© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/

Z. Säugetierkunde 58 (1993) 281–285
© 1993 Verlag Paul Parey, Hamburg und Berlin
ISSN 0044-3468

Activity of the Yellow mongoose *Cynictis penicillata* in a coastal area

By P. Cavallini

Department of Zoology, John Ellerman Museum, University of Stellenbosch, Stellenbosch, South Africa

Receipt of Ms. 25. 9. 1992
Acceptance of Ms. 27. 12. 1992

Abstract

Observed the activity of yellow mongooses (*Cynictis penicillata*) in the West Coast National Park, Cape Province, South Africa. The majority of the population was captured, and a sample (4 females; 3 males) was radio-tracked. Radio-collared mongooses were usually (86 % of time) involved in the same kind of activity as uncollared ones. Mongooses spent most of the day (37 % of radiolocations) foraging. Time of start and cessation of activity was correlated to sunset and sunrise times, minimum and maximum temperature, windspeed, and meteorological conditions (mist, rain, cloudiness). The availability of insects may be a factor underlying this relation. This can explain the differences in activity rhythms among previous studies. Total size of home range (minimum convex polygon) used each day, percentage of total home range used each day, and total daily movements were not related to any of the above variables.

Introduction

The yellow mongoose *Cynictis penicillata* (Carnivora: Herpestidae) feeds mostly on insects, but also rodents are frequently eaten. It frequents open areas and lives singly or in small groups, spending the night and part of the day in burrows (Skinner and Smithers 1990; Cavallini 1993). Gravid females have been recorded from mid-July to the end of December (Zumpt 1969).

In spite of its abundance (Stuart 1981) and apparently diurnal habits, data on the activity budget of this species are scarce. Earlé (1981) reported a marked effect of temperature on the activity of *C. penicillata*, but presented no supporting data. This study investigates the activity budget and ranging movements of the yellow mongoose in relation to selected meteoreological variables.

Material and methods

The study was conducted in the West Coast National Park (2700 ha), Cape Province, South Africa. The climate is mediterranean and rainfall is concentrated in winter. Over 80 % of the area is covered by bush, the rest being covered by short grass. Further details on habitat are reported by Boucher and Jarman (1977) and Cavallini and Nel (1990).

Twelve yellow mongooses were captured and marked. For trapping and radiotracking methodologies, see Cavallini (1993). From 4 to 7 unmarked mongooses were observed in the area. Total population size was therefore estimated at 16–19 individuals. Of these, seven adult mongooses (4 females; 3 males; 37 % to 44 % of total population) were radio-tracked from March to May 1991, one animal per day, randomly chosen. The non-breeding season was selected to avoid the eventual effects of rutting activities on the time budget. Since preliminary observations in the area and a review of the literature (e. g. Herzig-Straschil 1977) suggested that yellow mongooses left the den after sunrise, retreating back into the den at sunset, they were tracked from before sunrise (06.30–07.00 h) until after sunset (19.00 h–19.30 h), and all mongooses within sight were observed. The eventual occurrence of nocturnal activity was checked during ten nights. During a random period, all radio-equipped animals were located and activity was checked for 15 min through signal intensity fluctuations. The exact location of the mongoose (inside or outside a den) was then checked by

U.S. Copyright Clearance Center Code Statement: 0044-3468/93/5805-0281 $ 02.50/0

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/

homing on the signal, while still checking for the constancy of signal. This procedure assured that the mongoose did not change location (e. g. retreating into the den) while I approached it.

Definitions

Behavioural variables

Start of activity: the time either of first movement > 50 m from the den or beginning of feeding (whichever came first). Yellow mongooses are known to rest ('sunbathing') outside the den in the morning, before beginning to feed and travel (Earlé 1981).

Stop of activity: stop of feeding or proximity (< 50 m) to the den (whichever came last).

Daily home range size: total size of the minimum convex polygon (Hayne 1949) enclosing all locations of a particular animal on a day. Although not an ideal technique, the minimum convex polygon was found to perform better than more recent methods in this case (Cavallini 1993). In fact, the minimum convex polygon is less sensitive to the use of autocorrelated data, as those used in the present study (Swihart and Slade 1985).

Percentage of total range: percentage of daily home range size on total minimum convex polygon enclosing all the locations recorded for a particular animal.

Daily movements: sum of all distances between consecutive 15-min fixes recorded on one day.

Number of active fixes: the total number of locations in which the radio-tracked mongoose was active during the day.

Meteorological variables

Minimum and maximum daily shade temperatures: measured at about 20 cm from the ground, with a Brannan dry-bulb thermometer.

Average windspeed: measured with an anemometer at 2 m from the ground (windspeed was measured in m/s every hour during the day, then averaged and converted to a Beaufort scale).

