ACTIVITY PATTERNS OF CHACMA BABOONS *(PAPIO URSINUS)* AT CAPE POINT

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Accepted: October 1977

ABSTRACT

Field data were analysed to assess daily and seasonal activity patterns of a troop of 85 free-ranging chacma baboons. The baboons emerged from their night-time shelters at sleeping cliffs at roughly 07h00 throughout the year. Foraging began almost immediately after emergence in the dry summer months (December-February). During the remainder of the year, the baboons rested near the sleeping cliff before foraging. Feeding was the predominant activity from 10h00 to 15h00 throughout the year. The daily time spent feeding by the troop was greatest during August to January. Seasonal changes in the daily time spent foraging appeared to be related to the availability and nutritive value of food.

INTRODUCTION

Interest in primate biology has flourished during the last two decades. Baboons, in particular, have been studied in captivity and under natural conditions in savanna and montane habitats (DeVore 1965; Kummer 1968; Altmann & Altmann 1970). Most studies have focused on the behaviour, particularly social behaviour, of free-ranging baboons. This approach was pioneered by the late Professor K R L Hall, who made a study of chacma baboons in the Cape of Good Hope Nature Reserve (Hall 1962*a*, 1962*b*, 1963). Few studies have been made on activity patterns of baboons. The little information available on this subject is based largely on unquantified data (Hall 1962*a*, 1963; Rowell 1966; Struhsaker 1967; Stoltz & Saayman 1970). Recently, attempts have been made to quantify activity patterns, mainly using the instantaneous scan and focal animal methods of data collection (Altmann 1974). This paper reports daily and seasonal activity patterns for a troop of 85 chacma baboons *Papio ursinus* (Kerr 1792) from data collected by the scan method over 12 months.

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METHODS

Data collection

The study was made from March 1975 to February 1976 in the Cape of Good Hope Nature Reserve, situated at the southern tip of the Cape Peninsula, South Africa. The home-range of the troop studied (*O* troop) covered roughly 4 000 ha of the north-western and west-central sectors of the reserve. A description of the study area, and ecological data for the troop, are given elsewhere (Davidge in press).

Data on daily activity patterns were obtained using the instantaneous scan method (Altmann 1974). The age and sex class and current activity of all visible baboons were noted every 10 minutes, using a tape-recorder. Not more than 10 seconds were spent observing each individual. Behaviour was, therefore, divided into broad categories to allow instant categorization of any observed activity. The categories used included all major activities of baboons and were mutually exclusive. *O* troop was followed for as long as possible from the first turn of the hour after sunrise on days chosen at random with respect to weather conditions. Observations in the afternoon (from 15h00) were made from the first turn of the hour after sighting the troop. Roughly equal numbers of observations per month were made in each hour of the day. Data were, however, collected less frequently in the late afternoon than in the morning owing to the difficulty of following the troop for more than 8 hours. Four days, or 30 hours, of observations were made on average each month.

Five age and sex classes were used (after Altmann & Altmann 1970):

Adult male: animals with fully developed secondary male characteristics, such as shoulder mane, enlarged canines, large head and body.

Adult female: adults with divided ischial callosities, individuals menstruating or turgescent, certain of the old animals, recognizable and known to be female. Among younger females, neither menstruating nor turgescent, classification was more difficult. If the animal had divided ischial callosities and was larger than a certain subjectively determined size, it was classed as female, otherwise as juvenile.

Juvenile: all non-adult individuals of both sexes no longer carried by the mother.

Brown infant: brown-furred infants carried jockey-style by the mother.

Black infant: individuals with black fur and skin colour ranging from the bright pink of the newly born to fully pigmented.

Six activity categories were used:

Resting: animals auto-grooming, lying, sitting or standing motionless.

Feeding: animals standing or sitting, on the ground or in a bush or tree. Feeding encompassed digging, pulling up of roots and cleaning and gathering of food items, but not chewing of food. Movement while feeding, other than very slight, was categorized as "walking".

