Habitat use by the southern springhare (*Pedetes capensis*) in the Eastern Cape Province, South Africa

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The habitat and dietary preferences of the southern springhare, *Pedetes capensis,* were investigated on a farm in the Eastern Cape Province, South Africa. The farm comprised a variety of habitat types and was typical of the greater range occupied by springhares in this region. Springhares preferred short grass (*Cynodon dactylon* and *Cyperus esculentus*) dominated habitats found in recently disturbed or cultivated areas. These provide a suitable environment for predator detection and avoidance, and provide an abundant, good quality, stable food supply throughout the year. Stomach contents and springhare feeding patches confirmed that in addition to leaf material, *C. dactylon* rhizomes and C. *esculentus* tubers are heavily utilized. *C. esculentus* abundance was significantly positively correlated with springhare densities. Springhares avoided fields in which chicory (*Cichorium intybus*) was cultivated and no evidence of them feeding on chicory roots or leaves was found.

Key words: springhares, *Pedetes capensis,* habitat use, diet.

INTRODUCTION

The southern springhare, *Pedetes capensis,* from southern Africa, and the eastern springhare *Pedetes surdaster* from East Africa (Matthee & Robinson 1997), are large (3–4 kg), nocturnal, bipedal, saltatorial rodents that shelter in complex burrow systems during the day. They are found throughout large parts of southern and East Africa where deep sandy and other soft soils provide a suitable substrate for burrowing. The physical nature of the substratum appears to be the major limiting factor in their natural distribution. Springhares prefer flat, open, short grasslands or sparsely vegetated habitats (FitzSimons 1920; Smithers 1971; Kingdon 1974; Butynski & Mattingly 1979; Coetzee 1979; Rautenbach 1982; Butynski 1984; Augustine *et al.* 1995; Anderson 1996) and in southern Africa are frequently associated with geological features known as pans, particularly the edges of these pans (Butynski 1984; Anderson 1996).

Springhares feed on the roots, stems, leaves, leaf bases, corms, rhizomes, and seeds of various plant species, but particularly grasses (Kingdon 1974; Smithers 1971; Butynski & Mattingly 1979; Williamson 1987; Augustine *et al.* 1995; Anderson 1996). They are almost entirely herbivorous, although there are reports of springhares feeding on locusts, beetles (Kingdon 1974; De Graaff 1981) and carrion (O'Brien 1982). The principal food of springhares throughout their distributional range is couch grass (*Cynodon dactylon*) with the leaves and particularly the rhizomes being eaten (Shortridge 1934; Smithers 1971; Jacobsen 1977; Watson 1992; Augustine *et al.* 1995; Anderson 1996).

In the Northern Cape Province springhares have been shown to utilize at least 20 different plant species; eight grasses, five dwarf shrubs, one geophyte, five trees and shrubs, and one herb (Anderson 1996). The eight grasses comprised approximately 76% of the springhare's diet. Of the 20 species eaten, only four contributed more than 5% of the total diet. These were the grass species *C. dactylon, Schmidtia pappophoroides* and *Eragrostis lehmanniana,* and the geophyte *Gladiolus permeabilis.* These four species together accounted for approximately 74% of the diet (Anderson 1996).

Where springhares occur in large numbers they can have a considerable impact on their feeding grounds (Anderson 1996). While feeding on roots and rhizomes they systematically dig over extensive patches of ground, totally denuding them of vegetation. They are highly selective and wasteful

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feeders, often eating only the choicest parts of plants and discarding the remainder (Shortridge 1934; Kingdon 1974; Skinner & Smithers 1990; Watson 1992; Augustine *et al.* 1995; Anderson 1996). This destructive and wasteful nature of feeding, coupled with high population densities, regularly brings them into conflict with farmers (Butynski 1973; Kingdon 1974; De Graaff 1981; Willan 1992; Anderson 1996).

In the Eastern Cape, springhares are commonly regarded by farmers as pests, particularly of chicory (*Cichorium intybus*), which is one of the most important crops grown in this region (Anon. 1992; Kigozi 2003). Nevertheless, little is known about their habitat preference, diet, or impact on the natural vegetation and agricultural crops in this area. The Eastern Cape lies at the southern limit of the southern springhares' distributional range where the biotic and abiotic factors are very different to those of previous studies. Rainfall is typically much higher, the climate less seasonal, agriculture is practiced more intensely, and the natural vegetation is very different.

