

9638



OCCURENCE

DETERMINING THE SPECIES AND DENSITIES OF RODENTS  
AT VISNARA IN THE NAMIB DESERT

No date, prob. 1987/88  
G. psacca, tytonis,  
Dermis  
Poph density

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CAPE TECHNIKON  
1988

Abstract

## INTRODUCTION

Studies on Arachnida in the vicinity of Gobabeb <sup>have</sup> indicated that rodents have a high rate of predation on <sup>several species of</sup> ~~spiders~~ (Henschel pers. comm.). This study was undertaken to determine the rodent species present <sup>and to estimate their</sup> ~~as well as the approximate~~ population densities, ~~in this~~ ~~area.~~

<sup>Since the spiders</sup> ~~The Arachnida~~ in this area are nocturnal species, therefore ~~nocturnal~~ <sup>gerbils</sup> rodents were the target <sup>predator</sup> species. A capture-mark-release method of <sup>censuring gerbils</sup> ~~trapping for~~ rodents was <sup>conducted</sup> ~~used~~. This was done on nine consecutive nights.

The study area was 70-80m south of the main channel of the Kuiseb River, <sup>and represents</sup> ~~The area is~~ an ecotone with riverine vegetation to the north and vegetation associated with the interdune plains to the <sup>south</sup> south (Fig. 1). Most of the plains region consisted of a sandy substrate, but the southern <sup>most?</sup> 20m was a harder calcium carbonate substrate.

<sup>or the first 20m?</sup>

## 2. METHODS

### a) Collecting of data

The total area of study was  $10\ 500\text{m}^2$  in a grid of 70m by 250m. Half a trap distance was added on either side of the grid to allow for equal trapping opportunities of all the individuals (Smith et al. 1971). The study area is shown in Fig. 2.

One hundred and two Sherman-type <sup>(Boyer 1988)</sup> live capture traps were set <sup>with a</sup> ~~out~~ trap spacing <sup>of</sup> was 10m by 10m, and the traps were baited at sunset, with a mixture of peanut butter and oats, ~~with water added as an adhesive.~~ <sup>at</sup> At the following sunrise the traps were checked and emptied. ~~For a description of the traps see Boyer, 1988.~~

The captured gerbils were individually marked by toe-clipping, weighed, sexed, and the lengths of the hindfeet were measured. <sup>to confirm species identification</sup> They were then released. The precise capture location was also noted to provide data on ~~the~~ habitat preference of each species (Fig. 2).

### b) Analysis of data

Two methods were used to <sup>estimate</sup> ~~determine the population~~ <sup>density</sup> ~~estimate~~; a ~~capture-mark-recapture method~~ <sup>(year)</sup> the Jolly-Seber <sup>stochastic</sup> model and the regression line model (Southwood / 1978).

The following <sup>Numerous</sup> ~~assumptions~~ <sup>capture-</sup> ~~underlie most methods of~~ mark-recapture models (Southwood / 1978):

- The marked animals are not affected (neither in behaviour nor life expectancy) by being marked and the marks will not be lost.
- The marked animals become completely mixed in the population.

<sup>way</sup> <sup>there</sup> all known by most workers in the field. 3

- The probability of capturing a marked animal is the same as that of capturing any member of the population.
- Sampling must be at discreet time intervals and the actual time involved in taking the samples must be small in relation to the total time.
- The population is a closed one or, if not, immigration and emigration can be measured or calculated.
- There are no births or deaths in the period between sampling or, if there are, allowance must be made for them.
- Being captured one or more times does not affect an animal's subsequent chance of capture.
- Every animal has the same probability of surviving through the sampling period.

The Jolly-Seber method efficiently <sup>processes</sup> groups the data and is fully stochastic. <sup>The model computes</sup> ~~Situations in which there <sup>are</sup> both loss (death and emigration) and <sup>input</sup> dilution (births and immigration) are covered, and~~ ~~The Jolly-Seber method also makes allowance for any animals killed after capture and hence not released again (Southwood, 1978).~~

The basic equation <sup>for</sup> the Jolly Seber method is:

$$N_i = \frac{M n_i}{r_i}$$

where  $N_i$  = the estimate population on day i

$M_i$  = the estimate of the total of marked animals in the population on day i

$r_i$  = the total number of marked animals recaptured on day i

$n_i$  = the total number captured on day i (Southwood, 1978).

