

THE RELATIVE TAIL-LENGTH OF STRIPED MICE

RHABDOMYS PUMILIO SPARRMAN 1784 IN RELATION TO CLIMATE

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INTRODUCTION

Striped Mice *Rhabdomys pumilio* are distributed throughout southern Africa except for the eastern tropical corridor (northern Zululand, Mocambique and the typical lowveld part of the Kruger National Park). They are mainly confined to dry river beds and pans in the Kalahari, Karoo, southern South West Africa and Namib.

Striped Mice are diurnal. They live mostly in shallow holes or among thickets or dried branches where they have grass nests above ground level. They may use true burrows during the winter in the Drakensberg. Their runways, leading from one bush to another, are a typical feature of their habitat. They are less active during the heat of the day when they make full use of available cover, but may be seen away from cover during the morning or late afternoon. Early evening trapping shows that they are also crepuscular; this is supported by the occurrence of *Rhabdomys* remains in owl pellets.

They are thus exposed to considerably greater changes in air temperature and humidity than any of the nocturnal, fossorial rodents found in the same areas. Climatic data from meteorological stations unfortunately do not give the true picture of the microclimate under which Striped Mice live. No other rodent with such a wide distribution in southern Africa is exposed to outside climatic conditions to the same extent. A factor that could play a role in the tolerance of striped mice to high temperatures is the heavy pigmentation of the skull.

Tail length of striped mice, relative to head-and-body length, was used by Roberts (1951) as a taxonomic character at the subspecific level. He used the criteria: (a) tail longer than head-and-body, (b) tail about equal to head-and-body, (c) tail shorter than head-and-body.

The forms described from Kuruman, the Orange River valley from Prieska downstream and Little and Great Namaqualand were grouped as those with long tails; those from Knysna, Cape Town, Ovamboland, Swakopmund, the Karoo, Cradock, Port Elizabeth, Bloemfontein and Bethulie were regarded as having tails more or less equal to head-and-body length; and those from Zululand, Basutoland and Mazoe constituted the short-tailed group. Lundholm (unpublished note) considered the possibility of dividing the described forms into only two groups having either long or short tails.

MATERIAL AND METHODS

In a comparison of this nature, one should ideally use measurements made by only one person. The influence of this variable factor was discussed by Jewell and Fullagar (1966). The measurements used in the present study are unfortunately those of various collectors, namely Roberts

