

Pattern of space use by relocated servals *Felis serval*

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Summary

This paper reports on the successful relocation of captive-bred male servals and provides information on activity patterns, dispersal and spatial utilization. Servals maintain themselves without any prior training in hunting. They are predominantly nocturnal and direction of dispersal was determined by habitat preferences, they confine themselves to areas with permanent water and adequate shelter. Core areas of activity coincided with the points of release and home range size varied from 2.1 to 2.7 km².

Résumé

Cet article rend compte du succès de la réimplantation de servals mâles reproduits en captivité et fournit des informations sur les types d'activité, de dispersion et d'occupation spatiale. Les servals survivent sans entraînement préalable à la chasse. Ils sont avant tout nocturnes et le sens de leur dispersion est déterminé par des préférences d'habitat, se confinant dans des zones à eau permanente et abri suffisant. Les régions centrales de leur activité coïncident avec les zones de lâchage et les domaines vitaux varient de 2,1 à 2,7 km².

Introduction

The relocation of rare and/or endangered carnivores into protected areas where they used to occur is an important tool in conservation and often serves as a motivation for breeding them in captivity. *Felis serval* Schreber formerly occurred in the area of the Rustenburg Nature Reserve but were cleared from the area prior to its establishment as a reserve. An opportunity to reintroduce them was provided by the successful breeding programme at the De Wildt Research Centre of the National Zoological Gardens of South Africa.

Servals are distributed throughout most of Africa south of the Sahara, but due to their habitat requirements they are confined to areas with adequate cover where water is permanently available (Smithers, 1983). Information on the biology of these rare, medium-sized cats (10 kg), is limited, but they are known to feed on a variety of murids (especially *Otomys* spp.), small birds and reptiles (Smithers, 1978). In an attempt to evaluate the feasibility of relocation projects as conservation measures the present paper reports on aspects of use of space by captive-bred, relocated servals. This pilot investigation is based on information obtained through radio-tracking.

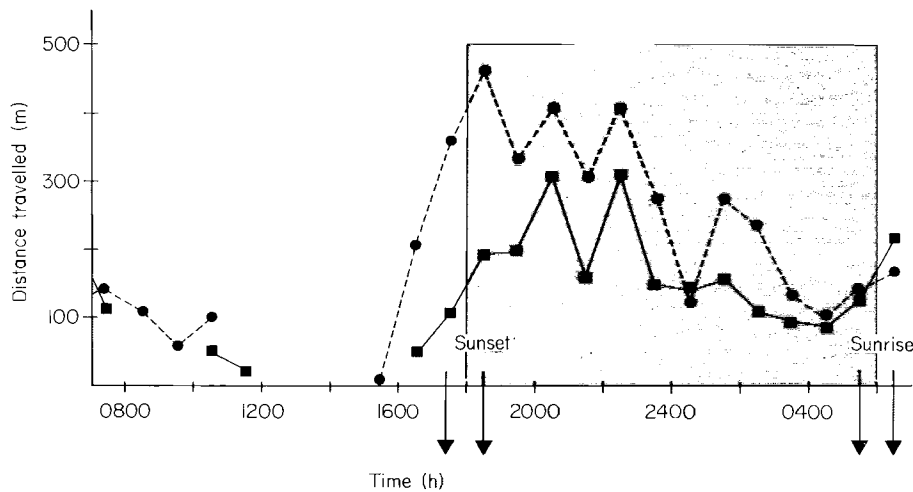


Fig. 1. The activity patterns of two male servals released in the Rustenburg Nature Reserve.

Material and methods

Three adult serval males raised within their natal groups in outdoor enclosures were available for the attempted relocation. They were not hand-raised, but had no experience of catching and handling live prey. All of them were fitted with radio-collars (AVM Instrument Company, California, U.S.A.) prior to their release.

Two siblings released at the same site on 5 August 1982 stayed on the Rustenburg Nature Reserve (25°45'S, 27°15'E) but due to equipment failure could only be monitored for 2 and 5 months respectively. The third male, released at the same site on 4 March 1983, was accidentally killed 20 days later by a farmer 17 km from the point of release. No information was obtained from this male.

