the sett was occupied. The cubs were heard regularly over the next three days, but on the night of 3 February the sow had presumably removed them to the sett in the wood.

The previous two recorded instances of badger nests above ground were also in Somerset and in areas where the land was waterlogged (Neal, 1977, 1986). Instances of five cubs in a litter have been recorded on a number of occasions. However, this incident proves that all five came from the same litter. So often when five cubs are seen playing around a main sett they are the progeny of more than one sow.

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Range use by brown hyaenas *Hyaena brunnea* relocated in an agricultural area of the Transvaal

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Introduction

Brown hyaenas *Hyaena brunnea* inhabit a variety of habitats throughout Southern Africa. Man has a traditional aversion to this species which has been so heavily persecuted as to have become endangered (Simon, 1966). Apart from deliberate persecution, brown hyaenas are often inadvertently caught in gin traps set around prey after the predator has departed. In an attempt to conserve the species, 30 hyaenas were relocated between 1976 and 1985 in conservation areas (Skinner & Van Aarde, 1985) but the fate of most of these is unknown. Five of these hyaenas were radio-collared and information from three of them provides the first quantitative information on the response of this species to a new environment.

Material and methods

Four adult brown hyaenas (2 males, 2 females) captured in fall-door traps in the Thabazimbi district (Transvaal) were fitted with radio-collars (AVM Instrument Co., California, USA) after being immobilized with a mixture of 600 mg ketamine hydrochloride (Ketalar; Parke-Davis (Pty) Ltd., Isando Africa) and 20 mg xylazine hydrochloride (Rompun; Bayer Pharmaceuticals (Pty) Ltd., Johannesburg, South Africa). They were then released in the Rustenburg Nature Reserve, in the Magaliesberg, Transvaal (24° 45′ S; 27° 15′ E) about 100 to 190 km south of their capture sites, and their locations determined at irregular intervals over periods varying from 91 days to 15 months. Home range size was determined as the area of the minimum convex polygon included by the outermost radio locations. Locations affected by translocation were excluded and only those describing the area 'over which the animals usually travel in pursuit of their routine activities' (Jewell, 1966) were included in these calculations.

Results

All four brown hyaenas released between October 1981 and October 1982 moved out of the Rustenburg Nature Reserve less than 14 days after being released. They established themselves

TABLE I

Home range size (km²) of brown hyaenas in the Magaliesberg, Transvaal

Individuals	Number of radio fixes	Number of days followed	Size (km²)	Home range description
A—adult male	43	91	8·8	Mountainous and included three farmsteads and one hotel
B—adult female	52	107	5·5	Limited to a deep kloof and included two farmsteads
C—adult male	187	461	48·9	Mountainous and included 25 farmsteads and one holiday resort

Mean ± S.D.: 21·1 ± 2·8 km²

8–17 km from the release point and home range size for the three, for whom cumulative range sizes did not increase over the 30-day period before the end of the observation period, varied from 5·5 to 48·9 km² ($\bar{x}$ = 21·1 ± 2·8; n = 3; Table I). Areas used per month varied from 5·5 to 29·9 km² ($\bar{x}$ = 15·7 ± 8·8; n = 15) and percentage overlap per month varied from 7·4 to 100% ($\bar{x}$ = 55·7), as a result of different parts of the range being used at different times. Home ranges of the marked individuals did not overlap but at least one unmarked hyaena was observed in the home range of one of the marked males.

One of the marked females restricted her activities for three months to a deep riverine valley, but then moved away and was killed four months later by a farmer in the Smithfield district, Orange Free State, about 530 km south-east of the release point.

The home ranges of both adult males and the other female incorporated uninhabited mountainous slopes and valleys and populated agricultural flatlands along the northern slopes of the Magaliesberg, the latter accounting for less than 20% of the area traversed by them. Farmsteads within their ranges were visited frequently but at irregular intervals. When traversing their home ranges the hyaenas followed definite routes which were dictated by the topography of the area. They tended to walk along kloofs and valleys leading from their shelters on mountain ridges to inhabited farmsteads where they scavenged food.

The three animals in the Magaliesberg were predominantly nocturnal and left their shelters soon after sunset, foraging through most of the night. All three individuals used more than one shelter and did not always return to the same site after a foraging bout. Minimum distances covered during a night of foraging varied from 8·4 to 22·6 km ($\bar{x}$ = 12·5 ± 4·9; n = 81) and foraging speed varied from 0·3 to 5·6 km per hour ($\bar{x}$ = 1·96 ± 1·28; n = 486). There was no correlation between distance travelled in one hour and time since sunset.

Discussion

Our observations indicate that brown hyaenas translocated into a new environment can establish and maintain themselves, given the conditions that prevailed within the study area (i.e. uninhabited mountain ranges surrounded by patches of agricultural development). Variability

in range sizes recorded may be a factor of inadequate sampling. However, it would appear that the home ranges recorded for these individuals are smaller than those reported for animals in areas with no agricultural development (central Kalahari, Owens & Owens, 1978; southern Kalahari, Mills, 1978, 1982), suggesting that agricultural development is advantageous to the brown hyaena. The irregular visits to farmsteads where hyaenas in the Magaliesberg scavenged suggests that offal produced around farmsteads may be of particular significance (Skinner, 1976). This correlation is also supported by the foraging distances (22·6 km/night in this study and 54·4 km/night recorded by Mills & Mills (1978) in the Kalahari). However, it should be noted that range sizes recorded during this study were for individual hyaenas, while those recorded by Mills (1982) and by Owens & Owens (1978) were for established groups.

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The helminth parasites of the wild rabbit *Oryctolagus cuniculus* and the brown hare *Lepus capensis* from the Isle of Coll, Scotland

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Introduction

Brown hares *Lepus capensis* (L.) and rabbits *Oryctolagus cuniculus* (L.) share the same helminth parasite fauna but the prevalence of the parasites in these animals, living in the same habitat, has not been studied. Broekhuizen (1975) suggested that the brown hare was not as well adapted as the rabbit to the stomach worm *Graphidium strigosum*, while Boag & Iason (1986) found mountain hares (*Lepus timidus*), occupying the same area as rabbits, had considerably heavier burdens of the nematode *Trichostrongylus retortaeformis*. Boag (1972) also suggested that myxomatosis may have reduced rabbit numbers below the threshold density necessary for the survival of certain helminth species, although subsequent surveys, on the mainland of Britain, have shown