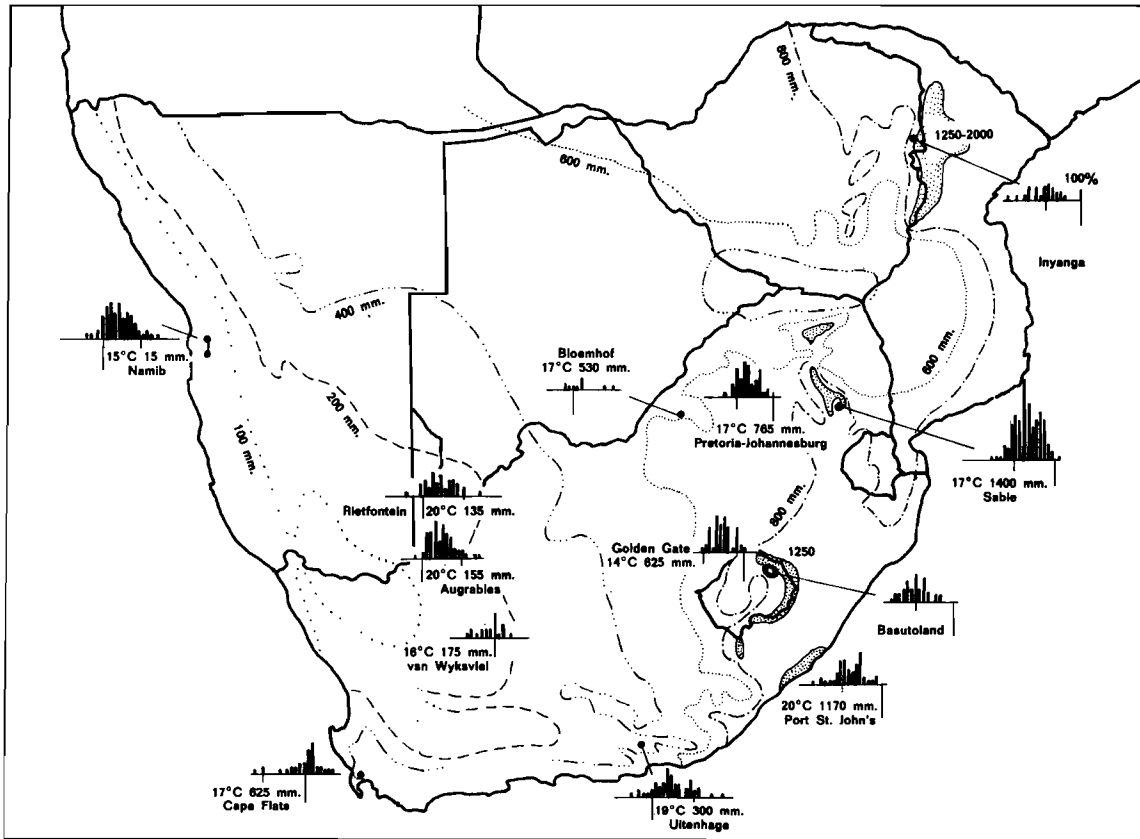


FIGURE 1

Histograms indicating the relative tail-length of Striped Mice from different areas, plotted on a map of Southern Africa with some isohyets drawn in. The annual mean temperature and precipitation given with some of the histograms represent the available figures for weather stations in the proximity of the collecting sites. The long vertical lines below the abscissae mark the 100% ratio while the shorter vertical lines are for either the 80% or 120% ratio. Climatological data were taken from official reports of the South African and Rhodesian Governments (South Africa, 1954 and Southern Rhodesia, 1952).

(seven specimens from Rooibank, which were grouped with others from the Namib, Pretoria and Southwestern Cape), the staff of the Medical Ecology Centre (Johannesburg, Karoo, Basutoland, Sabie and Uitenhage), Meester (Bloemhof), Lundholm (Rietfontein, Inyanga and the Namib), Swinney (Port St. John's) and myself (most of the Namib specimens, Golden Gate, the Kalahari and some from Uitenhage).

The need for a standard method of making body measurements was also discussed by Ansell (1965). The method used by all the collectors for measuring tail lengths used in the present study was, as far as I know, the "standard" or so-called "tail vertebrae" method.

Data from a large number of specimens in the Transvaal Museum and the Medical Ecology Centre were disregarded because of possibly different methods of measurement. The relative tail-length, expressed as a percentage of the head-and-body length, was used as a comparative criterion.

RESULTS

The histograms drawn on the map (Fig. 1) show the tail length to head-and-body length percentages for Striped Mice from different areas, as well as the relevant isohyets and other climatological data.

It can be seen that tail length is markedly greater than head-and-body length in specimens from the Namib, southwestern Kalahari, Augrabies and the Sundays River valley in the Uitenhage District. The areas have a mean annual rainfall of less than 400 mm. The mean maximal temperature for December is over 34°C for the region between Augrabies and the Namib and about 32°C in the Sundays River valley.

It can also be seen that tail length is about equal to head-and-body length in Striped Mice from:

- (a) the Cape Flats where the mean annual rainfall varies from over 600 mm. in Cape Town to less than 400 mm. 20 miles northwards. The mean maximal temperature for December is 25.5°C;
- (b) Van Wyksvlei (rainfall less than 400 mm. per annum, mean maximal temperature for December 33.3°C);
- (c) Panfontein, Bloemhof District, southwestern Transvaal (less than 500 mm. of rain per annum, mean maximal temperature for December 31.4°C).

Finally, it is evident from Figure 1 that tail length is less than head-and-body length in:

- (a) mice from regions in which the mean annual rainfall is between 600 and 1,000 mm., winters are cold and summers moderate (e.g. Pretoria, Golden Gate and the mountains of Basutoland). Mean maximal temperatures for December are 27.7°C in Pretoria and 25.1°C in Harrismith.
- (b) Sabie, Inyanga and Port St. John's with over 1,000 mm. rainfall per annum, mild winters and a mean maximal temperature for December of between 23.5°C (Inyanga) and 26.3°C (Sabie).

DISCUSSION

The above groupings indicate a possible influence of the mean annual rainfall (most probably in combination with temperature) on the relative tail length of Striped Mice. The histograms in Figure 1 are repeated in Figure 2 together with diagrams showing the annual "arid" period, based on the principle of Gaussen (1954), plotting mean monthly rainfall and temperature on the same graph and using a set scale of 20°C to 40 mm. (Walter & Leith 1960).

With the exception of those from Van Wyksvlei, the specimens with tails mostly shorter than head-and-body length come from places with an all-year-round "arid" period, i.e. where the mean monthly temperature graph exceeds the mean monthly rainfall graph. Mice with tail and head-and-body about equal in length come from places with (a) winter rainfall,

