Observations on the utilization of a dune succulent by Namib faunae

Karen Nott* and M.J. Savage

Department of Soil Science and Agrometeorology, University of Natal, Pietermaritzburg
*To whom correspondence should be addressed at; P.O. Okaukuejo, via Outjo, 9000 South West Africa

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Trianthema hereroensis is one of the few plant species which persist during long dry periods in the Namib dunes. Direct and indirect utilization of this plant by Namib faunae, for food and shelter, were observed. Utilization of *T. hereroensis* by *Oryx gazella* resulted in vigorous regrowth which was preferentially utilized. The extent of utilization as well as the response of this plant to utilization, are discussed.

Trianthema hereroensis is een van die weinige plantsoorte wat langdurige droë periodes in die duine van die Namib oorleef. Direkte en indirekte benutting van hierdie plant as voedsel en beskutting deur Namib-fauna is waargeneem. Benutting van *T. hereroensis* deur *Oryx gazella* lei tot vinnige hergroei wat dan by voorkeur benut is. Die mate van benutting en die reaksie van hierdie plantsoort op benutting, word bespreek.

The southern Namib dune system comprises an area of low and sporadic rainfall (Seely & Louw 1980). After rainfall several ephemerals germinate. Dormant perennials become active, producing new vegetative growth and dune faunae increase in numbers. In the dry years following rain, resources become increasingly limited and patchy, and plant and animal population sizes decrease. During dry years, the dune faunae are restricted to a system dominated by a succulent shrub, *Trianthema hereroensis*, and a coarse grass, *Stipagrostis sabulicola*, whose continued growth is possible because of their capability of utilizing the moisture from frequent but irregular advective fogs (Seely, de Vos & Louw 1977; Louw & Seely 1980).

Trianthema hereroensis, in particular, provides nourishment and shelter for a large variety of satellite faunae (Seely *et al.* 1977). Although only 1% of the dune slope surface area is covered by *T. hereroensis* and *S. sabulicola*, 32% of the animal population occurs within and around these plants (Seely & Louw 1980). In this paper we present some observations of the utilization of *T. hereroensis* by Namib faunae during a dry period.

The study was undertaken in the Namib-Naukluft Park in SWA/Namibia. Three study sites were chosen within the southern Namib dune system, south of the Kuiseb river. Rooibank, Flodden Moor and Vulture Valley are 12, 53 and 70 km from the coast and have plant densities of 60, 31 and 22 plants per ha, respectively. From July 1982 to June 1983, each site was visited at least twice a month.

Ten parallel transect lines of variable length were laid out at each site from the dune base to the area below its slipface. The transect lines were located on either side of the interdune valley in opposite pairs at 300-m intervals, starting from a randomly chosen point. Along each transect line a series of 400-m quadrats, 60 m apart, was permanently marked.

In December 1982, plants in each quadrat were counted to obtain the species composition, defined as the frequency of occurrence of a given species relative to the total number of all plants. *T. hereroensis* was the only plant found at Rooibank, but represented only 14% of the species composition at Flodden Moor and 9% at Vulture Valley (Table 1). *S. sabulicola* and *Asthenotherum glaucum* were major components of the vegetation at Flodden Moor and Vulture Valley. *A. glaucum* was found growing at the dune base, while *S. sabulicola* was found mostly near the top of the dunes. *T. hereroensis* plants occur at the dune base and along the dune slope.

Table 1 The percentage species composition (a) and percentage of the total number of grazed plants (b) that each species represented at each site, December 1982

	Sites					
	Rooibank		Flodden Moor		Vulture Valley	
Species	a	b	a	b	a	b
Poaceae						
Asthenotherum glaucum	0	–	44	1	39	0
Eragrostis spinosa	0	–	4	1	5	3
Stipagrostis lutescens	0	–	0	–	5	11
Stipagrostis sabulicola	0	–	38	78	42	57
Aizoazeae						
Trianthema hereroensis	100	0	14	20	9	29

The relative positions of *T. hereroensis* plants within each quadrat were mapped as distances from the permanent markers. Individual plants could then be relocated from the map without marking each plant. The germination of any new plants and the growth or death of existing plants could thus be monitored. Subjective monthly assessments of the extent of grazing were performed on each plant over the 12-month period.

