's Korhaan.

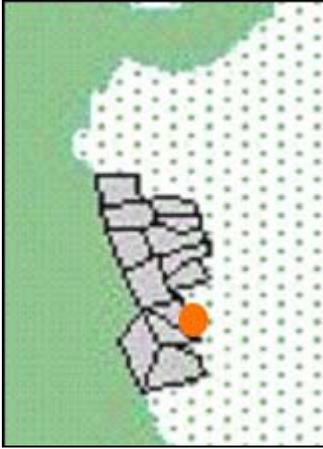


Figure 1: Shows where NaDEET is located (red dot) on the NamibRand Nature Reserve

## **2. OBJECTIVES**

### **2.1. PROJECT OBJECTIVES**

1. To determine the biodiversity of nocturnal small mammals occurring in two different habitats; the sand dunes and the grass plains.
2. To determine the population densities of these small mammals
3. To compare the densities of these small mammals in the two different stated habitats.

### **2.2. PERSONAL OBJECTIVES**

1. To gain more experience in doing a research
2. To be able to contribute to research on the NamibRand Nature Reserve and at NaDEET
3. To apply my theoretical knowledge into practice
4. To increase my chances of getting a job in the related field
5. To learn more about sustainable living at NaDEET and be able to teach it to others

## **3. METHODS and MATERIALS**

### **MATERIAL LIST**

1. 30 Sherman traps
2. Black ink
3. Data sheets
4. Buckets
5. Bait (peanut butter and oats mixture)
6. Writing materials (pen, pencil, rubber etc)
7. Animal identification books

## 8. Paint brush

### **OBJECTIVE 1- determining the biodiversity of nocturnal small mammals in 2 different habitats.**

The fieldwork was conducted between August and October 2006. The Sherman traps (FIG. 2) were set out at sundown on each trapping night at the 2 different habitats and released at sunrise the next morning. The traps were placed randomly in a 100x 100meter square area. Random sampling is used where the habitat being sampled is fairly uniform; (<http://www.offwell.free.online.com>). A mixture of oats and peanut butter was placed at the far end of the trap and used as bait to lure the animals to the traps. The traps were left alone overnight and only checked in the morning. Every individual trapped was released in a plastic bucket for identification, recorded and then released unharmed back into the environment immediately. The sampling took thirty (30) nights of three (3) nights per week.

### **OBJECTIVE 2 and 3 determining the population size of the small mammals**

Using the Capture, release and recapture method, the small mammals were captured in the 2 habitats; the grassy plains and the sand dunes (FIG 3&4) on an area of 100x100m square on each habitat. The Sherman traps were set and released as for Objective 1. The animals caught were recorded and the data kept for later analysis. The animals were marked using a paint brush with a black permanent ink with a recognizable small circle on their backs or sides. The population size would then later be compared for the 2 habitats during the analysis of the data. The animals were released at the same spot captured after identification. The animals were marked on the 3<sup>rd</sup> visit of the biodiversity study – making it the 1<sup>st</sup> visit or the capture night for the density study and then recaptured after seven days and again after seven days then after. This was done to allow sufficient time to pass for the marked individuals to redistribute themselves among the unmarked population before being recaptured. About seven (7) recaptures were done to compare the population estimates of each recapture day.

### **ANALYSIS- determining population size**

The Lincoln- Petersen method was used to estimate the population size. The combined data consisting of the two sample sizes (capture sample and recapture sample) and the number marked in the recapture sample was then used to calculate or estimate the total or overall population size (Barnett, 2003). Population size can be estimated from as few as two (2) visits to the study area when using this method. ([www.answers.com/topic/mark-and-recapture](http://www.answers.com/topic/mark-and-recapture)). Using the Lincoln index to estimate population sizes involves making a number of assumptions; one assumption is that marked individuals are as likely as unmarked individuals to die or to emigrate from the population before the second sample is obtained. (King and Reiss, 2001)

The Lincoln index formula: 
$$N = \frac{n_1 n_2}{M}$$

The modified version: 
$$N = \frac{(n_1 + 1)(n_2 + 1)}{m + 1} - 1$$

Where as; N= estimate of total population size

n1=total number of captured on first visit  
n2=total number of animals captured on 2<sup>nd</sup> visit  
m=number of animals recaptured on 2<sup>nd</sup> visit

#### 4. RESULTS

There were only two (2) small mammal species caught in the traps throughout the study period (FIG.5&6). The total populations of these small mammals are shown in Table 2 per habitat. Samples of the individuals captured are shown in Figures 1 and 2 below. The numbers of animals captured per night are shown in table 1 below. Other animals other than mammals were sometimes captured in the traps (i.e. birds and some crickets). The study concentrated only on nocturnal animals but according to a research report by Schradin and Pillay and some other literature, the striped mouse is not nocturnal but diurnal but the Hairy-footed dune gerbil is. The hairy footed gerbil clearly dominated in both the habitats (see FIG.3&4). Unfortunately a total of twenty-four (24) Gerbils were found dead in the traps during the study, this was encountered during cold nights. Average total population is shown in table 3.

