NOTES ON THE WATER REQUIREMENTS

OF CERTAIN NAMIB DESERT GERBILS

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(Running title: Water Requirements of Gerbils)

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INTRODUCTION

While stationed at the Namib Desert Research Station, Gobabeb, the author had the oportunity of carrying out a preliminary investigation on the water balance of gerbils.

At Gobabeb three biotopes meet: the high, wind-blown sand dunes to the south of the Kuiseb River, the dry Kuiseb River with its riverine forest of camelthorns Acacia giraffae and anna trees A. albida. The third biotope consists of gravel plains to the north of the river. Both dunes and plains lack open water (except for some isolated fountains, the nearest of which is over 50 km away), while the normally dry Kuiseb River has occasional pools of water left from rainy season floods. Vegetation is practically non-existent in the dunes but sparse grass and xerophytic shrubs occur upon the plains.

It is on this plain, especially under and amongst the granite boulders, that the gerbils have their burrows. These burrows are also found in old abandoned 'kraal' sites where the Topnaar Hottentots had penned their goats. Most burrows appeared to be grouped close to one another, forming distinct colonies and all three gerbil species were on occasions taken from one site.

The rainfall in this area is less than 25 mm per year and the only other sources of free water are dew and fog. Dew occurs fairly often while fog is rarer. Gobabeb is 64 km from the coast and fog, resulting from the cold Benguella Current, frequently moves far inland. There are times, however, when Gobabeb receives no fog for periods of up to three weeks (Schulze, 1969). This fog is presumably responsible for the survival of many species of xerophytic and succulent shrubs such as the *Mesembryanthemum* species. Moreover, it has recently been established that dead grass may hygroscopically gain up to 40% of its weight in water from dew and fog (M.K. Jensen, 1971, pers. comm.).

PROCEDURE

With the aid of Sherman traps, baited with cheese, grains etc., two brushtailed gerbils Gerbillus vallinus, twelve lesser gerbils G. paeba and two namaqua gerbils Desmodillus auricularis were caught alive. These traps were set in front of burrows at sunset and collected and emptied the following morning. All the animals were trapped in the immediate vicinity of the Research Station.

After capture the animals were weighed and placed in numbered cages. These cages were in some cases large glass bottles with fine wire netting placed over the top, the bottom was covered with sand and cotton waste. Other cages were constructed of wire mesh with trays at the bottom to facilitate the removal of urine, faeces and food waste.

Water was provided in graduated tubes in order to measure intake and the daily evaporation was measured in a control tube. Maximum and minimum temperatures were recorded daily in the laboratory where the animals were kept.

The animals were fed on shelled raw ground-nuts and a mixture of crushed maize, sunflower and sorghum seeds. Where possible the daily food consumption was measured and preferences were noted. Wild succulent plants were also made available in some cases and the response of the animals under conditions of dehydration was recorded. All weights and measurements were taken at 22h30 before the start of the activity cycle.

RESULTS AND DISCUSSION

Post-capture stress (in G. paeba) resulted in a loss of weight which continued for some days. With the exception of some temporary reversals of this trend the loss in weight continued when water was withheld until death occured. (Fig. 4). The rate at which this took place varied within the same species and is probably dependent upon individual physiological differences.

The influence of unlimited food and water upon the body weight was dramatic, indicating perhaps that, at the time of capture these animals found barely enough food to exist. One gerbil

(*G. vallinus*) gained 4,62 g over a 20 day period using 52,11 g food and 41,0 ml water (Fig. 1, from day 59 to day 79). As soon as water was provided the weight gain become constant with small, irregular daily fluctuations which could possibly be ascribed to the daily temperature fluctuations (Fig. 1, 2, 3).

Temperature exerted the expected influence on the gerbils and by determining the rate of dehydration. High temperatures reduced the intake of food and raised water consumption.

In the course of these trials various gerbils were given parts of *Mesembryanthemum* to eat and if they were in a dehydrated state they would consume up to 5,0 g (25% of body weight) of plant material.