Walking: animals walking, running or climbing.

Drinking:

Social behaviour: grooming of another individual, fighting (individuals threatening, screaming, fleeing, pursuing or in physical combat).

Copulation.

Data analyses

The percentage frequency of observations of activity categories per age and sex class was calculated for each hour of day per month. "Feeding" and "walking" were chosen for the following analyses as being the activities most likely to vary seasonally in response to environmental changes (e.g. food availability). Feeding and walking frequencies in each hour in every month (March 1975-February 1976) were analysed by computer using the sum of squares simultaneous test procedure (SS-STP) (Sokal & Rohlf 1969). These analyses were made separately for each hour to minimize the effects of diurnal variation in activities. Frequencies for each hour in every month were averaged to give a single hourly frequency for each activity for each age and sex class. These values were summed to give the frequency with which each age and sex class was observed feeding or walking each month. This method was chosen since the hours of observation were not evenly distributed throughout the month.

The calculated activity frequencies for each month referred to an average "day", although day-length (hours between local sunrise and sunset) at latitude 34°S varies considerably during the year (Anon. 1957). Activity frequencies were therefore multiplied by the average day-length of the corresponding month to give the average number of minutes in a day spent on each activity.

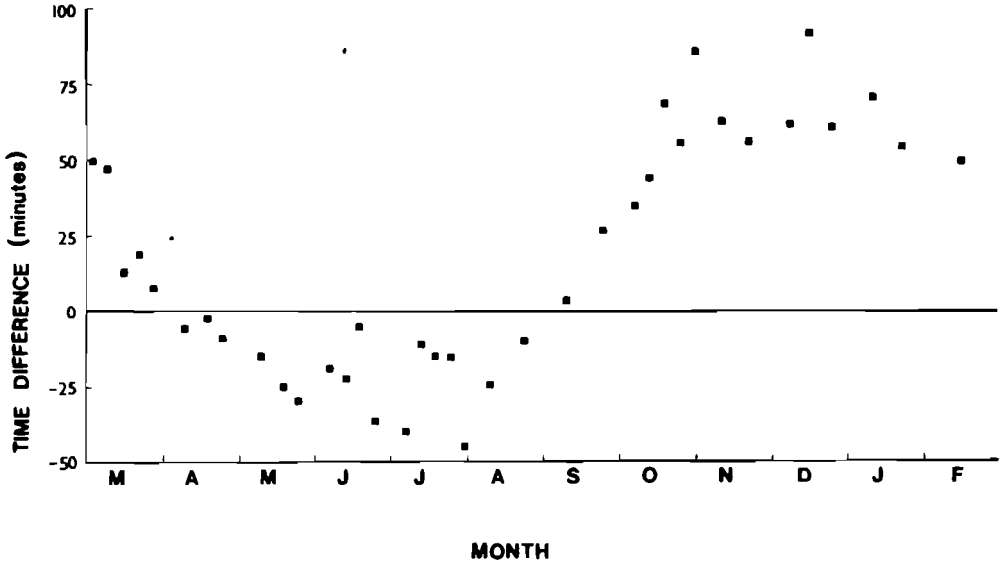

FIGURE 1

Difference between time of local sunrise and the emergence of the first 10 or more baboons of *O* troop from night shelter during March 1975 to February 1976. Time of sunrise has been reduced to zero.

RESULTS & DISCUSSION

Diurnal variation in activities

Start of diurnal activities of the baboons in *O* troop appeared to be independent of time of sunrise (Figure 1), allowing comparison of activities occurring in the same hour throughout the year. Table 1 shows that there were significant differences (generally at low probability levels) between months, for several hours of the day, in the average hourly number of minutes spent feeding or walking. However, up to 64 "non-significant subsets" (monthly values which, for a given hour, did not significantly differ from one another) were produced for each hour by the SS-STP analysis. Significant differences between values for one month and another were thus not demonstrated. This apparent failure of the analysis was almost certainly due to insufficient data, since less than 16 samples were analysed for each hour in every month.

