Home range and movements of black-backed jackals at Cape Cross Seal Reserve, Namibia

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Black-backed jackals, *Canis mesomelas*, were radio-collared and tracked at Cape Cross Seal Reserve on the Namib Desert coast, Namibia. Two methods of calculating home-range size were used giving mean areas of 24,9 km² and 7,1 km². Jackal density around the seal colony was estimated at 22 jackals/km². Activity peaks were recorded at 09h00 and 18h00. Home-range size and overlap are discussed in terms of habitat structure, and prey abundance and distribution. Activity patterns are related to food availability and lack of harassment from man.

Bewegings van radio-gemerkte rooijakkalse, *Canis mesomelas*, is in die Kaap Kruis-robreservaat aan die Namibwoestynkus waargeneem. Jakkalsdigthede is op 22 diere/km² geskat. Die groottes en oorvleueling van tuisgebiede (wat deur twee berekeningmetodes gemiddeld 24,9 km² en 7,1 km² beslaan) word na aanleiding van habitatstruktuur en voedselbeskikbaarheid en -verspreiding bespreek. Aktiwiteitspieke, wat om ongeveer 09h00 en 18h00 waargeneem is, word aan die hand van voedselbeskikbaarheid en menslike versteuring toegelig.

Keywords: Canis mesomelas, density, desert, home range, movement

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Introduction

The black-backed jackal, *Canis mesomelas*, is the most common large predator along the Namib Desert coast. High concentrations of these carnivores occur at localities with permanent food resources, such as seals at Cape Cross Seal Reserve (CCSR) and birds at Sandwich harbour.

The few studies which have been carried out on these coastal jackals have all been diet orientated, hence other aspects of the ecology of these coastal populations are largely unknown (Stuart 1976; Nel & Loutit 1986). To provide a better understanding of their ecology, radio-telemetric monitoring of four jackals at CCSR was employed to determine their home range and movement patterns.

Study area

Cape Cross Seal Reserve $(14^{\circ}00'S / 21^{\circ}46'E)$ occupies an area of 51,3 km² on the Namib Desert coast. The reserve consists primarily of sandy beaches and salt pans. Sand hummocks, covered with *Zygophyllum clavatum* and *Psilocaulon kuntzei* succulents, lie parallel to the beaches separating them from the salt pans.

During the study period, from April to July 1986, approximate daily temperatures were 17°C, dropping to 9°C at night. Fog occurred on most mornings, dissipating either mid-morning or mid-afternoon. No rainfall figures are available for CCSR. The main feature of the reserve is the Cape fur seal *Arctocephalus pusillus* colony, comprising approximately 90 000 seals (David 1986).

Methods

Two male jackals approximately three and four years old

and two females aged one and four years (J1, J2, J3, & J4), were caught in a large square mesh cage. The cage, which was 6 m in diameter, was baited with either fresh seal carcasses or fresh fish, or both.

Each jackal (mean jackal mass = 9,0 kg; range = 7,9-10,4 kg) was immobilized with an intramuscular injection of 5 mg/kg of ketamine hydrochloride. Body measurements of each animal were recorded and its age estimated using Lombaard's (1971) method.

Radio collars operating on 151 MHz were fitted to each jackal which was tracked using a hand-held yagi antenna and receiver (Telonics, Arizona, USA). Relocation of each animal was determined by triangulation at half-hour intervals and the position plotted on a 1:50 000 map. Home-range sizes were calculated using the minimum area method (Mohr 1947) and modified minimum area method (Harvey & Barbour 1965) for comparison.

Jackal density was calculated from strip counts over a set 7-km route. Counts were carried out one day per month at 06h00, 12h00, 18h00 and 24h00.

Jackals crossing the salt pans towards or away from the beach, were recorded between first light and 18h00 when possible. This provided additional data on when jackals moved inland to rest or beachward to forage.

Results

There was much variation in home-range sizes, both within and between methods of calculation (Table 1). Mean home-range size differed significantly between the two methods, with the minimum area and modified minimum area method being 24,9 km² and 7,1 km² respectively (t = 4,34; d.f. = 3; P < 0,05). There was home-range overlap with the beach being the most

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Table 1 Home-range sizes of four radio-collared black-backed jackals at Cape Cross Seal Reserve between April and July 1986, compared with data from previous jackal studies (Ferguson *et al.* 1983 and Rowe-Rowe 1982)

Jackal	Age (years)	Sex	Number of radio locations	MAM (km²)	MMAM (km2 ⁾	Study area	Comments
J1	3	М	248	25,9	13,2	CCSR	
J2	4	Μ	114	34,0	. 4,0	CCSR	Died
J3	1	F	103	17,6	7,9	CCSR	
J4	4	F	88	22,4	3,2	CCSR	Died
n = 10				24,8		SNR	
n = 8				5,3		KGNP	
<i>n</i> = 9				181,7		TVL	
<i>n</i> = 10				18,2		GCGR	

MAM = minimum area method

MMAM = modified minimum area method

SNR = Suikerbosrand Nature Reserve (Ferguson *et al.* 1983) KGNP = Kalahari Gemsbok National Park (Ferguson *et al.* 1983)

TVL = Transvaal farmland (Ferguson et al. 1983)

GCGR = Giant's Castle Game Reserve (Rowe-Rowe 1982)

heavily utilized area (Figure 1). No observations suggesting territoriality were made during the study.