Weather conditions: 1 = clear sky for more than 80 % of the day; 2 = variable; 3 = cloudy for more than 80 % of the day; 4 = rain.

Morning fog: duration, starting from 06.30 h until complete dissolvence of fog.

Standard tables were used for sunrise and sunset times.

Standard nonparametric tests (Siegel 1956) were used. Because of large number of tests, significance level was set at 0.01 (Rice 1989). When the analysis of variance showed no significant differences (conservatively, I used $P > 0.1$) among individuals, data were pooled (because of repeated measures on the same individuals, these analyses should not be considered a rigorous statistical testing, but rather as an indication to be tested with a larger data base). Otherwise, analyses were done separately for each individual.

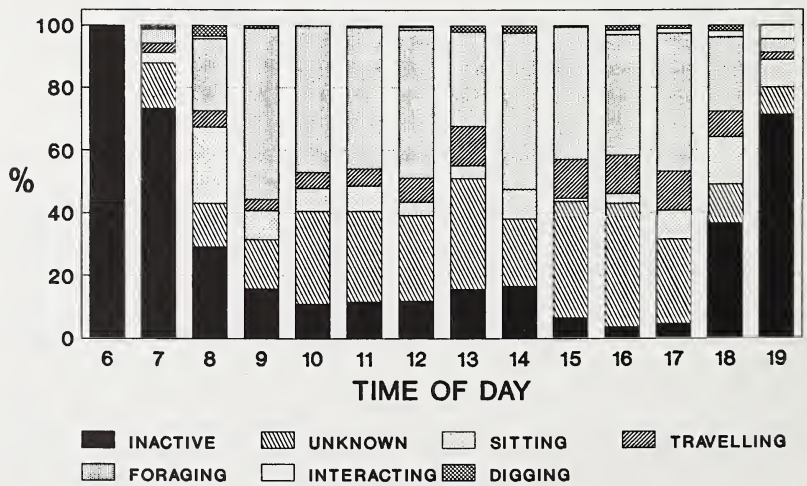

Fig. 1. Activity budget of seven yellow mongooses *Cynictis penicillata* (4 females; 3 males) in the West Coast National Park in relation to time of day, during March-May 1991 (n = 2260)

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/

Results

During the study, minimum temperatures ranged between 8 °C and 23 °C, and maximum between 18 °C and 35 °C. Windspeed reached 5 on only one day; the mode was 2. Most tracking days (56.5 %) were clear. Rain occurred on 8.9 % of tracking days, and fog on 32.6 %, lasting an average of 107 min when present. The sun rose between 06.48 h and 07.31 h, and set between 19.05 h and 17.57 h. A total of 2260 daytime animal locations was obtained (range: 119–489 per individual). Mongooses were never seen outside the den when tracking periods started, and were already in the den from ≥ 30 min when observations ended. Mongooses spent most of day (37.2 % of fixes), foraging, especially from 09.00 h to 18.00 h, without an evident peak in this activity. They sat and groomed in 8.4 % of fixes (particularly around 08.00 h and 18.00 h), and travelled in 7.4 %, mostly between 13.00 h and 18.00 h. Occasionally (26.8 % of days), they rested inside the den at mid-day, for up to 4.5 hours. Social interactions (0.8 % of fixes) were most frequent in late evening, especially before entering the den. Digging at the den (opening new holes and enlarging old ones) occurred in 1.1 % of fixes, particularly in the morning (08.00 h), at mid-day (13.00 h–14.00 h) and in the evening (16.00 h–18.00 h). They were not visible for 24.9 % of fixes (Fig. 1). Night-time fixes revealed no activity. Mongooses were invariably found in den during the night. When untagged mongooses were observed, they were often (86.3 % of sightings) seen involved in the same kind of activity at the same time as the tagged ones. Mongooses started their daily

Average and individual differences for seven behavioural variables of seven yellow mongooses *Cynictis penicillata* (4 females; 3 males) in the West Coast National Park, during March–May 1991

Correlations with metereological variables (Spearman rank correlation) are reported. For definition of variables, see 'Material and methods'