The following conditions must be satisfied for use of the regression line model:

- The ~~catching or~~ trapping procedure must not <sup>change</sup> ~~lower (or increase)~~ the probability of an animal being caught.
- The population must remain stable during the trapping ~~or catching~~ period; there must not be any ~~significant~~ natality, mortality (other than by the trapping) or migration.
- The population must not be so large that the <sup>trapping</sup> ~~catching~~ of one member interferes with the <sup>trapping</sup> ~~catching~~ of another.
- The chance of being <sup>trapped</sup> ~~caught~~ must be equal for all animals (Southwood / 1978).

The regression ~~line~~ method <sup>is based on</sup> ~~uses~~ the principle that the rate of decrease in the number of unmarked animals captured is linear and that the zero intercept (no unmarked animals captured) will yield the total population estimate. The number of animals caught on the  $i$  th occasion <sup>s</sup> ~~are~~ plotted against the previous total catch. The line may be fitted by eye or calculated (Southwood, 1978). For this study both methods were used <sup>(Tables -</sup> ~~(See Appendix A & B))~~

## 2. RESULTS

### a. Species composition and habitat preferences

Three species of rodents were captured, all belonging to the subfamily Gerbillinae/<sup>ie</sup> Gerbillurus paeba (Hairy-footed Gerbil), Gerbillurus tytonis (Dune Hairy-footed Gerbil) and Desmodillus auricularis (Short-tailed Gerbil). A total of 69 gerbils were caught of which 42 were G. paeba, 17 were G. tytonis and 10 were D. auricularis.

The capture history of each individual rodent is reported in

~~Appendix A~~, Table 1

~~Desmodillus auricularis~~ <sup>wee</sup> was mainly captured on the hard calcium carbonate substrate (~~row A & B~~), while G. paeba occurred throughout the study area. G. tytonis also occurred towards the southern side of the study area (~~row A, B, C & D~~), both on the sandy substrate/<sup>and</sup> as well as on harder ground. Several burrows of D. auricularis were located ~~south of row A & B~~ on the interdune plain, while G. tytonis burrows occurred primarily on the sandy soil and under the INara plants.

### b. Population estimates

The Jolly-Seber/<sup>model generated</sup> ~~estimate~~ gave the following total population

estimates: Gerbillurus paeba = 70<sup>5</sup> (s.e.  $\pm 35$ )

Gerbillurus tytonis = 11<sup>5</sup> (s.e.  $\pm 4$ )

Desmodillus auricularis = 7<sup>4</sup> (s.e.  $\pm 3$ ) (Table 1.)

2 Don't have it!

Don't repeat results in the text + in a table.

The population estimates calculated by using the regression-line method gives population estimates of:

$$\text{Gerbillurus paeba} = 47 \text{ (s.e. } \pm 9)$$

$$\text{Gerbillurus tytonis} = 13 \text{ (s.e. } \pm 2)$$

$$\text{Desmodillus auricularis} = 6 \text{ (s.e. } \pm 2)$$

(Table 2)  
(Appendix A & B)

Thus the Jolly-Seber method gives a total <sup>gerbil</sup> rodent population estimate of 88 individuals and the regression-line method estimates 66 individuals.

#### 4. DISCUSSION

Gerbillurus paeba is a small species of gerbil (<sup>~ 20g</sup>) and ~~It~~ occurs from the <sup>western and northern</sup> Cape to southwestern Angola, ~~and~~ in the drier areas of <sup>and Namibia, but not in the Namib Sand Sea.</sup> Southern Africa. This species <sup>it</sup> prefers sandy soil (desert and (subdesert conditions), <sup>s</sup> sandy alluvium with a grass, scrub or woodland cover are commonly frequented (de Graaff / 1981, / Smithers / 1983). <sup>hellus</sup> Gerpaeba is characterized by its slender form, a slightly tufted, long tail and well developed ears. The upper parts of the body vary from reddish-brown to a greyish-red, <sup>white</sup> while the under parts are pure white and the tail is the same colour as the upper parts. The distal part of the hindfeet are always hairy and the claws on the digits are fairly long for digging (de Graaff / 1981, / Smithers / 1983). <sup>Delete / paraphrase the species descriptions</sup>

Gerbillurus tytonis <sup>is</sup> are endemic to the shifting sand dunes south of the Kuiseb River in Namibia. ~~Characteristic of these~~ gerbils are <sup>characterised by</sup> the sharp line of demarcation between the dorsal and ventral colour of pelage. The upper parts of the body are reddish brown, <sup>white</sup> and the underside ~~hands~~ and feet are white. They <sup>are present</sup> have small white spots <sup>are present</sup> behind the ears and just above the eyes, <sup>white</sup> while the tail is very long with a greyish tuft of hair at the tip (de Graaff / 1981, / Smithers / 1983).