Jackals were regulary seen actively foraging and feeding throughout the day. Radio tracking showed variation in jackal activity periods, although activity periods tended to peak around 09h00 and 18h00 (Figure 2). The radio-collared jackals were found to be active for 183 (36%) of the 515 relocations made during the study.

Jackal counts on the pans suggested that the beach was used primarily at night, as few jackals were observed moving towards the beach during daylight (Table 2). Night observations, radio tracking and monthly strip counts, also indicated that jackals used the beach at night. The mean jackal density calculated from strip counts was 22 (\pm 2,23) jackals/km².

J1 moved inland generally between 08h00 and 09h00 and returned to the beach at or after sunset. During the day he rested in the hills up to 7,5 km inland from the CCSR beaches. His nocturnal activity was limited to feeding and foraging in and around the seal colony.

J2 moved primarily along the beach, resting up either on the sand or among the adjacent sand hummocks. Of 114 locations, only four (3,5%) were made 1 km or more away from the beach. This jackal regulary foraged around both active guano platforms. He was not seen foraging in the main seal colony, but instead foraged around small haul-outs of 50 or less seals. His foraging activity was largely confined to a strip of beach 11,5 km long.

J3 varied her movements from remaining along the beach for 24-h periods, to moving inland during part of the day. Movement away from the beach was associated with resting, either on the gravel plains or in the adjacent hills. J3's main forage site was the seal colony. Edible



Figure 1 Home ranges of four black-backed jackals at Cape Cross Seal Reserve between April and July 1986. G = guano platform, S = seal colony, = jackal census track.



Figure 2 Combined activity patterns of four radio-collared black-backed jackals determined from 515 relocations at Cape Cross Seal Reserve between April and July 1986. The bars show standard error.

Table 2Results from 54 observations of black-backedjackals crossing the Cape Cross Seal Reserve salt pansbetween April and July 1986

	Time									
Movement	<8h00	8–10h00	1012h00	12–14h00	14-16h00	16-18h00				
Beachward	-	3	2	2	1	_				
Inland	2	43	25	-	-	-				
Total	2	46	27	2	1	0				

scraps were also scavenged from the seal factory and refuse dump within the reserve.

J4 used the beach south of the seal colony where she foraged in small haul-outs. She rested in the hummocks or on the salt pans up to 2,5 km inland. Two weeks prior to her death, she was tracked for 24 h during which her movements were confined to an area of approximately 500 m^2 .

Discussion

Home ranges

The high degree of home-range overlap at CCSR is likely to be related to the presence of large localized food resources, namely seals and cormorants (Hiscocks & Perrin 1987). Rowe-Rowe (1982) found that mated adult male and female jackals in Giant's Castle Game Reserve had overlapping home ranges which did not overlap the home ranges of other mated pairs. From observations and telemetry carried out at CCSR, it appears that jackal pairs do have home-range overlap, because of the clumped food distribution. In accordance with Rowe-Rowe's (1982) data the youngest CCSR jackal, J3, occupied the smallest home range. This range size may represent the initial stages of home-range development, which may expand as she matures.

The clumped food resources, coupled with the homogeneous nature of the habitat, may also explain the breakdown of territorial behaviour. A similar breakdown in territoriality has also been observed in golden jackals, *Canis aureus*, in Israel (Macdonald 1979). The jackals studied were also dependent on clumped food resources, namely an open refuse pit and a carnivore feeding site. One of the two jackal groups observed showed territorial behaviour, whilst the second group had no demarcated territory (Macdonald 1979). Thus, clumped food resources do appear to influence territorial behaviour.

The 500 m^2 area covered by J4 was the smallest area used by a jackal over a 24-h period. This was probably related to the heavy infestation of sarcoptic mange from which she was suffering. The mange had resulted in a loss of condition including substantial hair loss and bleeding skin lesions (Hiscocks & Perrin 1987).

The marked difference in home-range size using the two methods, shows the importance of taking into account the methods used in various studies. Biased interpretation of data can therefore result from homerange calculations. Thus, the method used for a calculation must be known before data from different sources can be compared. The CCSR jackal home ranges are discussed using the minimum area method, as this method was used for calculating jackal home ranges in other studies. Mean home-range size of jackals at CCSR is similar to those of jackals in Giant's Castle Game Reserve and Suikerbosrand Nature Reserve, even though the habitat types differ (Rowe-Rowe 1982; Ferguson, Nel & De Wet 1983).