Behavioural variable	Average ± S.D.	Kruskall-Wallis ANOVA	Correlated metereological variables
Start of activity	08.45 h ± 74 min	H = 9.82, d.f. = 6, P = 0.13	Sunrise time, mist hours, weather; $r_s > 0.42$, $P < 0.001$, n = 69
Stop of activity	18.15 h ± 35 min	H = 5.04, d.f. = 6, P = 0.40	Sunset time, max temperature, windspeed; $r_s > 0.33$, $P < 0.01$, n = 69
Mid-day rest hours	10 ± 50 min	H = 7.49, d.f. = 6, P = 0.27	Maximum temperature; $r_s = 0.59$, $P < 0.001$, n = 69
N of active fixes	39.3 ± 5.0	H = 14.50, d.f. = 6, P = 0.024; Among males: H = 0.60, d.f. = 2, P = 0.738; Among females: H = 13.58, d.f. = 3, P = 0.022;	Males (pooled): mist hours; $r_s = -0.55$, P = 0.016, n = 27. Daylength; $r_s = 0.65$, $P < 0.01$, n = 27 Females (individually): none ($r_s < 0.37$, $P > 0.3$, $14 > n > 8$)
Daily range	20.8 ± 21.5 ha	H = 32.05, d.f. = 6, P < 0.001	None ($r_s < 0.47$, $P > 0.16$, $15 > n > 8$)
Percentage of total range	33.2 ± 16.8 %	H = 2.97, d.f. = 6, P > 0.5	None ($r_s < 0.19$, $P > 0.18$, n = 69)
Total movements	3229 ± 1135 m	H = 23.54, d.f. = 6, P < 0.001	None ($r_s < 0.59$, $P > 0.15$, $15 > n > 8$)

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/

activity between 07.15 h and 12.00 h, and stopped between 16.30 h and 19.15 h, with no significant individual differences (for all significance levels mentioned, see table). Time of start of activity was positively correlated to sunrise time, mist hours, and weather conditions. Time of cessation of activity was positively correlated to sunset time and maximum temperature, and negatively to windspeed. The duration of mid-day rest was not different among individuals, and positively correlated to maximum temperature. Most (86.6 %) of rests were at temperatures above 24 °C. Number of active fixes per day averaged 39.3 ± 5 S. D., with significant individual differences. For males mist depressed total active fixes, and daylength increased them, whereas for none of the females the environmental variables had any effect. Each day mongooses used on average 33.2 ± 16.8 % S. D. of their overall home ranges, without significant individual differences. The actual area used daily averaged 20.8 ± 21.5 ha S. D., with significant individual differences. Radio-tagged animals moved an average of 3,229 ± 1,135 m S. D. per day, with significant individual differences (Table). Males ranged daily over larger areas than females, and moved correspondingly more (Mann-Withney test, $U = 430$, $P < 0.01$, $n_1 = 20$, $n_2 = 31$). Movements were slower in the morning, increasing throughout the day, and faster in the afternoon (14.00 h to 17.00 h; Fig. 2). This increase corresponds to the peak in the "travelling" category in the time budget (Fig. 1). None of the three range use variables was significantly correlated with any environmental variable.

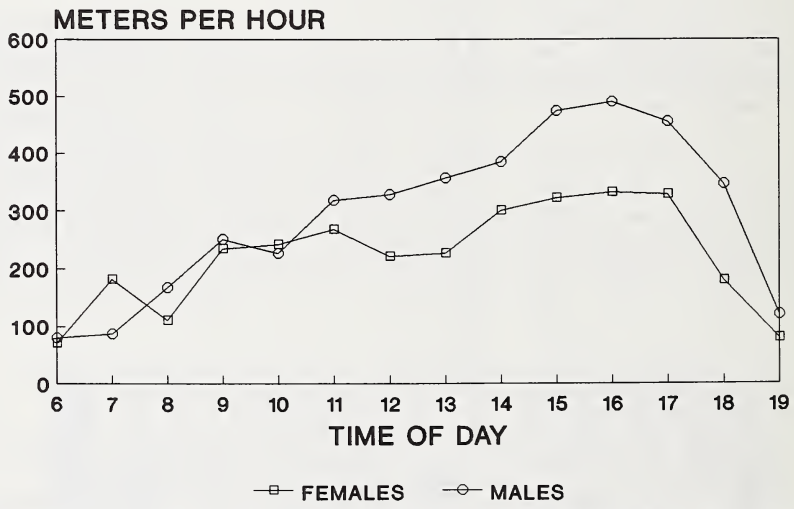

Fig. 2. Average movements of seven yellow mongooses *Cynictis penicillata* (4 females; 3 males) in the West Coast National Park in relation to time of day, during March–May 1991

Discussion

The environmental variables I investigated might have been associated with timing of activity, but not with the extent of movements, of yellow mongooses. The onset and end of activity, including the mid-day rest, may be related to weather through the availability of food resources. Indeed, both temperature and relative humidity have large influences on the foraging behaviour of termites (Nel et al. 1969), the main food source of *Cynictis* in this area (MacDonald and Nel 1986). Differences in meteorological conditions, including temperature, and sunrise times among different areas might therefore explain: (i) the discrepancy between the start of activity time (08.00 h–10.00 h) reported in Herzig-

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/

Straschil (1977) and that (06.00 h–07.00 h) reported in Earlé (1981); (ii) the greater variability (07.15 h–12.00 h) found in the present study, which may be consistent with the greater variability in weather typical of a coastal region; (iii) the lack of consistency between the majority of studies of this species (e.g. Stuart 1981; Herzig-Straschil 1977), which indicate an exclusively diurnal activity, and two other authors (Earlé 1981; Smithers 1971), who suggest the occurrence of some nocturnal activity.