Observations were made on the species and numbers of animals occurring in the study areas. Numbers of large herbivores were deduced by counting the numbers of animals present or by assessment of their tracks. Direct (food) or indirect (shelter) utilization of *T. hereroensis*, by these animals was recorded.

Sidewinding adders, *Bitis peringueyi*, fork-marked sand snakes, *Psammophis leightoni trinasalis*, and Cape foxes, *Vulpes chama*, were all observed utilizing *T. hereroensis* as temporary shelter.

Springbok, *Antidorcas marsupialis* and ostriches, *Struthio camelus* feed on *T. hereroensis* during the irregular periods that they inhabit the dunes. *T. hereroensis* plays host to honeydew-producing scale insects, *Eriococidae* sp. Ants, *Campenotus detritus*, utilize this honeydew as well as the nectar of the flowers. These flowers attract many small flying insects which are eaten by chameleons, *Chameleo namaquensis*. On eleven occasions, flocks of 8 to 25 grey-backed finch-larks, *Eremopterix verticalus* were observed feeding on the seeds of *T. hereroensis* exposed by animal disturbance around the plant and were noted, on seven occasions, to peck at the leaves of the plant, possibly to obtain moisture from them.

During the present investigation, *T. hereroensis* appeared to be the only food source of hairy-footed gerbils, *Gerbillurus paeba,* nocturnal dune-dwelling rodents. Apart from four observations of gerbils collecting or eating pieces of *T. hereroensis* broken by feeding *Oryx gazella*, remains of this plant were found at the entrance to gerbil burrows on nine occasions. Our findings agree with those of Laycock (1975), who reported that these gerbils were entirely herbivorous during dry years when invertebrate prey concentrations are low.

Gemsbok, *Oryx gazella*, are the only large herbivores resident in the dunes. Between two and twelve gemsbok were resident at Flodden Moor and about five at Vulture Valley, while none were seen at Rooibank.

During the investigation, some *A. glaucum* plants were present at the study sites and after a small amount of rain, produced new leaves. However, this material was not utilized by gemsbok, as noted by Seely & Louw (1980) while *S. sabulicola* and *T. hereroensis*, which are less preferred during the wet periods, were utilized extensively. Gemsbok often began by feeding on *T. hereroensis* plants at the base of the dunes and then moved up the dune slope to feed on *S. sabulicola*. The latter did not regrow rapidly and many of these plants remained dormant after defoliation.

Within four to six weeks of being grazed, *T. hereroensis* plants rapidly produced succulent regrowth with a significantly higher xylem water potential (Nott & Savage Unpubl.). This was more attractive to gemsbok than the older and less succulent plant material. The monthly assessments of plants within the quadrats indicated that certain plants were being eaten regularly, while others in the same quadrat were left untouched (Table 2). For example, at Flodden Moor 70% of the *T. hereroensis* plants that had been grazed in August 1982 had been grazed during July, 1982. All plants grazed in March 1983 had been previously grazed. The variation, between months, in the extent of utilization, was due to local movements of the gemsbok.

The new leaves on grazed plants are larger and brighter in colour. This difference in appearance may assist gemsbok in locating preferred plants. This selective feeding was also evident from gemsbok tracks. They moved directly from one recently grazed plant to the next, ignoring the ungrazed plants. Since tracks on the soft sand are quickly covered by the regular winds, the gemsbok could not be following a visible path. Memory therefore may also play a role in relocation of the plants.