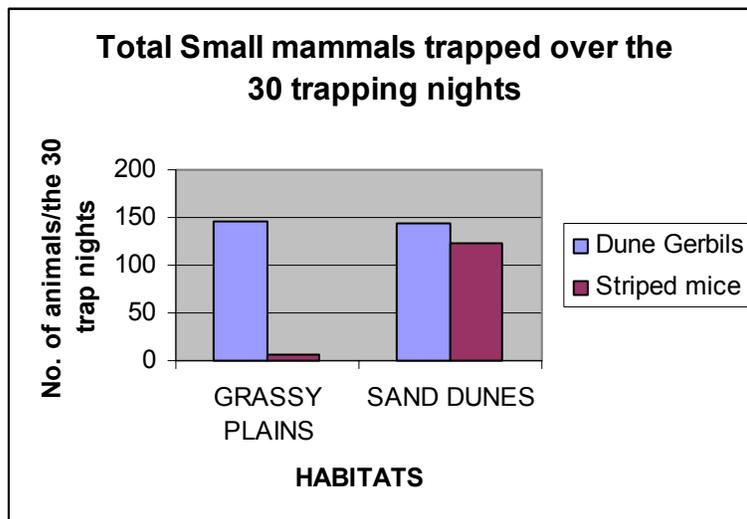


Figure: 3- The total number of each species that was captured in each habitat

**Table 1: History of capture\trapping for 30 nights**

DATE	GRASSY PLAINS		DUNES	
	Dune gerbils	Stripped mice	Dune Gerbils	Stripped Mice
10 August - Thursday	1	0	8 (1 dead)	0
12 August - Saturday	3	0	12 (7 dead)	3
13 August - Sunday	1	0	9	1
17 August - Thursday	5 ( 3 dead)	0	11 (3 dead)	4
19 August – Saturday (MS)	8	0	7	4
20 August – Sunday	3	0	4	1
26 August – Saturday (RS1)	7 ( 1 dead)	0	7 (2 marked)	3
27 August- Sunday	7	0	8	2
28 August – Monday	5 (1 dead )	1	6 (1 marked)	6 (1 marked)
29 August – Tuesday	7	1	6	4
02 September- Saturday (RS2)	7	0	8	2
03 September – Sunday	7(1 dead)	1	2	10
04 September – Monday	4 (1 marked)	1-marked	6 (2 marked)	7 (2 marked)
08 September - Friday	8	1	8	1
09 September – Saturday (RS3)	6	1	6 (1marked)	4 (1 marked)
10 September – Sunday	4	0	1	9 (2 marked)
13 September – Wednesday	6 (1 marked)	0	2	5
16 September – Saturday (RS4)	7 (3 dead)	0	2	6 (2 marked)
17 September – Sunday	4 (3 dead)	0	0	5
20 September – Wednesday	2	0	3	6
23 September – Saturday (RS5)	5	0	3	4
24 September – Sunday	5	0	4	4
27 September – Wednesday	6	0	4	1
29 September – Friday	4	1	5	6
30 September – Saturday (RS6)	3	0	2	5
04 October – Wednesday	7	0	3	4
07 October – Saturday(RS7)	4	0	3	6 (1 marked)
08 October – Sunday	5	0	3	6
09 October – Monday	6 (1 dead)	0	3	2
12 October – Thursday	3	0	0	6
<b>TOTAL</b>	150(13 dead)	7	146(11)	127

Key: MS- Marked sample

RS- Recapture sample

**NB:** Total trapped per day and overall includes dead or marked where indicated dead or marked.

**Table 2: SMALL MAMMAL POPULATION ESTIMATE LOG**

	Total no. Recaptured				No. Marked in Recapture				Total estimated Population (TEP)			
	Gerbil		Mice		Gerbil		Mice		Gerbil		Mice	
	GP	SD	GP	SD	GP	SD	GP	SD	GP	SD	GP	SD
Recapture 1	7	7	0	3	0	2	0	0	56	24.5	0	12
Recapture 2	7	8	0	2	0	0	0	0	56	56	0	8
Recapture 3	6	6	1	4	0	1	0	1	48	42	0	16
Recapture 4	7	2	0	6	0	0	0	2	56	14	0	8
Recapture 5	5	3	0	4	0	0	0	0	30	21	0	16
Recapture 6	3	2	0	5	0	0	0	0	24	14	0	20
Recapture 7	4	3	0	6	0	0	0	1	32	21	0	24

No. of animals in first capture= Gerbils (Grass plains 8; Dune sand 7)  
 Mice (Grass plains 0; Dune sand 4)

