

unlikely source of bias. Although based on a small sample size, this study found no evidence of an effect of either ambient temperature or cloud cover on the timing of noctule activity. These two factors are important in determining the timing of activity of other bat species (Erkert 1982, Avery 1983).

This work was carried out during the tenure of a NERC research studentship. I am grateful to Prof. Paul Racey and Dr Rosemary Cockerill for help and advice.

#### REFERENCES

- Avery, M. I. (1983). *Winter activity of pipistrelle bats*. PhD thesis, University of Aberdeen.
- Avery, M. I. (1985). Winter activity of pipistrelle bats. *J. Anim. Ecol.* **54**: 721–738.
- Erkert, H. G. (1982). Ecological aspects of bat activity rhythms. In *Ecology of bats*: 201–242. Kunz, T. H. (Ed.). New York: Plenum Press.
- Stebbins, R. E. (1977). Order Chiroptera: Bats. In *Handbook of British mammals*: 68–128. Corbet, G. B. & Southern, H. N. (Eds). Oxford: Blackwell Scientific Publications.
- Vesey-Fitzgerald, B. (1949). *British bats*. London: Methuen.

### **The use of space by the Aardwolf *Proteles cristatus***

J. D. SKINNER AND R. J. VAN AARDE, Mammal Research Institute, University of Pretoria, Pretoria 0002, South Africa

#### *Introduction*

The Aardwolf, *Proteles cristatus*, is widely distributed in southern Africa, and occurs commonly in open semi-arid environments. This medium-sized hyaenid is one of Africa's most specialized carnivores with termites forming the bulk of its diet (Kruuk & Sands, 1972; Cooper & Skinner, 1979). Published information on aspects of its biology other than diet are limited and data on the use of space are only available for individuals in East Africa (Kruuk & Sands, 1972), where a home range size of 1.5 km<sup>2</sup> was found.

The present paper reports on the pattern of space use by the Aardwolf on the Rustenburg Nature Reserve (25° 45'S, 27° 15'E) and contributes to our knowledge of the life history of an endangered species.

#### *Materials and methods*

The timidity of Aardwolves in an open savanna on top of the Magaliesberg within the sour bushveld (Acocks, 1953) precluded direct observations for extended periods. Information on spatial utilization and activity was obtained by means of triangulation whereby the location of an adult female radio-tagged in October 1981 was determined at hourly intervals during at least 3 nights each month from November 1981 to March 1983 (517 radio-locations). The accuracy of radio-fixes varied from 0° to 9° ( $\bar{x} = 3.4 \pm 2.7^\circ$ ;  $n = 10$ ) at 500 m and from 1° to 5° ( $\bar{x} = 3.3 \pm 1.6^\circ$ ;  $n = 10$ ) at 1000 m. The distance between the receiver unit and the animal never exceeded 1000 m. Home range size was estimated as the area of the minimum complex polygon included by the outermost radio-locations. Incidental information on other Aardwolves encountered in the study area of 6.0 km<sup>2</sup> in the central part of the Reserve was also recorded.

### Results

#### Density and home range size

The 15 Aardwolves identified within the study area suggest a density of 2.5 animals/km<sup>2</sup> in January 1982. Nine of these were young of the year, thus reducing the density estimate to 1.0 adult Aardwolf/km<sup>2</sup>.

Information obtained through radio-tracking indicates that the adult female used an area of 3.8 km<sup>2</sup> over a period of 16 months. The area used each month varied from 0.8 to 1.3 km<sup>2</sup> ( $\bar{x} = 1.0 + 0.2$  (S.D.) km<sup>2</sup>;  $n = 16$ ). Home range size estimates increased nearly linearly during the first 10 months of observation (January 1982 to October 1982, Fig. 1), and this was influenced by season and sampling intensity. At least 10 months of observations were thus required to estimate the total area utilized over a one-year-period. Four months of observations reflected only 50% of the total area and after six months of radio-tracking only 75% of the total home range could be defined (Fig. 1). Cumulative range size for each month levelled off with an increase in the number of radio-fixes and the increase in range size estimates is due to shifts in the range positions. The home range of this female overlapped with that of at least one other adult (presumably a male, as they live in pairs; see Smithers, 1983) which was observed to scent-mark actively within the range of the female and at times took shelter in burrows within her range. It was seen also associating with her offspring and spending extended periods with them in their den while the dam was foraging. The