The vigorous regrowth of *T. hereroensis* in a desert environment following grazing is unexplained. It is possible that grazing stimulates higher metabolic activity in the remaining leaf tissue and induces stomatal opening (Gifford & Marshall 1973). The opening of stomata would also imply more efficient utilization of water from the advective fogs. Ruminant saliva is claimed to have a growth stimulating effect (Rearden, Leinweber & Merrill 1972; 1974). Several plants were clipped, and trampled in an attempt to simulate the effect of gemsbok grazing. The plants did not exhibit the vigorous regrowth of those grazed by gemsbok and in many cases, there was no regrowth.

Since several of the gemsbok moved out of the study areas towards the end of the investigation, even though there seemed to be sufficient *T. hereroensis* material available for grazing, the plants were not subjected to continuous severe utilization. It is possible that the plants would have been unable to maintain vigorous regrowth had this severe utilization regime continued. However, of the plants that died during the investigation, only a small percentage had been grazed (Table 3). The highest percentage plant mortalities occurred at Rooibank where plants are totally dependant on fog as their source of moisture. At Flodden Moor and Vulture Valley where groundwater is sometimes available and where the plants are utilized, plant mortalities were lower.

Table 2 The extent of grazing by *Oryx gazella* of *Trianthema hereroensis* for the period July 1982 to June 1983

	Rooibank $n = 139$		Flodden Moor $n = 51$		Vulture Valley $n = 26$	
1982/3	a	b	a	b	a	b
July	0	–	43	–	31	–
August	0	–	53	70	38	70
September	0	–	47	92	54	64
October	0	–	33	94	65	88
November	0	–	39	85	38	100
January	0	–	39	80	23	100
March	0	–	29	100	15	100
April	0	–	32	100	23	100
May	0	–	32	100	25	100
June	0	–	38	100	–	–

n = number of plants.
a % of the *T. hereroensis* population which was grazed.
b % of the plants grazed in that month which had been grazed previously.

Table 3 The percentage plant mortalities during the investigation and the percentage of these plants which had previously been grazed

Site	% plant mortalities	% dead plants previously grazed
Rooibank	36	0
Flodden Moor	22	18
Vulture Valley	15	25

In conclusion, *T. hereroensis* is an important component of Namib dune vegetation since it provides a source of shelter and food for a variety of dune faunae. Plant regrowth appears to be stimulated by gemsbok grazing, but the reasons for the regrowth need to be more fully investigated.

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A preliminary report on locomotory activity in wild and captive *Chrysospalax trevelyani* (Mammalia: Chrysochloridae)

A.H. Maddock* and G.C. Hickman

Department of Zoology, University of Natal, P.O. Box 375, Pietermaritzburg, 3200 Republic of South Africa
*To whom correspondence should be addressed

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The locomotory activity of a free-ranging, male *Chrysospalax trevelyani* was monitored for five days in the Amatola Forest, Ciskei, using radio telemetry. In addition, locomotory activity of a captive juvenile male and adult female *C. trevelyani* was monitored in a special laboratory enclosure for 30 days. Preliminary results indicate that the giant golden mole has a primarily nocturnal regimen possibly associated with its feeding physiology or thermoregulation. It is also suggested that diurnal locomotory activity of *C. trevelyani* on the surface occurs as a result of extreme conditions and is not usual.

Die bewegingsaktiwiteit van 'n vrylopende, manlike *Chrysospalax trevelyani* is vyf dae lank in die Amatolawoud, Ciskei, deur middel van radiotelemetrie gemonitor. Daarbenewens is bewegingsaktiwiteit van aangehoue jeugdige manlike en volwasse vroulike *C. trevelyani* 30 dae lank in 'n spesiale laboratoriumruim gemonitor. Voorlopige resultate dui aan dat die reusekruipmol 'n vernaamlik nagtelike regimen het wat moontlik met sy voedingsfisiologie of termoregulasie verband hou. Daar word ook aan die hand gedoen dat die bewegingsaktiwiteit van *C. trevelyani* bedags bogronds voorkom as gevolg van uiterste omstandighede en nie gebruiklik is nie.