Key: GP= Grass plains  
 SD= sand dunes

**TEP=  $\frac{\text{No. of animals in first capture} \times \text{Total No. recaptured}}{\text{No. marked in recapture}}$**

Table 3: Average total estimated population

ANIMALS	GRASS PLAINS	SAND DUNES
Striped mice	0	14
Hairy footed dune gerbil	43	27.5

**Average TEP=  $\frac{\text{Total of TEP's}}{\text{No. of recaptures}}$**

## 5. DISCUSSION

The results of this study confirm the assumption made that there are only 2 specie seen\caught around NaDEET. The population estimates of individual species on each habitat obtained from this study is based on the following postulations:

The first assumption was that the marked individuals released after the first capture, mixed in with the first population after release and had the same chance of being recaptured as any unmarked animal. If

the marked animals did not mix back with the individuals, the population would have been underestimated. In this study, the number of unmarked individuals encountered during the recapture exercise was twice higher and even more than the marked individuals. This is confirmation that the marked individuals successfully mixed back with the rest of the population.

The second assumption was that the population would have been over estimated if the markings were worn off, or destroyed in which case fewer marked animals would have been recaptured than should have been. The recapture exercise was done after seven days. Shortening the recapture period but long enough to allow the marked individuals to remix with the rest of the population prevented this deficiency. So the population estimate was not over estimated.

The 3<sup>rd</sup> assumption was that even though a lot of Gerbils died during the study, it did not matter if individuals died or emigrated from the population between the release and recapture period, as long as the ratio of marked to unmarked animals leaving was the same as the ratio in the population as a whole. In this case, the chance of a marked or unmarked individual emigrating or dying was equal. If this is the case, then the ratio in the remaining population remained constant and an accurate estimate of the size of the population at the time of release of marked animals was obtained.

(<http://www.cites.org/common/cop/13/inf/E13i-04.pdf>)

Problems could have occurred, if both the number of marked individuals decreased and the number of new arrivals increased during the study period. The ratio of marked to unmarked animals would have been decreased both by loss of marked individuals from death and emigration and by the addition of new unmarked individuals. This would have caused the population to be over estimated at the time of recapture. In this study conducting the recapture soon after the first release minimized this effect.

Vegetation cover seemed not to be an important factor for the abundance of especially the striped mouse as the results shows that there's almost none in this habitat given the fact that it functions both as food supply and shelter. Mortalities were high due to the fact that some nights were extremely cold and the material of the traps was metal.

## 6. CONCLUSION

It is therefore concluded that there are only two (2) rodent species around the NaDEET Centre, *Gerbillus tytonis* and *Rhabdomys pumilio* there could be other small mammal species but they could be "trap shy" or diurnal or they simply didn't prefer or occur in the 2 habitats that were sampled. The populations of these rodents were expected to be higher than was obtained in this study because by observation there seemed to be a lot of rodents occurring in the area. It is concluded that *tytonis* is more abundant than *pumilio*. There are factors that could have affected the results a great deal; the weather could be one of them and given the fact that the Striped mouse is diurnal, some individuals of this animal could have been hunting during the day and sleep at night as they are supposed to. It is also suspected that some of the mice trapped were either trapped just after setting the traps before it got dark or in the morning before checking the traps.

## 7. RECOMMENDATIONS

If there would be another student at NaDEET, i would recommend that they continue with this study to find out their home ranges and to study more of some of the Biodiversity components like evenness and species richness. Most people ignore and kill\ poison these animals but they are a very important component of the ecosystem as part of the energy \ food chain so their numbers and if they are decreasing or increasing would be helpful. Although they are not declared problem animals, they are problems in houses and if needed to be controlled it is good to study their population.

### **Acknowledgement**

My heartfelt thank you to everyone that has helped me with this study. Most of all thank you to Viktoria keding and Michaella phemelo, (the NaDEET staff), for advising me and helping me draft my project proposal and Michaella and Martin for helping me with my data collection all the way. I would also like to thank Mr Adank for making new suggestions for my project. Thank you to Danica and nils for willing to edit this report.

## 8. REFERENCES

Barnett, V.2003.Sample survey: principles and methods. Oxford University press US. P214.

Keding, V.2006.Personal Communication. Director: NaDEET.

King, TJ; Reiss Michael, Roberts Michael. 2001. Practical advanced biology. Nelson Thomas publishers.pg291

Mc Callum. 2001. Population parameters: Estimates for ecological models. Blackwell publishers. Pg.96.

Rosenzweig, L.M. 1995. Species diversity in space and time. Cambridge university press. Pg.53.

Southwood. 2001. Ecological methods. Blackwell publishers. Pg.74

Web page: <http://www.shermantraps.com/c-7-tradition.aspx>

Web Page: <http://www.offwell.free.online.com>

Web page: <http://www.cites.org/common/cop/13/inf/E13i-04.pdf>