Desmodillus auricularis has a wide distribution throughout <sup>of South Africa</sup> southwestern Africa. They are found in the Cape <sup>and Transvaal</sup>, Namibia, and also in parts of Botswana. The short-tailed gerbil occurs on hard ground with some cover of grass or karroid bush. The most prominent features ~~of D. auricularis~~ are the large white patches

behind the ears. There is a wide variation in the colour of this species, but the under parts are always pure white. The tail is short compared with <sup>gerbillus species</sup> other ~~gerbillines~~ and is the same colour as the upper parts of the body. The palms and proximal halves of the soles of their feet are naked, <sup>white</sup> the distal half of the soles and undersides of the toes are closely haired (de Graaff, 1981 ; Smithers, 1983).

The habitat preference of the gerbils in the study area <sup>say what it is in the results</sup> can be seen in Fig. 2. <sup>Habitat preferences</sup> This <sup>is</sup> agreed with the literature available (Boyer / 1988, de Graaff / 1981, Smithers / 1983) as G. paeba occurred towards the river and G. tytonis were found in the sandy areas towards the dunes. <sup>Each</sup> Both species showed a concentration where vegetation occurred in the study area, <sup>white</sup> As expected D. auricularis were mainly captured on the more stable gravel plains.

~~For the purpose of this study the total population number~~ estimates of the regression line model <sup>are</sup> ~~may be~~ considered of more value than <sup>those</sup> ~~that~~ of the Jolly-Seber model, <sup>because</sup> ~~the~~ regression-line estimates were closer to the actual number of animals captured, <sup>these</sup> ~~assuming~~ that most animals were captured by day nine, as no new animals were caught. ~~that day.~~

The high population estimate obtained by the Jolly-Seber model indicated a transient population or that the animals had a large home range. This <sup>invalidates</sup> ~~broke~~ two of the conditions <sup>required of</sup> ~~set by~~ the Jolly-Seber model and the population estimate was probably an over-estimation. The number of animals present in the study area at any point in time <sup>was</sup> ~~were~~ likely to be less than the <sup>total</sup> population estimate.

as it included <sup>transients</sup> animals from the outside of the study area. The regression line model was likely <sup>to give</sup> a more realistic <sup>estimate</sup> view of the population <sup>density</sup> ~~number~~ of Gerbillinae.

A relatively high population density of 66 <sup>gerbils</sup> animals/ha<sup>-1</sup> occurred.

Boyer (1988) recorded a maximum population density of 18.2 <sup>gerbils</sup> animals/ha<sup>-1</sup> in the Namib dunes. Several reasons for the high <sup>density</sup> number of animals in this study area are suggested. It is an ecotone which shows characteristics of riverine, dune and gravel plain habitats. This diversity of habitats may be able to support a higher <sup>density</sup> number of rodents than a more <sup>homogeneous one</sup> uniform area. ~~Another~~ <sup>Also,</sup> possibility is that fairly good rains occurred in 1987<sup>(? mm)</sup> resulting in above normal primary plant productivity in the study area, <sup>and</sup> the rodent population density may have increased <sup>owing</sup> <sup>event</sup> due to this. ~~Another~~ <sup>Further, were</sup> reason could be that <sup>there are</sup> a great number of invertebrates available to be exploited as food resource; <sup>a</sup> About 225 Leucorchestris arenicola (<sup>d</sup> Dancing <sup>w</sup> White <sup>e</sup> Lady <sup>s</sup> Spiders), which are <sup>the gerbil species studied,</sup> potential prey items of Gerbillinae occurred in the study area (Henschel pers. comm.).

De Graaff (1981) and Smithers (1983) recorded that G. paeba feeds on plant material, but Boyer (1988) found that their diet ~~also~~ <sup>comprises</sup> consists of 52,9% invertebrates. De auricularis is mainly <sup>modulus</sup> granivorous, but may eat insects (De Graaff/ 1981). Boyer (1988) p. 162 recorded that G. tytonis also feeds on invertebrates amounting to between 33,6% ( $\pm 3,2$ ) and 58,9% ( $\pm 4,9$ ) of stomach contents.

