

# Black mongoose (*Galerella nigrata*) home range and social behaviour affected by abundant food at an antelope carcass

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The rupicolous black mongoose (*Galerella nigrata*) is endemic to southwestern Africa. Because virtually nothing is known about its behavioural ecology we radio-tracked an adult male that we accidentally captured in the foothills of the Erongo Mountains of Namibia from May to July 2003. During our study a greater kudu (*Tragelaphus strepsiceros*) died within the home range of the mongoose and up to seven mongooses fed on adult, larval, and pupal sarcophagid flies attracted to the rotting antelope. Intra-specific aggression near the carcass probably produced a dominance hierarchy that resulted in the mongooses feeding solitarily at the kudu. The post-kudu home range area of the tagged mongoose shrank by 66% and its centre of activity shifted to the carcass. The feeding and ranging behaviours of *G. nigrata* appear to be similar to other species of *Galerella*.

**Key words:** black mongoose, *Galerella*, kudu, feeding, home range, social behaviour.

The black mongoose (*Galerella nigrata*) is distributed from the Erongo Mountains in north-central Namibia north into extreme southwestern Angola. Within this area it is found in mountainous habitats with an abundance of large rocks and boulders, especially granitic areas (M. Griffin, pers. comm.), and it is often sympatric with the slender mongoose (*G. sanguinea*). The Cape grey mongoose (*G. pulverulenta*) is found further south, mainly in the Cape provinces of South Africa. The taxonomy of these three southern African mongooses has been confusing, but currently they are considered distinct species (Watson & Dippenaar 1987; Taylor & Goldman 1993). However, it is possible that *G. nigrata* should be referred to as *G. flavescens* because of taxonomic priority (Bronner *et al.* 2003).

We observed both *G. sanguinea* and *G. nigrata* at our study site in the foothills of the Erongo

Mountains (10 km west of Omaruru town near the Erongo Wilderness Lodge, 21°27.679'S, 15°52.523'E). The slender mongoose is cinnamon brown and about 2/3 the size of the black mongoose, which is essentially black with a total length of almost 800 cm and a weight of nearly 1 kg. The behavioural ecology of the black mongoose is the least known of the three species of *Galerella* in southern Africa, so we opportunistically radio-tagged an adult male that was accidentally captured during a study of dassie-rats (*Petromus typicus*), which live among the many 10–20 m high granite outcrops or kopjes in the area (Rathbun & Rathbun, in press).

The mongoose was captured on 15 May 2003 in a Tomahawk live trap (model 201, 40 × 12 × 12 cm, single door) baited with raw apple. The radio transmitter (Holohil Systems Ltd, Carp, Ontario, Canada; model MD-2C, 2.2 g weight, 120-day battery life, 20-pound test 10-cm-long wire whip antenna) was attached to a neck collar made of antenna wire inside Tygon tubing. The 927 g mongoose was radio-tagged while sedated with intramuscular medetomidine hydrochloride (Domitor) – a potent, selective, and specific alpha<sub>2</sub>-adrenoceptor agonist at both central and peripheral receptor sites. The dosage rate was 30 µg/kg of body weight. Moderate to deep sedation was achieved after 5–7 minutes, and the analgesic properties were sufficient for radio collaring and the insertion of a subdermal passive integrated transponder microchip during a 30-minute period. Sedation was reversed with the intramuscular administration of atipamezole hydrochloride (Antisedan) at four times the dosage rate of medetomidine hydrochloride.

Radio locations were gathered several times a day between dawn (06:30) and dusk (17:30), but mongoose observations (with 8 × 40 binoculars) were sometimes difficult because of its wary

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behaviour and camouflaged colouration (Rathbun 2004). Scan and focal animal sampling (Altmann 1974) were used every five minutes when possible.

Three methods of radio-location were used, all based on a hand-held global positioning system (GPS) receiver reading in universal transverse Mercator (UTM) coordinates. To assess the accuracy of the GPS receiver, 13 hourly readings (one-second averaging for one minute) were taken during a 12-hour daylight period; the maximum span of these coordinates was 10 m. When the mongoose was radio-located and sighted, a GPS reading at the site was taken only if the animal would not be disturbed, otherwise we measured the distance and azimuth to the mongoose from our known GPS location with a laser rangefinder (Bushnell model 400X) and sighting compass (Brunton model 16-FSM360LA-SME). These instruments were accurate to  $\pm 1.0$  m and  $\pm 0.5$  degrees, respectively. These data were used to calculate the animal's coordinates with the computer software program UTM CALC (O'Leary 1998). If the mongoose was not visible its location was determined based on two bearings ('triangulation' but with no measure of error), or if triangulation was not possible because of the animal's rapid movement, terrain restrictions, or signal bounce from rock faces a 'crude estimate' of the location was made, which was assumed to be within 100 m of the mongoose. The software program RANGES 6 (Kenward *et al.* 2002) was used to calculate minimum convex polygon (MCP) and fixed kernel density home range areas using the software's default settings. To reduce the effects of auto-correlation, only locations separated from each other by at least 30 minutes were used. We included our 'crude estimate' locations in our home range analyses because they contributed to the fixed kernel analysis and did not greatly affect the MCP analysis. For example, the 'crude estimate' locations made up 19% of 305 locations but only influenced home range area by -7% for the 95% MCP analysis and +2% for the 100% MCP.