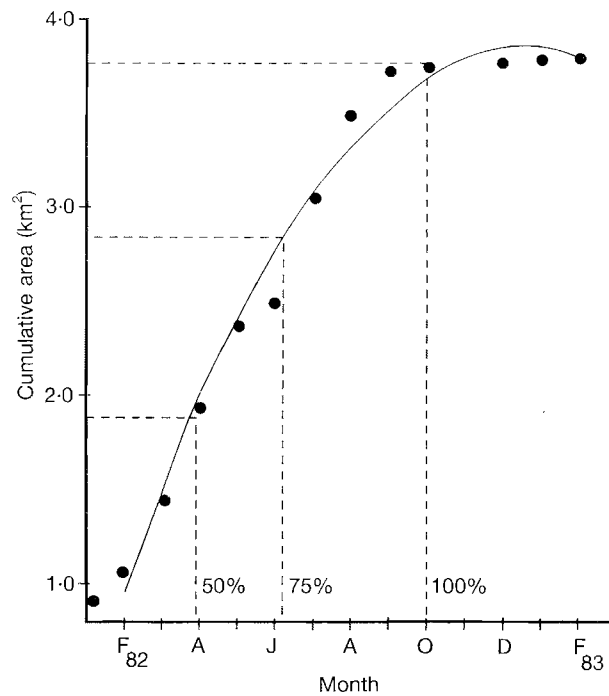


FIG. 1. Monthly increase in the total area used by an Aardwolf female in the Rustenburg Nature Reserve. The curve was fitted through non-linear regression analysis.

offspring (two in 1981, four in 1982) shared her home range for about 10 months after being born and dispersed one to two months before the birth of the following litter (September/October).

### Foraging

The distances travelled by the female Aardwolf while apparently foraging varied from 1.5 to 9.1 km per night ( $\bar{x} = 4.2 + 2.1$ ;  $n = 35$ ). Mean distances travelled per night during April and May (dry autumn) were longer than those travelled during any other month, but mean distances travelled per night each month (and thus presumably the intensity of foraging) were not related to the area used during that month. Limited direct observations suggest that Aardwolves follow a zig-zag route when foraging and the actual distances travelled per night will therefore be longer than the straightline distances between radio-fixes recorded above. Aardwolves were never recorded feeding from termitaria within the Reserve and only a few of these showed signs of utilization by the Aardvark, *Orycteropus afer*.

Routes followed when leaving the den varied considerably and no definite trend could be defined. The female, however, usually moved from the den to one of the two middens within her home range, and thereafter either returned to the den or started foraging away from the den or midden. More than one den was used to shelter in during the day, at night when disturbed, or during adverse weather.

The radio-collared Aardwolf was active predominantly during the night, and distances travelled per hour between sunset and sunrise varied from 0.05 to 1.07 km, the highest activity being recorded during the two hours after sunset and two hours before sunrise. Diurnal activity was recorded only during the winter months (June and July) and distances travelled varied from 0.02 to 2.27 km/h.

### Discussion

The Aardwolves in the Rustenburg Nature Reserve are shy and elusive and, as a result, only one female was caught. Our observations indicate that this specialized carnivore needs approximately 4.0 km<sup>2</sup> to survive annually under the conditions prevailing in the Reserve. The intensity of use of this area is apparently affected by seasonal factors and habitat heterogeneity. Home ranges do overlap and may be shared by an adult male, adult female and her offspring of that year.

Our observations on foraging behaviour and activity are in agreement with those of Kruuk & Sands (1972) and Aardwolves in the Reserve fed predominantly in patches of open grassland with virtually no trees, avoiding densely wooded areas. The only evidence for possible territorial behaviour consisted of prolonged sessions of scent-marking along the border of the foraging range by both male and female.

Financial support was provided by the Endangered Species Sub-committee of the Transvaal Branch of the Wildlife Society of Southern Africa who also showed a keen interest in the study. Mrs Amanda Nel drew the figure.

### REFERENCES

- Acocks, J. P. H. (1953). Veld types of South Africa. *Bot. Surv. Mem.* **28**: 1–192.  
Cooper, R. L. & Skinner, J. D. (1979). Importance of termites in the diet of the aardwolf *Proteles cristatus* in South Africa. *S. Afr. J. Zool.* **14**: 5–8.  
Kruuk, H. & Sands, W. A. (1972). The aardwolf (*Proteles cristatus* Sparrman) 1783 as predator of termites. *E. Afr. Wildl. J.* **10**: 211–227.  
Smithers, R. H. N. (1983). *Mammals of the Southern African Subregion*. Pretoria: University of Pretoria.