Baboons of *O* troop seldom emerged from their shelters at sleeping cliffs before 07h00. "Rising" time thus appeared to be unrelated to time of sunrise (Figure 1). Adult male baboons generally appeared first, usually at the top of the cliff. The troop rested near or at the top of the cliff for periods of a few minutes to three hours after rising. The resting period (Figure 2) was significantly longer in winter (June-August) than during November to February ($t = 7{,}56$; $p < 0{,}0005$), disagreeing with Hall's (1962*a*) statement: "Although

TABLE 1

Hours shown by SS-STP analysis to have monthly differences, significant at the probability level specified, in the number of minutes spent walking or feeding for three age and sex classes of chacma baboons in *O* troop, during March 1975 to February 1976.

	Level of significance					
	Adult male		Adult female		Juvenile	
Hour	Feed	Walk	Feed	Walk	Feed	Walk
07h00	0,05		0,01		0,01	
08h00	0,01	0,01	0,01	0,10	0,10	0,10
09h00	0,05		0,05			
10h00		0,01	0,10			0,05
11h00		0,10	0,10	0,10		
12h00	0,05					
13h00	0,05					
14h00		0,10			0,10	
15h00	0,10					
16h00						
17h00			0,10		0,01	

groups in the Cape tend to leave the sleeping cliffs and start their day-ranges later in the summer months . . . the differences are not significant." It was unlikely that observer interference "significantly delayed the start of day-ranging" (Hall 1962*a*) in the present study owing to the habituation of *O* troop to the observer. Feeding did not generally occur while the troop rested near the sleeping cliff, although a few juveniles sometimes fed intermittently on nearby plants.

The troop abruptly commenced the day-range after the resting period, and all the baboons began feeding. However, on 10 days during the study the troop moved directly for 0,5 km to *Acacia cyclops* thickets before first feeding. Feeding was the predominant activity from 10h00 to 15h00 (Figures 3-6 for June and December). The proportion of time spent feeding decreased progressively during the late afternoon (from 16h00) when the troop was in the vicinity of a sleeping site. The decline in "foraging activity . . . during the mid-day rest periods", reported for baboons in the Transvaal (Stoltz & Saayman 1970), was not observed for *O* troop.

There was apparently no tendency for copulation to occur more frequently at one time of day than at another (Figures 3-6). This was supported by qualitative impressions gained during the study, although Hall (1962*a*) suggested that, "sexual activity [of troops in the reserve] tends to be greatest in the early part of the day."