Acknowledgements

I wish to thank: the Trustees of the New Moorgate Trust Fund for the award of a John Ellerman Scholarship; Prof. J. A. J. Nel and Prof. R. Dallai for kindly providing facilities; the Oude Post Syndicate and the National Parks Board; D. Mostert, A. Craven, and especially N. L. Avenant for help both in the field and in the laboratory; F. Borsani for translating the German summary; Prof. S. Lovari, Prof. J. A. J. Nel, Dr. P. le FN. Mouton, and Dr. D. J. Holmes for comments on previous versions of this paper. This study was partly supported by Italian M.U.R.S.T.

Zusammenfassung

Aktivität der Fuchsmanguste Cynictis penicillata in einem Küstengebiet

Untersucht wurde die Tätigkeit der Fuchsmanguste *Cynictis penicillata* im Westküsten-Nationalpark (Cape Province, Südafrika). Der größte Teil der Individuen dieses Gebietes wurde gefangen und eine Stichprobe davon mit Radiohalsbändern versehen. Diese Tiere wurden mit Hilfe von Funkgeräten verfolgt. Tiere mit Halsbändern verhielten sich wie Tiere ohne Halsbänder. Die Mungos waren die meiste Zeit mit der Futtersuche beschäftigt. Anfang und Ende der Aktivitäten hingen von Sonnenauf- und -untergang sowie von der Lufttemperatur, der Windstärke und den Wetterbedingungen ab. Die Größe des täglichen Streifgebietes, dessen Verhältnis zum gesamten Aktionsraum sowie die tägliche Laufstrecke konnten mit keiner der genannten Variablen in Verbindung gebracht werden.

References

Boucher, C.; Jarman, M. L. (1977): The vegetation of the Langebaan area, South Africa. Trans. Royal Soc. South. Africa **42**, 241–288.

Cavallini, P. (1993): Spatial organization of the yellow mongoose *Cynictis penicillata*. Ethol. Ecol. and Evol. (in press.)

Cavallini, P.; Nel, J. A. J. (1990): Ranging behaviour of the Cape grey mongoose *Galerella pulverulenta* in a coastal area. J. Zool. (London) **222**, 353–362.

Earlé, R. A. (1981): Aspects of the social and feeding behaviour of the yellow mongoose *Cynictis penicillata* (G. Cuvier). Mammalia **45**, 143–152.

Hayne, D. W. (1949): Calculation of size of home range. J. Mammalogy **30**, 1–18.

Herzig-Straschil, B. (1977): Notes on the feeding habits of the yellow mongoose *Cynictis penicillata*. Zool. Afr. **12**, 225–229.

MacDonald, J. T.; Nel, J. A. J. (1986): Comparative diets of sympatric small carnivores. South African J. Wildl. Res. **16**, 115–121.

Nel, J. J. C.; Hewitt, P. H.; Smith, L. J.; Smit, W. T. (1969): The behaviour of the harvester termite (*Hodotermes mossambicus* (Hagen)) in a laboratory colony. J. entom. Soc. South. Africa **32**, 9–24.

Rice, W. R. (1989): Analyzing tables of statistical tests. Evolution **43**, 223–225.

Siegel, S. (1956): Nonparametric statistic for the behavioural sciences. New York: McGraw-Hill.

Skinner, J. D.; Smithers, R. H. N. (1990): The mammals of the southern African subregion. Sec. ed. Pretoria, South Africa: University of Pretoria.

Smithers, R. H. N. (1971): The mammals of Botswana. Mem. Nat. Mus. Rhod. **4**, 1–230.

Stuart, C. T. (1981): Notes on the mammalian carnivores of the Cape Province, South Africa. Bontebok **1**, 1–58.

Swihart, R. K.; Slade, N. A. (1985): Influence of sampling interval on estimates of home-range size. J. Wildl. Manage. **49**, 1019–1025.

Author's address: Dr. Paolo Cavallini, Department of Evolutionary Biology, Università di Siena, via Mattioli 4, I-53100 Siena, Italy

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: Mammalian Biology (früher Zeitschrift für Säugetierkunde)

Jahr/Year: 1993

Band/Volume: 58

Autor(en)/Author(s): Cavallini Paolo

Artikel/Article: Activity of the Yellow mongoose Cynictis penicillata in a costal area 281-285