Two <sup>other</sup> ~~more~~ rodent species <sup>may</sup> occur in the study area, Rhabdomys pumilio and Thallomys paedulcus (Boyer pers. comm.). The former "

is a diurnal terrestrial species and the latter is an nocturnal arboreal species (de Graaff / 1981). <sup>Since,</sup> The trapping in this study <sup>this likely explains why</sup> ~~was~~ ~~terrestrial and nocturnal,~~ ~~therefore neither of these~~ <sup>not</sup> species were captured.

As the study area is in a hyper-arid area of the Namib, it suggests that there may be competition for resources between the five rodent species occurring here. This should be considered for further investigation. *Speculation*

Heidi,

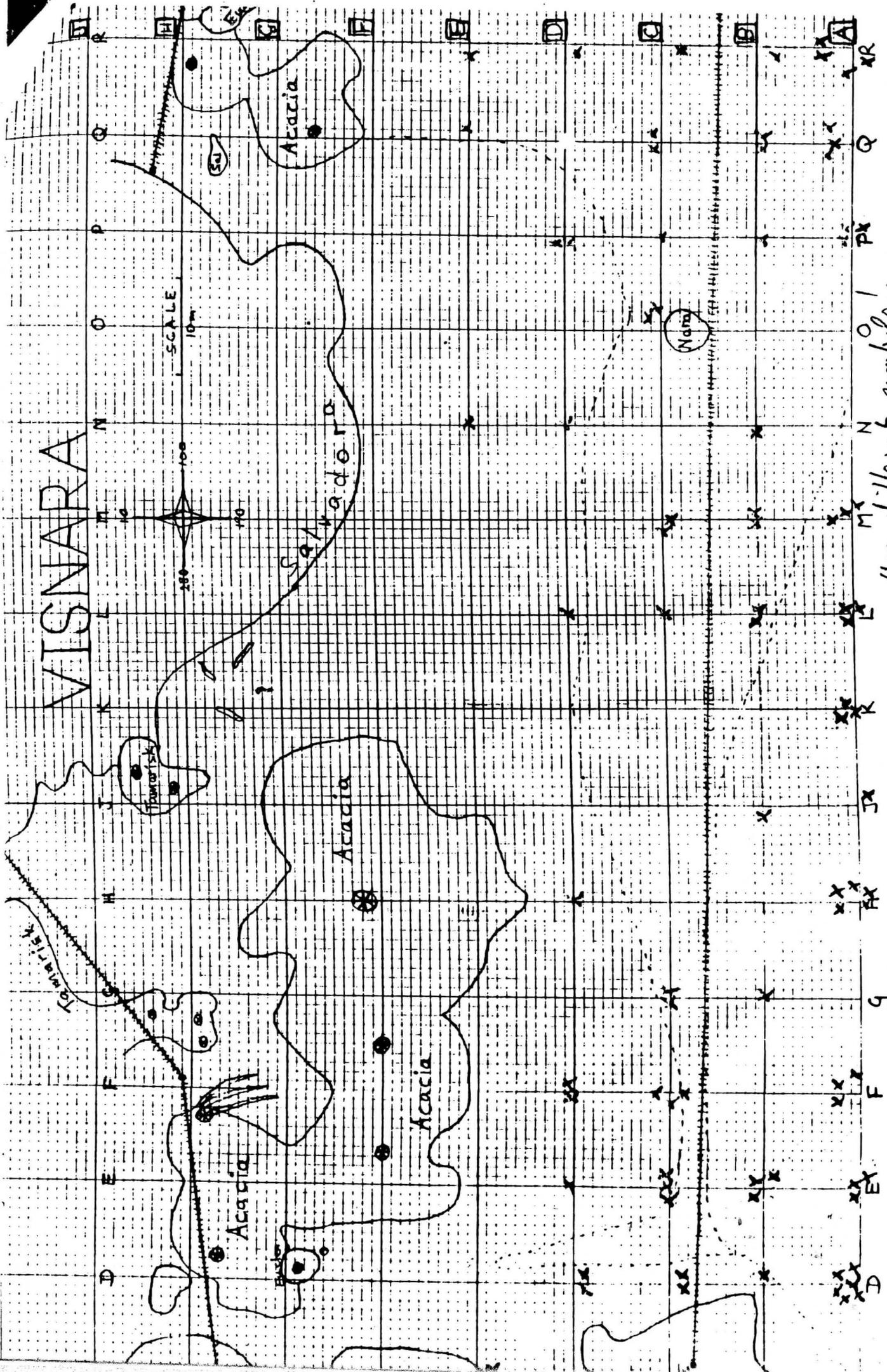
I suggest you conclude by stating what impact the gerbils could have on the spiders. This will require computing the energy demands of the gerbils present in relation to spider biomass.