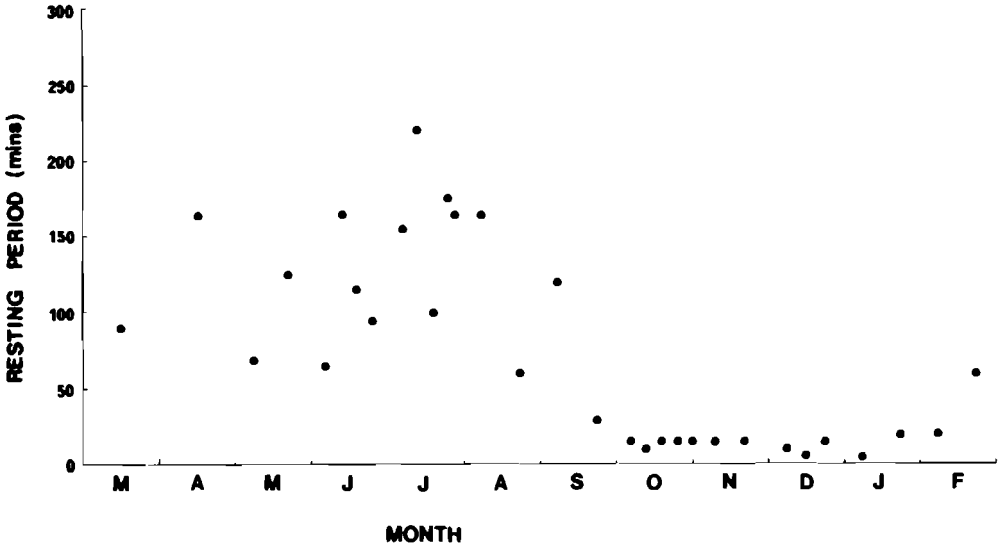

FIGURE 2
Initial morning resting period between time of *O* troop's emergence from night shelter and start of day-range, March 1975 to February 1976.

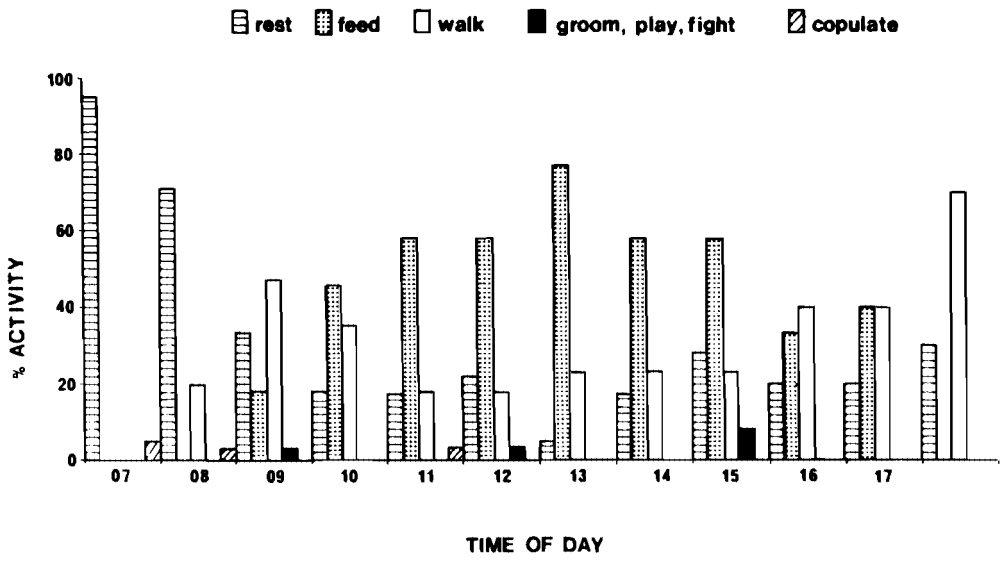

FIGURE 3
Average diurnal variation in activities of 12 adult male chacma baboons in June 1975.