We examined the habitat preference of springhares and, to a lesser extent, their diet and status as a pest of chicory. This will improve our understanding of the general ecology of springhares and lead to the improved management and control of these animals in areas where they are agricultural pests.

MATERIALS AND METHODS

Study site

The study was carried out on a portion of the farm Marlu in the Eastern Cape Province of South Africa (33°26′S, 26°19′E; altitude 415–450 m). The study site was chosen as it was representative of the greater area inhabited by springhares in this region and because it incorporated a variety of habitat types. The chosen 226 ha portion consisted of a mosaic of undisturbed natural grassland, old fields in various successional stages, and some recently cultivated areas. During the course of the study chicory was grown in some of the recently cultivated areas.

Springhare numbers and habitat preference

To evaluate habitat preferences of springhares within the study site, the site was subdivided into 15 sections or camps, each encompassing an area of relatively uniform vegetation (Fig. 1). These divisions were based primarily, but not exclusively, on existing divisions and fence lines. Information on the prior cultivation of the various camps was obtained from the farm owner and from orthophoto maps.

The number of springhares in each habitat type was determined by carrying out nighttime counts from a vehicle that traversed the study site along a set route (Fig. 1). This route was selected to ensure that practically the entire study site was covered with as little overlap as possible. It was approximately 5 km long and took 30–45 min to complete. This method could potentially result in double counting of individuals but this is unlikely to have occurred as the study site was divided into clearly distinguishable camps and springhares seldom, if ever, move much when disturbed in this fashion. The method used was similar to that employed by Butynski (1984), Augustine *et al.* (1995), and Anderson (1996). Sizes of those areas not covered by the drives (*i.e.* sites with dense, high vegetation or that were out of range of the spotlight) were subtracted from the sizes of the respective camps and the number of springhares per hectare calculated accordingly. In total, 149 ha of cultivated, old cultivated and previously uncultivated land was surveyed.

Counts and observations of springhares were made from a seat mounted on top (2 m above ground) of a slow-moving (10–15 km/h) vehicle. A 12 volt, one-million candlepower, hand-held spotlight was used to detect springhares. The bright eye reflection of springhares, their habit of bobbing up and down on their hind legs when disturbed, the flat, open nature of the terrain, and the height of the observer above the ground, ensured that springhares were readily detected at distances of up to 300 m. In places, however, a night vision telescope was also used to scan for springhares. The number of springhares in each habitat type was recorded on a dictaphone and the data subsequently transferred to a 1:10 000 orthophoto map. Counts were conducted four times/night during the austral summer months when nights were short (December–February) and five times/night for the remainder of the year. They began approximately two hours after sunset and were repeated at intervals of two hours throughout the night with the last count beginning approximately two hours before sunrise. Overall, 204 counts were done on 45 different nights over a period of 15 months. Counts were, however, not conducted in thick mist due to severely impaired visibility.