30/8/89 - home  
(Awaiting a plane!)

Nike

6. REFERENCES

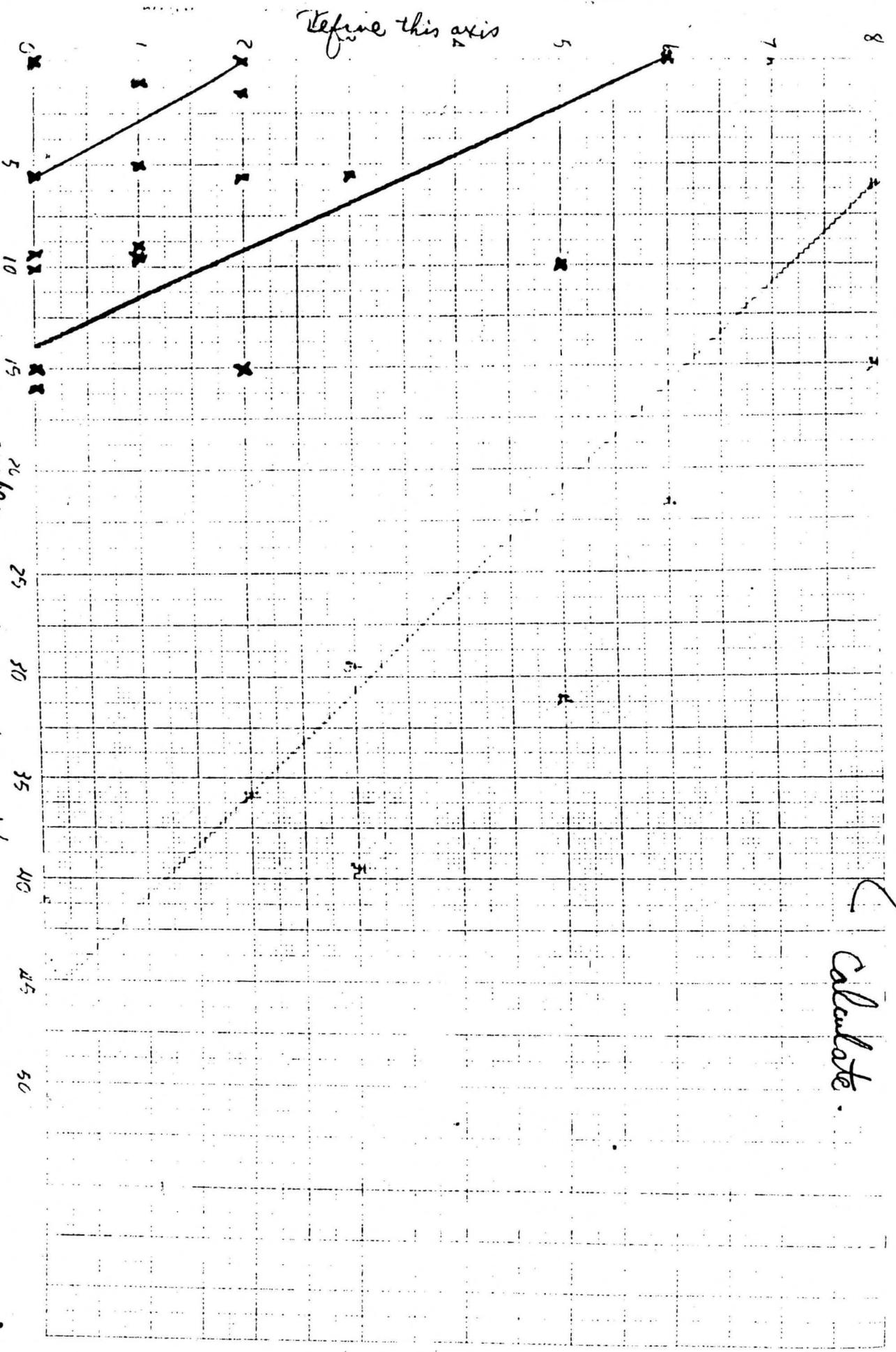
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Use different symbols of  
 (●) *Nesomachus autumnalis*  
 (x) *Sardinia sardinis*

Approximate Estimate based on REGRESSION LINE METHOD (using 100 cm)

Calculate.