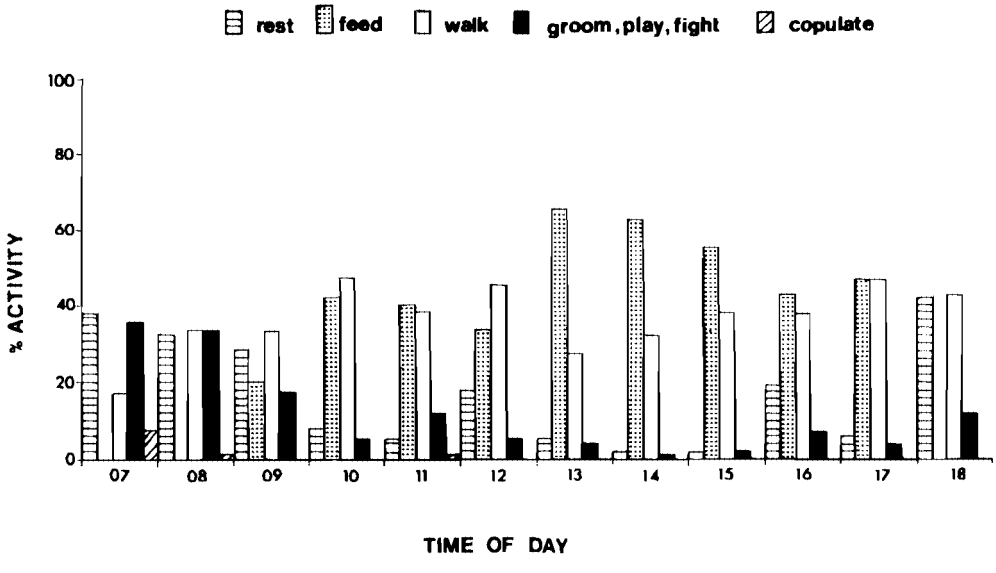

FIGURE 4
Average diurnal variation in activities of 24 adult female chacma baboons in June 1975.

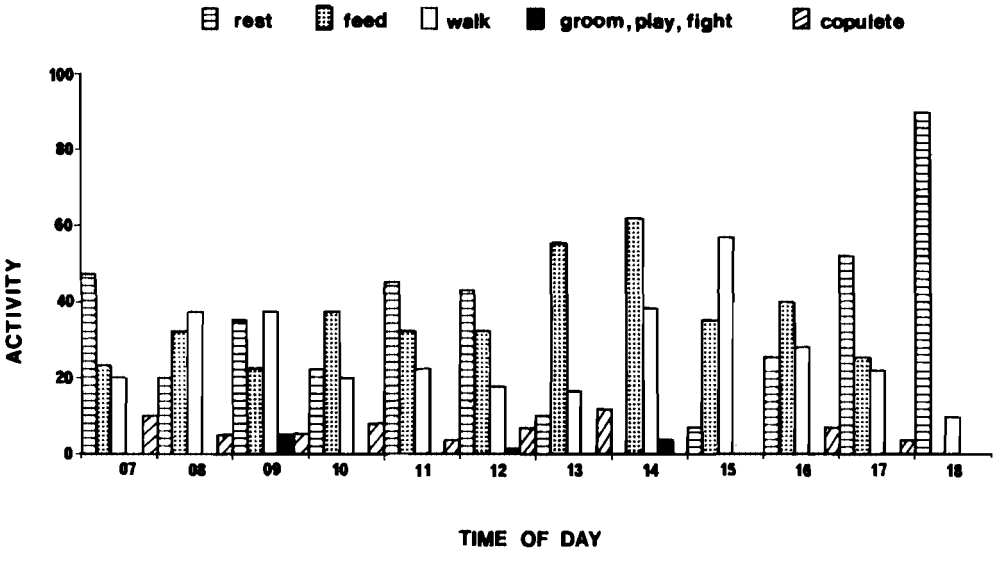

FIGURE 5
Average diurnal variation in activities of 12 adult male chacma baboons in December 1975.