Some gerbils tended to hoard their food, this activity was especially characteristic of one *D. auricularis*. It was also noted that *G. vallinus* eat and defecate in different locations in their cages and that these locations were never changed.

When a recently captured pair of *G. paeba* were placed together their first action was to smell each other's mouths. The male then nibbled the female's throat and ears whereupon she lay on her back while he continued to nibble her chest, stomach and to smell her vulva. She did not immediately respond to these attentions but a little later mounted him vigorously. In the following days she repeatedly mounted him but would not allow him to mount her.

When a sub-adult D. auricularis was placed with an adult female, the female killed him with a bite in the neck and proceeded to devour him. She consumed the tail and part of the rump. He could not have put up much resistance as she bore no scars.

The fact that the gerbils are found in the desert indicates that they are well adapted to the desert environment. They are nocturnal, burrow dwelling animals and thereby avoid environmental extremes, especially the extreme heat and dryness which prevails outside their burrows by day (Bolwig 1959). The various strategies employed for survival in the desert habitat by rodents have recently been reviewed in detail by Macmillen (1972) and no further elaboration is required here.

The above trials suggest that these gerbils could not utilise metabolic water efficiently enough to make them independent of free water under the conditions of the investigation. The results appear to indicate that they are dependent upon free water, a commodity which superficially appears to be very scarce in the desert. On closer examination of the desert habitat, however, it can be seen that water is not in fact so scarce for small animals. Dew and fog precipitation can be utilised by licking the moisture from rocks and other objects, as many of the insects have been observed to do. Failing this, feeding upon succulents can also supply the required water. Moreover, although it was not proved, it is suspected that gerbils often take insects to supplement their diet and water requirements.

Finally, it should be emphasised that these trials were not carried out under ideal conditions and the conclusions can only be considered very tentative. For example, the inclusion of ground nuts in the diet may have placed an unnaturally high urea load on the kidneys because of their high protein content. Furthermore, the relative humidity in the laboratory cages was probably not as high as in the natural burrow and, perhaps of equal importance, laboratory conditions may not have allowed the animals to enter into a circadian torpor which could have placed additional demands on the animals' water resources. The experiments obviously require to be repeated under more natural conditions, using larger numbers and with minimum disturbance to the animals. They may then be able to survive on air dry food as their ability to concentrate urine (± 4000 mOsm/kg) is theoretically sufficiently high to allow them to be independent of free water (Louw, 1972; Macmillen, 1972).

ACKNOWLEIGEMENTS

The author would like to extend his appreciation to Dr. G.N. Louw for the suggestions he made when critically reading the manuscript. The assistance provided by Dr. M.K. Jensen and Mr. C. Coetzee in preparing the manuscript is also appreciated.

REFERENCES

Bolwig, N.

1959 Further observations on the physiological and behavioural characteristics of small animals in the southern Kalahari. Koedoe 2, 70 -

Louw, G.N.

1972 The role of advective fog in the water economy of certain Namib Desert animals. Symp. Zool. Soc. Lond. No. 31, 297 - 314

Macmillen, R.E.

1972 Water economy of nocturnal desert rodents. Symp. Zool. Soc. Lond. No. 31, 147 - 174

Meester, J., Davis, D.H.S. and Coetzee, C.G.

1964 An interim classification of Southern African Mammals. Roneoed.

Schulze,

1969

CAPTIONS TO FIGURES

Fig. 1 Increase in body weight of G. vallinus together with food and water consumed and the mean daily temperature.

Fig. 2 The influence of unlimited water and food upon the live weight of *G. paeba*.

Note: ▲ = allowed to drink *ad lib*.

△→ = water freely available from this point onwards. Placed in same cage on 30th day.

Fig. 3 The effect of water upon body weight of *G. vallinus* after dehydration.

Fig. 4 The effect of withholding water upon live weight of *G. paeba*. Unless water is provided at the critical weight, death will occur.