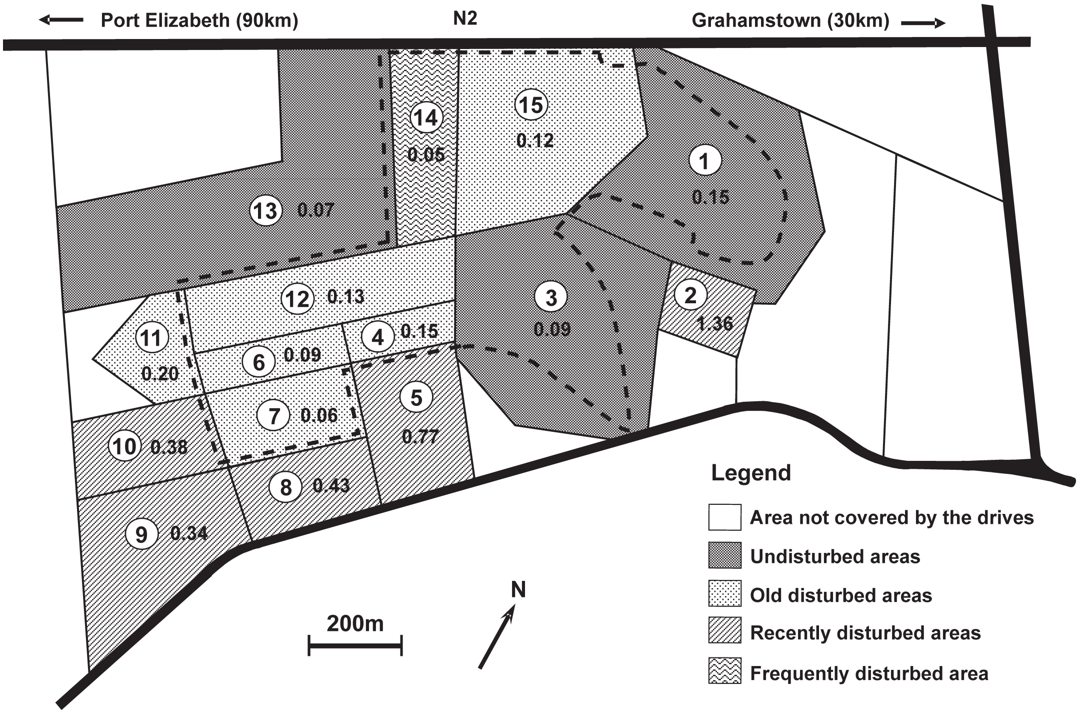

Fig. 1. Map of the study site. Camp numbers are given in circles and the mean number of springhares/ha in bold. The dashed line is the route driven.

Of the four or five counts conducted each night, only the one on which most springhares were encountered was selected for further analysis, thus giving a total sample size of 45 counts from 45 different nights. This was done to obtain the most accurate estimates of density, as springhare activity is known to be influenced by the time of night, phase of moon and certain weather conditions (Butynski 1984; Anderson 1996; Brown & Peinke, in press). Data are presented as both the mean (±1 S.D.) number of springhares encountered in each camp and as the mean (±1 S.D.) springhare density (*i.e.* springhares/ha) in each camp.

Vegetation sampling

A modified point-intercept method (Levy & Madden 1933; Goodall 1952; Kershaw & Looney 1985; Kent & Coker 1992; Vorster 1999) was used to describe the plant species composition and cover in each of the 15 camps. Three points were randomly selected in each camp and fifty points, at 0.5 m intervals, subsequently sampled in a straight line to the north, south, east and west of each of these three central points, thus giving a sample of 603 points per camp. Two hundred to 500 points are generally considered to be sufficient for a good description of the vegetation of an area (Levy & Madden 1933; Tiver & Crocker 1951; Mueller-Dombois & Ellenberg 1974; Vorster 1999).

At each point a 4 mm diameter rod was inserted perpendicularly into the vegetation and a record made of all the plant species in contact with the rod. All sampling was done in the absence of wind as this can markedly affect the results. If no vegetation was contacted, bare ground was recorded. The number of points at which a given species was contacted was expressed as a percentage of the total number of points sampled, which is in turn equal to the percentage cover of that species. As this is a species cover method, and since more than one species may cover the same unit of ground, the sum of the percentage covers can exceed 100%. Voucher specimens of all plant species encountered during this survey are housed at the Selmar Schonland Herbarium in the Albany Museum, Grahamstown. During the survey, all bare ground contacts that could be directly attributed to springhare feeding activity were also recorded.

Any springhare feeding patches encountered during the course of the study were also carefully examined for evidence of what springhares were feeding on. As springhares are extremely messy and very selective feeders, these patches are usually littered with discarded and partially eaten plant material. The plants and parts thereof (*e.g.* stems, flowers, roots, leaves, leaf bases and stolons) that springhares are feeding on can usually be identified from this discarded material.

Statistical analysis

Cluster analysis was used to group camps into similar vegetation types and a chi-square test was used to determine whether or not springhare distribution within the study site was significantly different from random. Correlation analyses were performed to determine if springhare numbers were correlated with any specific plant species, while changes in the number of springhares observed prior to and after various disturbances, which occurred in some camps during the study period, were examined for significance by means of Mann-Whitney *U*-tests. Statistica (StatSoft, Inc.) was used for all statistical tests and in all cases a 0.05 level of probability was accepted as indicating statistical significance.