Data on activity, direction of dispersal and space usage were obtained through triangulation. The location of each animal was determined at hourly intervals for 12 and 21 days and nights over a period of 42 and 107 days respectively. The straightline distances between radio locations recorded at hourly intervals were considered as an index of activity during that hour. Home range size was determined as the area of the minimum convex polygon included by the outermost radio locations.

In addition the spatial distribution of radio locations was analysed by means of a computer programme which graphically displays spatially distributed data as a three dimensional map in which the vertical dimension reflects the number of radio locations per 0.04 km² (0.2 × 0.2 km²) grid-block superimposed on the home range. Randomness in the direction of dispersal was evaluated in terms of the position of daily resting sites in relation to the centre of release using Rayleigh's test (Caughley, 1977).

The Rustenburg Nature Reserve (3600 ha) is situated on top of the Magaliesberg and is bisected by a permanently flowing river with numerous marshy areas partly overgrown and surrounded by reeds and tall grasses. Trapping revealed that the favoured food item of servals (*Otomys* spp.) occur

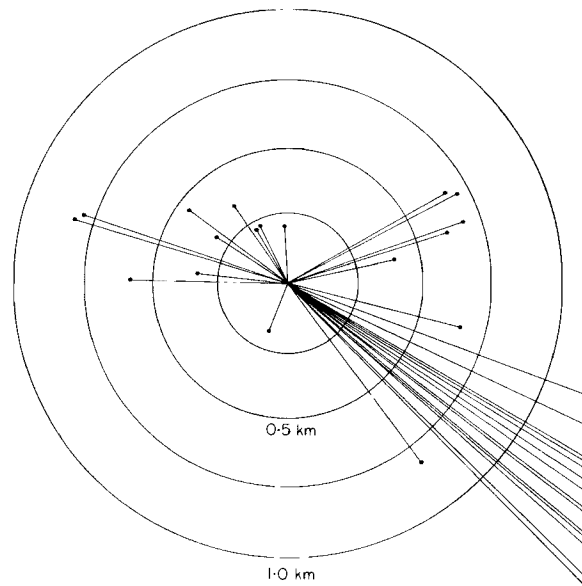


Fig. 2. The direction of dispersal of two male servals released in the Rustenburg Nature Reserve. The centre of the circle refers to the point of release and the dots represent daily resting sites.

commonly within the area. This habitat thus appeared suitable for the introduction and release of servals.

Results

From the time of their release the two servals were predominantly nocturnal with limited activity occurring during the early mornings and late afternoons (Fig. 1). No trend in nocturnal activity could be identified and almost continual movement throughout the night suggests that they spent most of their time either foraging or traversing their home ranges. An analysis of the distances moved per hour, over twelve 24-h periods, suggests that servals foraged over minimum distances of zero to 205 m. h⁻¹ during the day and 90 to 463 m. h⁻¹ during the night.

The total distance moved during a night varied from 0.37 to 6.66 km. In the case of one of these males the distances travelled per night increased linearly ($y = 1.65x + 0.13$) and significantly ($r = 0.85$; $n = 15$) with time spent in the new surroundings, but in the other male these factors were not correlated.

An analysis of temporal changes in the cumulative area used by each male suggests the home-range size was established within 20–30 days of release. The probability of randomness of dispersal from the point of release for both males was less than 5%, with the direction of dispersal, as suggested by daily shelter sites, being dictated by habitat (Fig. 2). Most radio locations (82.34%; $n = 385$) taken at hourly intervals were within the riverine habitat; significantly more so ($\chi^2 = 161.04$; $P < 0.001$) than expected.