The high rainfall, mountainous terrain and extensive grasslands of Giant's Castle Game Reserve and Suikerbosrand Nature Reserve are similar (Ferguson *et al.* 1983), and in marked contrast to CCSR. In addition, prey availability in these areas differs from that of CCSR, as they have no localized food resources. Habitat structure and prey distribution are therefore not necessarily parameters affecting home-range size. Furthermore, Rowe-Rowe (1982) estimated the Giant's Castle Game Reserve population density to be *ca* 1 jackal/2,5–2,9 km². Thus, although the CCSR jackal density is higher than that in Giant's Castle Game Reserve their home-range sizes are similar. This further suggests that for black-backed jackals, prey abundance, and not habitat structure and prey distribution, is partially responsible for home-range size. The jackal density calculated for CCSR must be viewed with caution, however, as the track used for sampling passed the seal colony where jackal concentrations were at their highest.

The large home-range sizes of jackals on Transvaal farmland have been linked to farming practices (Ferguson *et al.* 1983). They attribute the smaller homerange sizes of jackals in the Kalahari Gemsbok National Park to a greater availability of prey items relative to their other study areas. In the Kalahari Gemsbok National Park prey abundance is not localized, hence individuals could have smaller territories. Thus, this does not conflict with the CCSR situation.

Activity

There was much variation in jackal activity at CCSR, with individuals being observed feeding, foraging, and resting throughout 24-h periods. Jackals are often considered problem animals in southern Africa and are therefore persecuted (Rowe-Rowe 1974; Lensing & Joubert 1977). Continuous harassment in many areas has resulted in their becoming largely nocturnal. At CCSR, jackals are excluded from such harassment and therefore able to remain more diurnal. Even so, activity peaks associated with morning and evening or night periods were evident. Similar activity periods have been reported for jackals elsewhere (Ferguson 1981).

Activity peaks are possibly not as marked at CCSR as in other study areas, because jackals remaining on the beach near the seals and guano platforms are in constant proximity to their food source. Thus, they are able to feed immediately a sick or dead seal is washed up, or a waterlogged bird attempts to cross the beach towards the platforms (Hiscocks & Perrin 1987).

Records made of jackals moving across the salt pans complement radio tracking and general observations. Jackals foraged primarily along the beach in the mornings, before certain individuals moved inland. When moving either towards or away from the beach, they broke into a steady trot, stopping only to sniff a spot or greet conspecifics. Once in the vicinity of potential food items or resting places, individuals would slow to a walk and explore or forage in the area.

Numerous jackal paths criss-cross the salt pans and adjacent gravel plains, indicating regular movements to and from specific sites. Some paths could be traced from resting sites, such as among rocks, to the beach. Others radiated from the beach and continued for undetermined distances into the hills over 10 km away. As tracks on the fine sand overlying the plains are not removed by wind or sand movement, they are possibly the result of numerous jackals using them over the years. In conclusion, the localized food resources coupled with the xeric environment, appear to have lead to the atypical density of jackals at CCSR. Related to these factors are their home ranges, which have two major areas (the beach and inland hills) associated with feeding and resting. These two areas are connected by a series of paths used primarily as a means of bridging the two zones. Jackal home-range usage at CCSR therefore differs from that of jackals in more mesic environments where foraging areas are not as distinctly separate from the main rest sites.

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References

- DAVID, J. 1986. The Cape fur seal at Cape Cross. Afr. Wildl. 40(3): 103.
- FERGUSON, J.W.H. 1981. Die ekologie van die rooijakkals *Canis mesomelas.* M.Sc. thesis, Univ. of Pretoria.
- FERGUSON, J.W.H., NEL, J.A.J. & De WET, M.J. 1983. Social organization and movement patterns of blackbacked jackals *Canis mesomelas* in South Africa. J. Zool.(Lond). 199: 487–502.

- HARVEY, M.J. & BARBOUR, R.W. 1965. Home range of *Microtus ochrogaster* as determined by a modified minimum area method. J. Mammal. 46: 398–402.
- HISCOCKS, K. & PERRIN, M.R. 1987. Feeding observations and diet of black-backed jackals in an arid coastal environment. S. Afr. J. Wildl. Res. 17: 55–58.
- LENSING, J.E. & JOUBERT, E. 1977. Intensity distribution patterns for five species of problem animals in South West Africa. *Madoqua.* 10: 131–141.
- LOMBAARD, L.J. 1971. Age determination and growth curves in the black-backed jackal, *Canis mesomelas* Schreber, 1775 (Carnivora: Canidae). *Ann. Trans. Mus.* 27: 135–169.
- MACDONALD, D.W. 1979. The flexible social system of the golden jackal, *Canis aureus. Behav. Ecol. Sociobiol.* 5: 17-38.
- MOHR, C.O. 1947. Table of equivalent populations of North American small mammals. *Amer. Midl. Nat.* 37: 223–249.
- NEL, J.A.J. & LOUTIT, R. 1986. The diet of the blackbacked jackals, *Canis mesomelas*, on the Namib Desert Coast. *Cimbabasia* (A)8 (11): 91–96.
- ROWE-ROWE, D.T. 1974. The black-backed jackal as a problem animal in Natal. *NAUNLU*. 605: 9.
- ROWE-ROWE, D.T. 1982. Home range and movements of black-backed jackals in an African montane region. S. Afr. J. Wildl. Res. 12: 79–84.
- STUART, C.T. 1976. Diet of the black-backed jackal Canis mesomelas in the central Namib Desert, South West Africa. Zool. Afr. 11: 193–205.