On 14 June 2003 we observed a moribund adult bull greater kudu (*Tragelaphus strepsiceros*) in our study area, which died within two days and then was discovered as a source of food by the radio-collared mongoose on 18 June 2003. We spent 39.8 hours during 11 days beginning on 21 June visually monitoring activity at the carcass from a hide 30 m away. The distribution of our effort in two-hour periods starting at 06:00 was

4.5%, 38.7%, 15.2%, 15.0%, 16.8% and 9.8%.

As the kudu decomposed it attracted thousands of adult flies (Sarcophagidae), especially around the anus and face. Several black mongooses came to the carcass and fed on these flies by snapping them out of the air as well as lunging for them as they rested on the surface of the kudu. During the night of 25 June a large carnivore opened the anal area of the kudu and the exposed flesh attracted even larger numbers of flies, which the mongooses continued to eat. Kudu flesh, however, was only rarely eaten, as determined by lunging compared to tugging behaviour by the mongooses. By 1 July there were large numbers of fly maggots under and around the edges of the carcass and the black mongooses began to dig at the soil next to the kudu, presumably excavating fly larvae and pupae. We never observed any other diurnal vertebrate scavengers at the kudu carcass, even though slender mongooses and dwarf mongooses (*Helogale parvula*) occur in the area.

Based on five-minute scan samples ( $n = 475$ ) at the antelope, 18.7% of the time no black mongooses were within 30 m of the carcass, 30.3% of the time there was one mongoose, 26.7% two, 18.1% three, 5.9% four, and 0.2% of the time five mongooses were present. While one animal fed, others in the vicinity usually waited 5–25 m away and only moved in to feed when no others were present. On a few occasions mongooses arrived as well-coordinated pairs or triads, and if these animals fed on the carcass at the same time they stayed at different locations or one animal waited nearby while the other fed. Although we could individually identify only the radio-tagged male and another with a distinctive kink in its tail, we estimate that seven individuals used the carcass during our observations, but with little aggression. For example, the radio-tagged mongoose displaced without obvious aggression other mongooses at the antelope, while the animal with the kinked tail never displaced mongooses already at the carcass. However, we observed five intra-specific fights within about 30 m of the kudu. These encounters lasted about 10–15 seconds and included initial growling followed by face-to-face biting, rapid rolling about on the ground, and loud screeching or squealing.

While monitoring the kudu, we sampled the behaviour of the radio-tagged male every five minutes ( $n = 478$ ). He was not in the vicinity of the antelope (within 30 m) 42.9% of the time, he foraged at the kudu for 25.7% of the time,

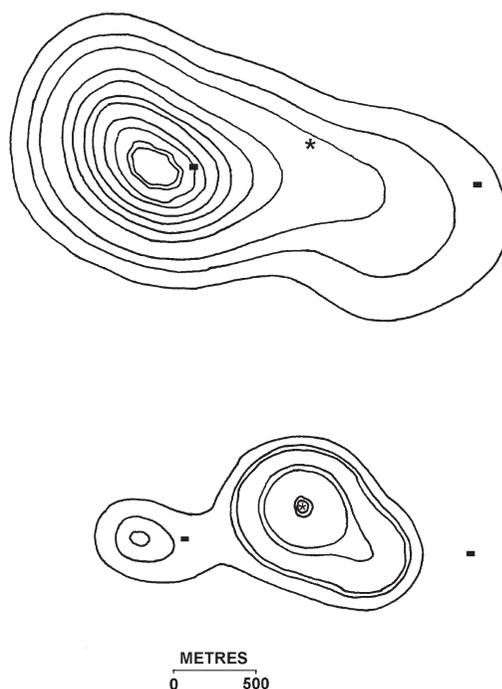
sheltered under boulders in the vicinity of the carcass for 17.6% of time, was vigilant or basked in the vicinity for 12.1%, and interacted with other mongooses within the 30 m for 1.7% of the time.