Chrysospalax trevelyani is endemic to eastern parts of southern Africa. Little is known about the giant golden mole owing to its rarity (inclusion in the I.U.C.N. Red Data Book) and secretive habits (Poduschka 1980; 1982). The present study on the locomotory activity of this animal provides information which may improve the effectiveness of capture techniques and laboratory studies.

The locomotory activity of two giant golden moles (one 420-g female and one 338-g male), caught in the Amatola Forest, Ciskei during October and December 1983 respectively, was measured in an indoor enclosure (Figure 1). Photocells were positioned strategically in the molearium (Figure 1) and movements through each of four light beams were automatically recorded on an Esterline Angus event recorder (Hickman 1980). Days were divided into 5-min periods and moles were considered active for the entire 5-min period regardless of the number of times activity was recorded during that period. Food was placed randomly in the forage area (Figure 1) between 08h00 and 09h00 and again between 17h00 and 18h00. A 12L:12D photoperiod simulated day (06h00 to 18h00) and night conditions while temperature (21,1 ± 0,4°C) and humidity (70%) were kept constant. Data were statistically compared using the Student's t test.

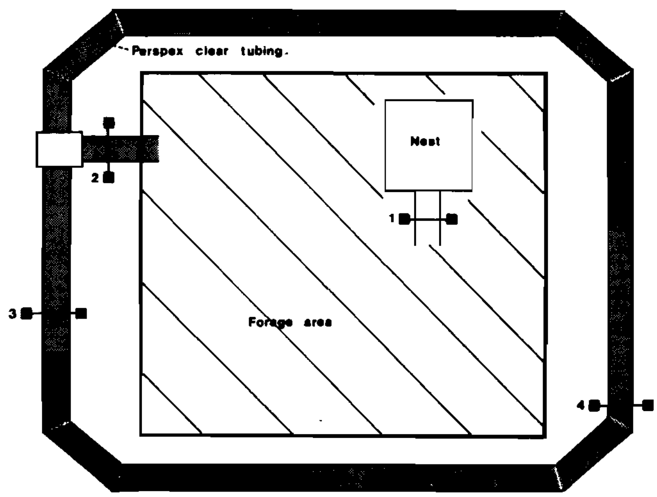

Figure 1 Plan of the artificial burrow system (molearium) indicating position of photocells (1 – 4), nest, forage area and clear perspex tubing. All measurements in cm. Scale 1 : 20.

Movements of a male giant golden mole (528 g) in the Amatola Forest, Ciskei were monitored in December 1983 using a Mini Mitter CH – 12 receiver and hand-held AF antenna. A 5 g 27,615 MHz 'Tm' transmitter (for maximum penetration of the soil) was glued to the dorsal pelage of the mole. Direct observations supplemented telemetry data.

In the laboratory the duration of locomotory activity was greater at night (74,3 ± 40,2 min) compared to day (34,8 ± 34,6 min; $P < 0,001$; Figure 2). Units of locomotory activity at night ranged from 5 to 114 min duration (35,9 ± 25,0 min) with a mean rest period of 142,9 ± 134,7 min (range 12 – 216 min). One longer rest period (264 ± 66 min) also occurred during the night. Between zero and six units of locomotory activity (3,2 ± 1,4 units/night), punctuated by rest periods with a range of 12 to 216 min, occurred nightly and were similar to the number of units recorded during the day (range 0 – 6; 3,1 ± 1,7 units/day).

Diurnal units of activity were significantly shorter than those recorded at night (20,6 ± 20,5 min; $P < 0,001$) and the mean rest periods significantly longer (176,4 ± 170,8 min; $P < 0,05$). During diurnal conditions a total of 32 isolated 5-min locomotory activity periods representing a single movement through one photo-electric beam (suggesting a change in