RESULTS

The 15 camps were grouped into four main vegetation types; undisturbed natural grassland (camps 1, 3 and 13), old fallow fields in various successional stages (camps 4, 6, 7, 11, 12 and 15), recently disturbed (*i.e.* ploughed) fields dominated by early pioneer species (camps 2, 5, 8, 9, and 10), and a single frequently disturbed area (camp 14) that was devoid of all natural vegetation (Fig. 1). Grouping the 15 camps into these four main vegetation types was supported by a cluster analysis of species cover. All of the old fallow fields were last ploughed at least 15 years prior to this study, whereas the recently disturbed fields were all ploughed on one or more occasion during the course of the study or in the three years preceding it (A. Page, pers. comm.). Camps 9 and 10 were planted to chicory midway through the study and this chicory was harvested 6 months later after which these camps were left lying fallow. When ploughed, these recently disturbed camps rapidly returned to their former states and even during the period when chicory was cultivated in camps 9 and 10 the pre-cultivation species were extremely abundant as no weed control was practiced. Camp 14, the frequently disturbed area, was devoid of all natural vegetation because it was repeatedly ploughed from shortly before the start of this study until chicory was planted in an attempt to eradicate the weeds. After chicory was planted it was regularly weeded until the end of the study.

A chi-square test showed that springhares were not randomly distributed within this grassland mosaic but showed a distinct preference for specific camps ($\chi^2 = 42.53$, d.f. = 14, $P < 0.001$). On average, more springhares than expected from a random distribution were observed in the recently disturbed camps 2, 5, 8, 9 and 10 (Table 1; Fig. 1), with camps 2 and 5 being particularly favoured. Camp 14, the frequently disturbed camp, was one of the least preferred camps (Table 1).

The dominant plant species (*i.e.* those with ≥5% cover) in each camp are given in Table 2. All the recently disturbed or preferred camps were dominated by a high proportion of *C. dactylon* and *Cyperus esculentus* with few other grass species. It should, however, be noted that chicory was cultivated in camps 9 and 10 for a large portion of the study period and that the vegetation survey was conducted only after the chicory was harvested. Nevertheless, prior to the planting of chicory and after its harvesting these two species predominated. During the period of chicory cultivation the chicory was also heavily infested by both *C. dactylon* and *C. esculentus.*

In contrast to recently disturbed camps, old disturbed camps were all dominated by the grasses *C. dactylon, Sporobolus africanus, Eragrostis curvula* and *Eragrostis plana* (Table 2). The undisturbed camps (1, 3 and 13) were more diverse than recently disturbed and old disturbed camps, and were characterized by a low coverage of *C. dactylon,* the absence of *C. esculentus,* and the presence (in addition to *S. africanus, E. curvula* and *E. plana*) of the grasses *Themeda triandra, Brachiaria serrata, Heteropogon contortus, Tristachya leucothrix, Harpochloa falx, Eragrostis chloromelas* and *Elionurus muticus* (Table 2). The frequently disturbed camp 14 was devoid of any natural vegetation.

Feeding patches attributable to springhares were predominantly encountered in recently disturbed camps (Table 1). These feeding patches were also found in all other camps but, because they occurred at much lower densities and were much smaller in area, they were not contacted during the point intercept survey. In the two most preferred camps (2 and 5) these feeding patches

Table 1. Habitat utilization and the density of springhares within the study site. Those camps utilized more than expected from a random distribution (*i.e.* observed > expected or density > 0.21 springhares/ha) have been shaded. (RD = recently disturbed, OD = old disturbed, UD = undisturbed and FD = frequently disturbed).

Camp number	Mean No. of springhares observed (n = 45)	No. of springhares expected from a random distribution	Mean (± 1 S.D.) No. of springhares/ha (n = 45)	Percentage of camp dug over by springhares (%)	History
1	3.09	4.20	0.15 ± 0.11	0.0	UD
2	4.36	0.66	1.36 ± 0.91	6.0	RD
3	1.80	4.30	0.09 ± 0.09	0.0	UD
4	0.38	0.52	0.15 ± 0.26	0.3	OD
5	6.02	1.61	0.77 ± 0.57	4.0	RD
6	0.29	0.70	0.09 ± 0.22	0.0	OD
7	0.36	1.22	0.06 ± 0.19	0.0	OD
8	2.44	1.18	0.43 ± 0.58	0.5	RD
9	3.78	2.32	0.34 ± 0.38	0.3	RD
10	2.29	1.26	0.38 ± 0.55	2.0	RD
11	0.82	0.85	0.20 ± 0.40	0.0	OD
12	1.18	1.92	0.13 ± 0.16	0.0	OD
13	1.76	5.32	0.07 ± 0.08	0.0	UD
14	0.31	1.37	0.05 ± 0.12	0.0	FD
15	1.87	3.31	0.12 ± 0.10	0.0	OD