— D. pyloni  
— D. aurivulvatus





# Appendix B 2(a)

-> ONEVREG (B:GERBCAPT): Regression formula for G.tytonis at Visnara

PAGE 1

X	A+(B*X)	A*EXP(B*X)	A+B*LOG(X)	A*X^B	Y
	4.222223	0	0	0	0
	13.22222	0	0	0	6
	8.722222	0	0	0	6
	11.72222	0	0	0	9
	11.72222	0	0	0	10
	5.722223	0	0	0	11
	13.22222	0	0	0	16
	10.22222	0	0	0	16
	13.22222	0	0	0	18
REG COEFF	13.22222	0	0	0	
REG COEFF	-1.5	0	0	0	
STD ERROR	2.327051	0	0	0	
STD ERROR	.8007933	0	0	0	
STD ERR EST	5.064661	0	0	0	
COEFF DET	.3338829	0	0	0	
COVARIANCE	-7.5	0	0	0	
CORR COEFF	-.577826	0	0	0	
DURBIN-WATSN	.5318688	0	0	0	

ANOVA for a linear model: A+(B\*X).

Source of Variation	Sum of Squares	df	Mean Square
Regression	90	1	90
Residual	179.5555	7	25.65079
Total	269.5556	8	

F-Ratio = 3.508664      R-Square = .333883

B2(b)

> ONEVREG (B:GERBCAPT): Regression formula for G.paeba at Vishara

PAGE 1

X	A+(B*X)	A*EXP(B*X)	A+B*LOG(X)	A+X*B	Y
	14.32154	0	0	0	0
	9.649818	0	0	0	1
	9.649818	0	0	0	15
	18.99326	0	0	0	23
	28.3367	0	0	0	29
	23.66498	0	0	0	33
	37.68015	0	0	0	38
	37.68015	0	0	0	40
	47.02359	0	0	0	42
REG COEFF	47.02359	0	0	0	
REG COEFF	-4.671721	0	0	0	
STD ERROR	4.86169	0	0	0	
STD ERROR	.9010686	0	0	0	
D ERR EST	7.320313	0	0	0	
JEFF DET	.7933921	0	0	0	
VARIANCE	-38.54167	0	0	0	
IRR COEFF	-.8907256	0	0	0	
IRBN-WATSN	1.139962	0	0	0	

ANOVA for a linear model: A+(B\*X).

Source of Variation	Sum of Squares	df	Mean Square
Regression	1440.448	1	1440.448
Residual	375.1082	7	53.58688
Total	1815.556	8	

F-Ratio = 26.8806      R-Square = .7933921

B2(k)

-> ONEVREG (b:gerbcapt): Regression formula for D.auricularis at Visnara  
PAGE 1

X	A+(B*X)	A*EXP(B*X)	A+B*LOG(X)	A*X^B	Y
	6.000001	0	0	0	0
4		0	0	0	0
5.000001		0	0	0	2
4		0	0	0	3
5.000001		0	0	0	5
3		0	0	0	6
6.000001		0	0	0	9
5.000001		0	0	0	9
6.000001		0	0	0	10
REG COEFF	6.000001	0	0	0	
REG COEFF	-1.000001	0	0	0	
STD ERROR	2	0	0	0	
STD ERROR	1.34164	0	0	0	
TD ERR EST	3.999999	0	0	0	
DEFF DET	.0735295	0	0	0	
CVARIANCE	-1.111112	0	0	0	
ORR COEFF	-.2711632	0	0	0	
URBN-WA'ISN	.1785715	0	0	0	

ANOVA for a linear model: A+(B\*X).

Source of Variation	Sum of Squares	df	Mean Square
Regression	8.888897	1	8.888897
Residual	112	7	15.99999
Total	120.8889	8	

F-Ratio = .5555563      R-Square = .0735295