The home ranges (which overlapped considerably) of these males, based on 151 and 234 radio locations respectively, were 2.08 and 2.70 km² respectively. An analysis of the intensity of use of space based on the number of radio locations

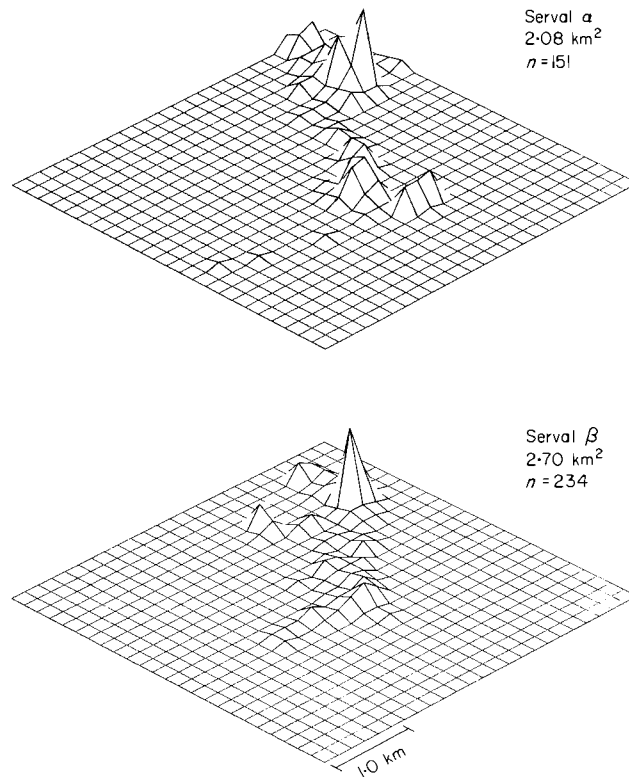


Fig. 3. The intensity of use of the home ranges of two male servals relocated on the Rustenburg Nature Reserve. Utilization of grid squares is indicated by the height of peaks.

determined for each 0.04 km² grid block within their home ranges indicated considerable overlap in the intensity of use of specific areas (Fig. 3). Furthermore, the centre of activity of both home ranges coincided with the point of release. These males did not move together through their ranges but occasionally layed up at the same site.

Discussion

The proclamation of farmland areas in order to establish nature reserves often requires the re-introduction of mammal species in order to create balanced ecosystems. Organizations responsible for such attempts may have to rely on captive-bred animals (especially in the case of carnivores) and difficulties encountered by these animals as well as the success of the relocation attempt can only be evaluated through concerted follow-up programmes. In terms of conservation the apparently successful relocation of captive-bred servals reported on here is encouraging. It illustrates that captive-bred (but not hand-raised) servals can maintain themselves in a natural environment without any prior training in hunting. This agrees with earlier observations on cheetahs *Acinonyx jubatus* (Schreber) (Pettifer, 1980).

Activity patterns of relocated servals released into a foreign environment are similar to those recorded for free-ranging servals (Smithers, 1983). Walking

distances, while either foraging or exploring their home ranges, have not been recorded previously. The behaviour of one of the animals might be interpreted as a systematic exploration of the new environment, if this is true the other animal was less systematic.

Non-randomness in the direction of dispersal from the centre of release and the eventual locus of the centre of activity, resulted from habitat preferences and confirms earlier statements that use of space is confined to areas with permanent water and adequate shelter (Smithers, 1978).

The fact that their core areas of activity coincided with the points of release suggests that the selection of release points is of particular significance and needs to be considered in future relocation attempts. The dispersal of the third male may be due to social factors, with direct or indirect territorial interactions forcing him to move away from the centre of release. Spatial overlap in the home ranges of the other two males can not be explained at this stage by may have resulted from their relatedness and the fact that they were raised in the same enclosure. They were however, temporally separated and only occasionally shared resting sites.

Equipment failure precluded us from establishing if these animals could maintain themselves within the selected habitat for an extended period. We suggest that future attempts to re-establish carnivores within areas set aside for conservation, should be preceded by similar but more extended pilot investigations, not only to ensure that such animals can adapt, but also to establish if productivity within the selected area is sufficient to maintain them.

Acknowledgments

Financial support was provided by the University of Pretoria and the Endangered Species Sub-committee of the Transvaal Branch of the Wildlife Society of Southern Africa. Experimental animals were bred and provided by Miss Anne van Dyk under the auspices of the Director of the National Zoological Gardens at the De Wildt Cheetah Research Centre. Ms Amanda Nel drew the figures.

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(Manuscript received 11 April 1985)