accounted for 6% and 4% of the camp's ground cover, respectively. Examination of these feeding patches indicated that springhares fed predominantly on three species, C. *dactylon* rhizomes, *C. esculentus* tubers and, to a lesser extent, on *E. curvula* leaf bases. Gross examination of the stomach contents of 120 animals collected for a reproductive study (Peinke & Bernard 2005), however, revealed that large amounts of green leafy material are also consumed. Of all the plant species encountered in the study site, *C. esculentus* was the only species that was significantly positively correlated with springhare numbers (r = 0.76, P < 0.001).

Surprisingly, significantly more springhares were encountered in camps 9 and 10 when chicory was not cultivated (*i.e.* before planting and after harvesting) (Table 3). The same did not, however, apply to camp 14 where there was no significant difference in the number of springhares seen prior to and after planting (Table 3). There was also no significant difference (U = 208.50, P = 0.49) in the number of springhares seen in camp 2 before (4.35 ± 1.90, n = 17) and after (4.36 ± 3.42, n = 28) it was ploughed. The number of springhares seen in camp 13 did, however, increase significantly (U = 43.50, P < 0.001) from 0.28 ± 0.67 (n = 18) to 2.74 ± 1.93 (n = 27) after it was burned.

DISCUSSION

Springhares within the study site showed a distinct preference for recently disturbed camps or those dominated by *C. dactylon* and *C. esculentus.* Both *C. dactylon* and *C. esculentus* are serious weeds of cultivated lands and disturbed ground. *C. dactylon* is a hardy and important pioneer grass. It is a rhizomatous and stoloniferous, mat-forming, perennial species that spreads rapidly to cover any bare ground. It is a relatively good pasture grass, capable of withstanding intensive grazing, and has an average grazing value under natural conditions (Tainton *et al.* 1976; Müller 1984; Grabrandt 1985; Gibbs Russell *et al.* 1991; Van Oudtshoorn 1992). Although the leaves are eaten by springhares, it is the rhizomes of this grass that are particularly favoured (Shortridge 1934; Smithers 1971; Skinner & Smithers 1990; Augustine *et al.* 1995; Anderson 1996; D.M. Peinke, pers. obs.). *C. esculentus,* like *C. dactylon,* develops lateral rhizomes. These, however, terminate in edible tubers. The plant is very competitive and reproduces by seeds, rhizomes and tubers, hence its high density in recently disturbed areas. Although there are no previous reports of springhares feeding on *C. esculentus,* it was the only species that was significantly correlated with springhare numbers.

In contrast to recently disturbed lands, spring-

Table 2. Percentage plant and bare ground cover in each of the camps at the study site (all species with <5% cover have been excluded).

Species	Camp number														
	Recently disturbed					Old disturbed						Undisturbed			Frequently disturbed
	2	5	8	9	10	4	6	7	11	12	15	1	3	13	14
Arctotheca calendula	–	–	–	7	–	–	–	–	–	–	–	–	–	–	–
Bare ground	6	6	–	20	26	–	–	–	–	–	–	–	–	9	100
Brachiaria serrata	–	–	–	–	–	–	–	–	–	–	–	5	26	9	–
Chenopodium album	–	–	–	–	6	–	–	–	–	–	–	–	–	–	–
Conyza albida	–	–	–	7	–	–	–	–	–	–	–	–	–	–	–
Cynodon dactylon	78	83	82	50	56	78	75	77	77	65	65	22	7	–	–
Cyperus esculentus	73	43	62	58	65	7	9	–	13	–	–	–	–	–	–
Digitaria natalensis	–	–	–	–	–	–	–	–	–	11	–	20	–	–	–
Diheteropogon filifolius	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–
Ehrharta calycina	–	–	–	–	–	–	7	–	9	10	–	–	–	–	–
Elionurus muticus	–	–	–	–	–	–	–	–	–	–	–	5	7	6	–
Eragrostis chloromelas	–	–	–	–	–	–	–	–	–	–	8	7	7	13	–
Eragrostis curvula	–	6	–	–	–	22	9	8	34	13	71	21	30	11	–
Eragrostis plana	–	–	–	–	–	28	30	33	25	24	6	17	9	–	–
Harpochloa falx	–	–	–	–	–	–	–	–	–	–	–	–	–	7	–
Heteropogon contortus	–	–	–	–	–	–	–	–	–	–	–	5	6	26	–
Restio triticeus	–	–	–	–	–	–	–	–	–	–	–	22	–	–	–
Rumex acetosella	–	–	14	–	–	–	–	–	–	–	–	–	–	–	–
Senecio inaequidens	–	–	–	9	–	–	–	–	–	–	–	–	–	–	–
Setaria sphacelata	–	–	–	–	–	–	–	–	–	18	6	–	–	–	–
Sporobolus africanus	–	–	6	–	–	35	42	45	33	33	7	23	20	8	–
Themeda triandra	–	–	–	–	–	–	–	–	–	–	–	–	39	7	–
Tristachya leucothrix	–	–	–	–	–	–	–	–	–	–	–	5	23	9	–