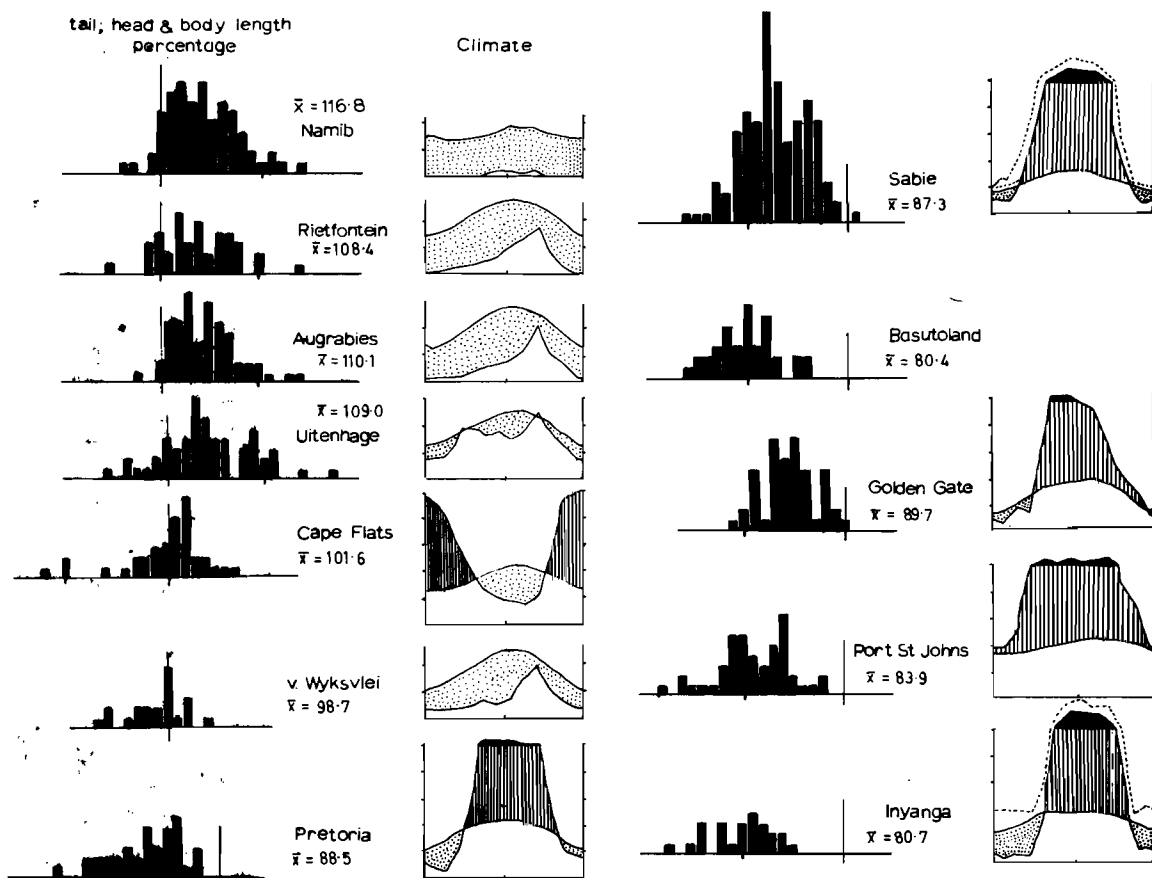


FIGURE 2

Histograms showing tail length percentages of Striped Mice from different collecting sites and climatic diagrams for collecting areas. Long vertical lines on histograms mark the 100% ratio while shorter lines are for either the 80% or 120% ratio. The mean tail length to head-and-body length percentage is shown in each case.

Legend of climatic diagrams showing rainfall (mm) and temperature ($^{\circ}\text{C}$) graphs, annual cycle depicted from July to June.

Shaded area: "Arid" period where the mean monthly temperature graph exceeds the mean monthly rainfall graph.

Striped area: "Moist" period where the mean monthly rainfall graph exceeds the mean monthly temperature graph but not "wet".

Solid area: "Wet" period, mean monthly rainfall exceeds 200 mm.

(b) year-round "arid" period and (c) about half the year "arid" but never "wet" during the rainy period.

The Pretoria-Johannesburg area has a moist summer with moderately high temperatures, while the temperatures during the "arid" winter are not too low (not as low, for example, as

those in the Drakensberg). In the same way, Sabie has a far less constant climate throughout the year than Port St. John's.

The slight difference between the mean tail to head-and-body ratios of males (87.19%) and females (88.79%) from Sabie shows that sex is of less importance than climate in determining tail length.

The actual body-sizes of Striped Mice from the different areas are not indicated in the histograms. Body-size of mice from Augrabies and Golden Gate may be compared; the mean head-and-body length of Striped Mice from Augrabies is 111.9 mm. and of those from Golden Gate is 99.5 mm. They are therefore larger in the drier, hotter region. This is contrary to Bergman's Rule, but characteristic for a number of species in southern Africa.

The collection of Striped Mice from Van Wyksvlei does not fit in with the general trends of tail-length in this species.

The variations in relative tail-length were compared with Stuckenberg's (1969) map of effective temperature; the effective temperature of 14°C lies more or less on the theoretical line of equal tail and head-and-body lengths. Although this criterion seems to be of use in the Cape Town-Van Wyksvlei-Bloemhof group, it cannot be used to relate the variations between average figures from Inyanga, Port St. John's and the Drakensberg.

CONCLUSIONS

The length of tails of Striped Mice, relative to their head-and-body length, appears to be influenced by the mean annual rainfall and temperature. Humidity (expressed as a measure of the precipitation) could be an influencing factor as shown by a comparison of specimens from Rietfontein, Pretoria and Inyanga on the one hand or from Swakopmund (Namib) and Port St. John's on the other. In accordance with Allen's Rule, temperature seems more effective in differences between mice from Basutoland and Pretoria or Augrabies. The histograms suggest that the summer climate is more important than the annual mean, especially in the relative tail-length of Striped Mice from the Cape Flats.

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