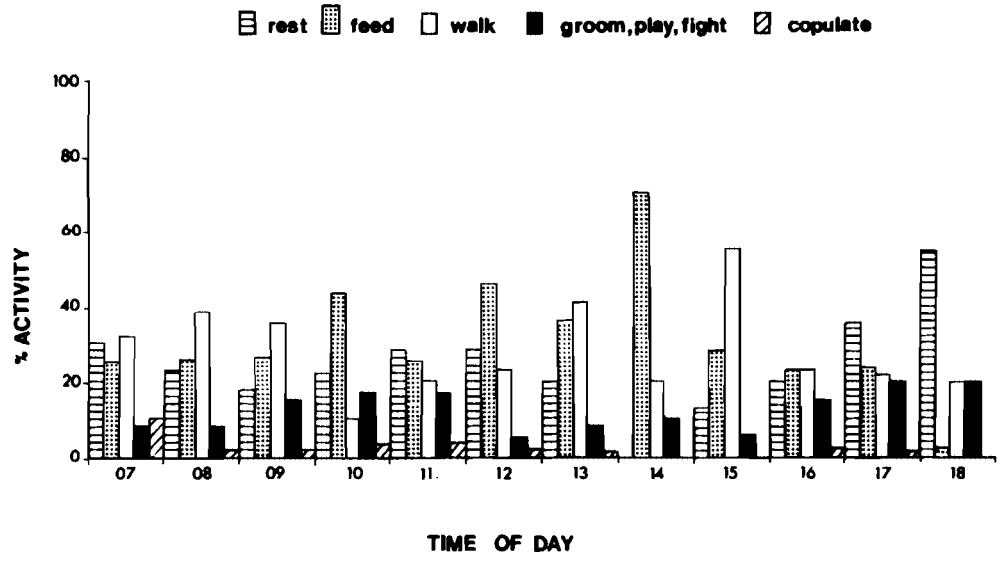

FIGURE 6
Average diurnal variation in activities of 24 adult female chacma baboons in December 1975.

Seasonal variation in activities

Tables 2 - 4 give the average monthly number of minutes per day spent by adult male, adult female and juvenile baboons of *O* troop in various activities. There appeared to be no seasonal pattern to the time spent resting by the three age and sex classes. The "expected" increase in resting time during winter (June-August), when the early morning resting period was longest (Figure 2), was not shown. This indicates that the baboons took a greater number of short resting periods throughout the day in summer than in winter. Adult male baboons rested significantly longer over 12 months than did adult females ($\bar{x} = 201$ and 148 minutes respectively; $t = 2{,}26$; $p < 0{,}025$).

The average daily number of minutes spent feeding ("feeding time") was greatest during August to January for all three classes. There were no significant differences between annual mean feeding time for adult male, adult female and juvenile baboons (258; 238; 268 minutes respectively. Adult male-adult female $t = 0{,}58$; $p > 0{,}1$. Adult male-juvenile $t = 0{,}29$; $p > 0{,}1$).

The average daily number of minutes spent walking ("walking time") by the three classes was greatest during March and April and October to February. These periods coincided with the dry season, when food was apparently scarcer than in winter. There were no significant differences in annual mean walking time for the three classes (222; 237; 229 minutes. Adult male-adult female $t = 0{,}55$; $p > 0{,}1$. Adult male-juvenile $t = 0{,}33$; $p > 0{,}1$).

TABLE 2

Average daily (dawn-dusk) duration (minutes) of activities of adult male chacma baboons. Figures in parentheses are percentages. "Social" category includes playing, grooming and fighting

Month	Rest	Feed	Drink	Walk	Social	Copulate	No. hours observation
March	171 (23)	179 (24)	0 (0)	290 (39)	75 (10)	22 (3)	60
April	215 (32)	179 (16)	7 (1)	248 (37)	40 (6)	54 (8)	74
May	200 (32)	162 (26)	44 (7)	131 (21)	37 (6)	44 (7)	25
June	190 (32)	220 (37)	0 (0)	179 (30)	6 (1)	0 (0)	28
July	211 (35)	181 (30)	0 (0)	193 (32)	6 (1)	6 (1)	20
Aug.	181 (28)	292 (45)	0 (0)	162 (25)	6 (1)	0 (0)	21
Sept.	184 (26)	304 (43)	0 (0)	198 (28)	7 (1)	7 (1)	23
Oct.	124 (16)	371 (48)	0 (0)	270 (35)	0 (0)	8 (1)	29
Nov.	108 (13)	398 (48)	0 (0)	299 (36)	0 (0)	17 (2)	33
Dec.	318 (37)	258 (30)	0 (0)	224 (26)	9 (1)	43 (5)	30
Jan.	202 (24)	371 (44)	0 (0)	244 (29)	17 (2)	9 (1)	12
Feb.	311 (39)	184 (23)	0 (0)	231 (29)	24 (3)	48 (6)	14

TABLE 3

Average daily (dawn-dusk) duration (minutes) of activities of adult female chacma baboons. Figures in parentheses are percentages. "Social" category includes playing, grooming and fighting