hares tended to avoid old disturbed, undisturbed, and frequently disturbed camps. Old disturbed camps were characterized by the grasses *C. dactylon, S. africanus, E. curvula* and *E. plana,* which are all good indicators of veld disturbance or mismanagement and have an average to low grazing value (Tainton *et al.* 1976; Van Oudtshoorn 1992). Undisturbed camps, on the other hand, in addition to those species mentioned above, contained a high proportion of more desirable good quality grasses such as *T. triandra, B. serrata, H. contortus* and *T. leucothrix.* The grazing value of these grasses for livestock ranges from average to very high (Tainton *et al.* 1976; Van Oudtshoorn 1992).

Themeda triandra is widely regarded as one of the best grazing grasses and, along with *B. serrata,* is generally regarded as an indicator of veld in good condition. That springhares largely avoided these camps was consequently quite surprising. The very low utilization of the frequently disturbed camp 14 was expected as this camp was

Table 3. Mean (±1 S.D.) number of springhares encountered in camps 9, 10 and 14 when chicory was present and when it was not.

Camp	Mean (±1 S.D.) number of springhares		Significance
	Without chicory	With chicory	
9	5.78 ± 4.36 (n = 27)	0.77 ± 1.06 (n = 18)	U = 84.0, P < 0.001
10	3.92 ± 3.76 (n = 25)	0.25 ± 0.55 (n = 20)	U = 87.5, P < 0.001
14	0.39 ± 0.92 (n = 31)	0.14 ± 0.36 (n = 14)	U = 202.0, P = 0.725

completely devoid of vegetation except for a short period during which chicory was cultivated.

General examination of springhare feeding patches not only confirmed that springhares were feeding on *C. dactylon* rhizomes and *C. esculentus* tubers, but also that they are highly selective feeders, eating only the choicest parts of plants and discarding the remainder. Examination of stomach contents from springhares confirmed that *C. dactylon* rhizomes and *C. esculentus* tubers are heavily utilized. These species could be identified in stomach contents on the basis of their characteristic colours and textures. Masticated *C. dactylon* rhizomes typically have a very white fibrous appearance and *C. esculentus* tubers a very white pasty appearance. The absence of *C. esculentus* and the near absence of *C. dactylon* in the undisturbed and frequently disturbed camps probably explains the low springhare densities in these camps.

Considerable evidence of springhares feeding on *E. curvula* leaf bases was also found, substantiating previous observations by Maritz (cited in Anderson 1996) and Temby (1977). Stomach contents also contained large quantities of green leaf material, the origins of which could not be identified macroscopically as springhares masticate their food extremely well (Anderson 1996; D.M. Peinke, pers. obs.). While individual plants eaten can potentially be identified by microscopic examination of the epidermal structures, this was not attempted in the present study. Grass seeds were also occasionally found in the stomachs, thus confirming earlier reports by Butynski & Mattingly (1979) that springhares in Botswana feed on grass seeds (sometimes in large quantities), although Anderson (1996) found no evidence of this in the Northern Cape Province. Although springhares are often considered to be pests of chicory and two of the three camps in which chicory was cultivated were among the preferred camps, no evidence of springhares feeding on chicory was found.