On five days we arrived at the kudu carcass early in the morning while the radio-tagged mongoose was still at its night den. It arrived at the carcass to feed at 08:23, 08:15, 08:30, 08:54, and 08:02. Conversely, it left the carcass at 16:08, 16:41, and 16:25 and travelled directly to a den for the night. The radio-tagged mongoose fed at the carcass on 10 of the 11 days that we monitored the kudu. On the day that it did not visit the carcass it remained within about 30 m of its night den.

We used 305 radio-locations (up to 12/day) from 15 May to 2 July 2003, inclusive, to determine home range areas. The minimum convex polygon home range during the entire observation period, based on 95% and 100% of locations, was 144.9 ha and 190.9 ha, but the pre- and post-kudu home range areas were remarkably (*c.* 60%) different. The 95% and 100% ( $n = 207$ ) pre-kudu home range was 158.0 ha and 187.1 ha compared to 59.9 ha and 61.8 ha post-kudu. In addition, the areas within the home range that were most intensively used by the tagged mongoose immediately changed with the discovery of the dead antelope (Fig. 1). For comparison with the minimum convex polygon home range areas, the 95% and 100% fixed kernel home range areas (Fig. 1) pre-kudu were 257.7 ha and 374.6 ha and post-kudu were 77.3 ha and 126.4 ha.

Prior to the kudu's death (until 17 June, inclusive), when the tagged mongoose cryptically hunted among boulders, only 15.5% ( $n = 207$ ) of our fixes included a visual sighting, whereas after the kudu was discovered 41.8% ( $n = 98$ ) included a sighting. Before the death of the kudu, while the mongoose spent nearly all daylight hours on the move searching for prey, the average daily ( $n = 26$ ) linear movement was 1722 m (range = 860–3465 m). Most of the home range was covered every few days during this period. After the antelope died the average daily ( $n = 13$ ) linear movement was 1357 m (range = 481–4434 m). Although this is shorter than before the kudu died, it is not significantly different ( $P = 0.3$ , two-tailed *t*-test) because the mongoose continued to use the same nocturnal den sites that were not near the antelope.

Vaughan (1976) described the feeding behaviour of at least three slender mongooses at a giraffe (*Giraffa camelopardalis*) carcass in Kenya over a five-day period. Like our black mongooses,



**Fig. 1.** Fixed kernel density home ranges for a male black mongoose. Home range at top is based on 207 locations from 15 May to 17 June 2003, inclusive, before the mongoose started foraging at a dead kudu, with isopleths at 10% intervals and including the 95% contour (second from outside). The location of the kudu carcass is at the star. Bottom home range is based on 98 locations from 18 June to 2 July 2003, after the mongoose discovered the antelope. Isopleths are distributed as in top range, but the carcass is located inside the most inner contour, which includes 50% of locations. Top and bottom home ranges are to the same scale, as shown by the two small rectangular reference points in each.

*G. sanguinea* spent large parts of the day feeding at the giraffe and they fed alone or at opposite ends of the carcass. Also similar to our observations, Vaughan (1976) did not see other species of mongoose feeding at the giraffe, although three other species occurred in the area. These observations suggest that *G. sanguinea* and *G. nigrata* have similar feeding habits and also that they both may exclude other mongooses from these temporarily abundant sources of food.

The main difference in the feeding behaviour at the giraffe and kudu carcasses was that slender mongooses focused on excavating fly pupae from the soil around the carcass (Vaughan 1976), whereas our black mongooses concentrated on snatching adult flies attracted to the kudu. This

difference may be due to the timing of observations. Vaughan (1976) did not discover the giraffe until after large predators had scavenged the carcass and it had largely dried. At this stage, it was probably not attractive to adult flies. We made observations at the kudu when the flesh was at the peak of decomposition and adult flies were remarkably abundant.

*Galerella* mongooses in southern Africa have a catholic diet of vertebrates, invertebrates, and fruits and seeds (Skinner & Smithers 1990). Our observations, along with those of Vaughan (1976) for *G. sanguinea* in Kenya and Cavallini & Nel (1990a) for *G. pulverulenta* in South Africa, further indicate that these mongooses are opportunistic feeders and will alter their use of space in order to take advantage of temporarily and spatially abundant prey.

*Galerella nigrata* engaged in intraspecific fights, which we believe helped establish a dominance order that determined when individuals fed at the kudu carcass and reduced further aggression between individuals. Our observations suggest that *G. nigrata* is essentially solitary, similar to the other species in the genus (Rood & Waser 1978; Cavallini & Nel 1990b).

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