The study site falls in the sourveld region of South Africa, which is characterized by constituent grasses becoming unpalatable at a relatively early stage in growth, usually as soon as they have flowered and set seed (Scott 1955; Comins 1962; Van Oudtshoorn 1992; Hardy *et al.* 1999). Grasses in this region are consequently seldom of nutritional value for more than 6–9 months of the year (Van Oudtshoorn 1992; Hardy *et al.* 1999; Tainton 1999). Thus, although food might appear to be plentiful, it often is not. As autumn sets in, grasses transfer nutrient reserves to the roots and leaf bases where they are stored until they are needed for spring growth (Scott 1955; Van Oudtshoorn 1992). The ability to dig up and feed on these underground food reserves ensures that springhares have a plentiful and relatively stable food (and water) supply throughout the year, even when the above ground vegetation cannot support other herbivores (Williamson 1987).

In northern and eastern Botswana, the flood plains of rivers and swamps provide the ideal habitat for springhares (Butynski 1984), whereas in the Kalahari and the semi-arid Northern Cape Province of South Africa springhares preferentially utilize the flat, short grass areas associated with pans (Butynski 1984; Anderson 1996). In the present study, the recently disturbed camps dominated by *C. dactylon* and *C. esculentus* provide not only an abundant food source but also the flat, short grass, open terrain that is preferred by springhares. This flat, open terrain not only facilitates social behaviours such as mate-finding, but also provides ideal conditions for predator detection and avoidance (Kingdon 1974; Butynski 1984; Augustine *et al.* 1995; Anderson 1996).

That camps 9 and 10, in which chicory was cultivated for a large part of the study period, were amongst the preferred camps creates the impression that springhares might have been attracted to these camps by the chicory. This was, however, not the case and significantly fewer springhares were found in these camps during the periods when chicory was cultivated than when the camps were fallow. That there was no significant difference in the number of springhares found in camp 14 prior to and during chicory cultivation can be ascribed to the already low numbers encountered in this camp prior to the planting of chicory because of continuous tilling of the soil and consequent lack of vegetation.

Springhares are often blamed for serious damage caused to chicory crops by common duiker (*Sylvicapra grimmia*), which not only cause severe damage to the leaf stock but also actively dig to expose and eat the root (Coetzee 1979; Kigozi 2003). The results of this study indicate that springhares normally avoid cultivated chicory and no evidence of springhares feeding on chicory roots or leaves was found. Damage caused to chicory by springhares is rather of an incidental nature due to the exposure of the root while feeding on *C. dactylon* and *C. esculentus* rhizomes and tubers and this largely occurs only around the edges of cultivated lands. Springhares' avoidance of chicory could be due to the extremely bitter taste of the root and/or the fact that chicory is cultivated in parallel raised rows, which creates an extremely uneven surface that poses a serious impediment to bipedal hopping locomotion.

The burning of camp 13 midway through the study provided an opportunity to examine the effect of fire on habitat use by springhares. After burning, significantly more springhares were encountered in this camp, thus confirming similar reports by Rautenbach (1982). Whether this increase was due to the decreased height and density of the vegetation or an improvement in the forage quality (*i.e.* new green shoots), or a combination of these factors, is unknown. The ploughing of camp 2 during the study caused a temporary decrease in the number of springhares in this camp. Numbers, however, increased rapidly thereafter and overall there was no significant difference in the number of springhares prior to and after ploughing. Continual ploughing and subsequent abandonment of camps in this region resets succession and ensures the continued dominance of *C. dactylon* and *C. esculentus.*

Springhares can have profound effects on their preferred habitat. In the process of digging up rhizomes, roots and tubers, springhares can totally denude large patches of vegetation (Butynski 1984; Anderson 1996). These patches are well worked over and devoid of all living vegetation. In this study, small feeding patches of less than 50 cm in diameter were scattered all over preferred camps. Feeding patches of 2–3 m in diameter and greater were also common. Although only an insignificant proportion of most camps were dug over, these patches accounted for 4–6% of the total cover in the two most preferred camps. Many of these patches, particularly the larger ones, appeared to be used repeatedly. This continuous disturbance by springhares, like ploughing, appears to favour the pioneer species *C. dactylon* and *C. esculentus,* which are in turn favoured by springhares. Despite their destructive feeding habits the overall impact of springhares in the Eastern Cape appears to be relatively low but in arid and semi-arid environments, as well as in areas where preferred crops or pastures are grown, they could have a substantial impact on crops and grazing.

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