Month	Rest	Feed	Drink	Walk	Social	Copulate	No. hours observation
March	164 (22)	134 (18)	0 (0)	335 (45)	97 (13)	14 (2)	60
April	127 (19)	101 (15)	0 (0)	295 (44)	81 (12)	67 (10)	74
May	75 (12)	212 (34)	0 (0)	162 (26)	100 (16)	75 (12)	25
June	101 (17)	196 (33)	0 (0)	220 (37)	71 (12)	6 (1)	28
July	163 (27)	181 (30)	1 (0)	175 (29)	79 (13)	6 (1)	20
Aug.	110 (17)	311 (48)	0 (0)	143 (22)	78 (12)	0 (0)	21
Sept.	198 (28)	304 (43)	0 (0)	113 (16)	85 (12)	7 (1)	23
Oct.	100 (13)	363 (47)	0 (0)	262 (34)	39 (5)	8 (1)	29
Nov.	116 (14)	315 (38)	0 (0)	340 (41)	41 (5)	8 (1)	33
Dec.	241 (28)	249 (29)	0 (0)	224 (26)	120 (14)	26 (3)	30
Jan.	160 (19)	303 (36)	0 (0)	337 (40)	42 (5)	8 (1)	12
Feb.	223 (28)	192 (24)	0 (0)	247 (31)	112 (14)	24 (3)	14

TABLE 4

Average daily (dawn-dusk) duration (minutes) of activities of juvenile chacma baboons. Figures in parentheses are percentages. "Social" category includes playing, grooming and fighting

Month	Rest	Feed	Drink	Walk	Social	Copulate	No. hours observation
March	194 (26)	171 (23)	0 (0)	298 (40)	82 (11)	0 (0)	60
April	210 (30)	154 (23)	0 (0)	221 (33)	107 (16)	0 (0)	74
May	156 (25)	225 (36)	0 (0)	156 (25)	87 (14)	0 (0)	25
June	137 (23)	220 (37)	0 (0)	190 (32)	48 (8)	0 (0)	28
July	193 (32)	181 (30)	0 (0)	193 (32)	30 (5)	0 (0)	20
Aug.	116 (18)	292 (45)	0 (0)	194 (30)	32 (5)	0 (0)	21
Sept.	127 (18)	339 (48)	0 (0)	184 (26)	52 (8)	0 (0)	23
Oct.	93 (12)	324 (42)	0 (0)	286 (37)	62 (8)	0 (0)	29
Nov.	91 (11)	357 (43)	0 (0)	315 (38)	58 (7)	0 (0)	33
Dec.	206 (24)	292 (34)	0 (0)	215 (25)	146 (17)	0 (0)	30
Jan.	93 (11)	413 (49)	0 (0)	270 (32)	59 (7)	0 (0)	12
Feb.	191 (24)	247 (31)	0 (0)	231 (29)	128 (16)	0 (0)	14

Social behaviour occurred relatively infrequently throughout the year for all three classes. Adult male baboons behaved socially for significantly less time annually than did either adult females or juveniles ($\bar{x} = 19$; 78 and 74 minutes respectively. Adult male-adult female $t = 5{,}95$; $p < 0{,}0005$. Adult male-juvenile $t = 4{,}43$; $p < 0{,}0005$). There was no significant difference between the annual mean time spent on social behaviour by adult female and juvenile baboons ($t = 0{,}30$; $p > 0{,}1$).

The average number of minutes per day spent copulating by adult baboons was relatively low in winter and spring (June-November), although the number of females with maximum turgescence in the period was not correspondingly low (Davidge in press). The "overall copulation frequency" for other troops in the reserve was found to be greatest in March and April and least in September and November (Hall 1962*b*).

Foraging

Average monthly "foraging time", defined here as the sum of the daily number of minutes spent walking and feeding, for adult male, adult female and juvenile baboons of *O* troop, is shown in Figure 7. There appeared to be no consistent difference in foraging time between the three age and sex classes for each month. However, foraging time increased from June

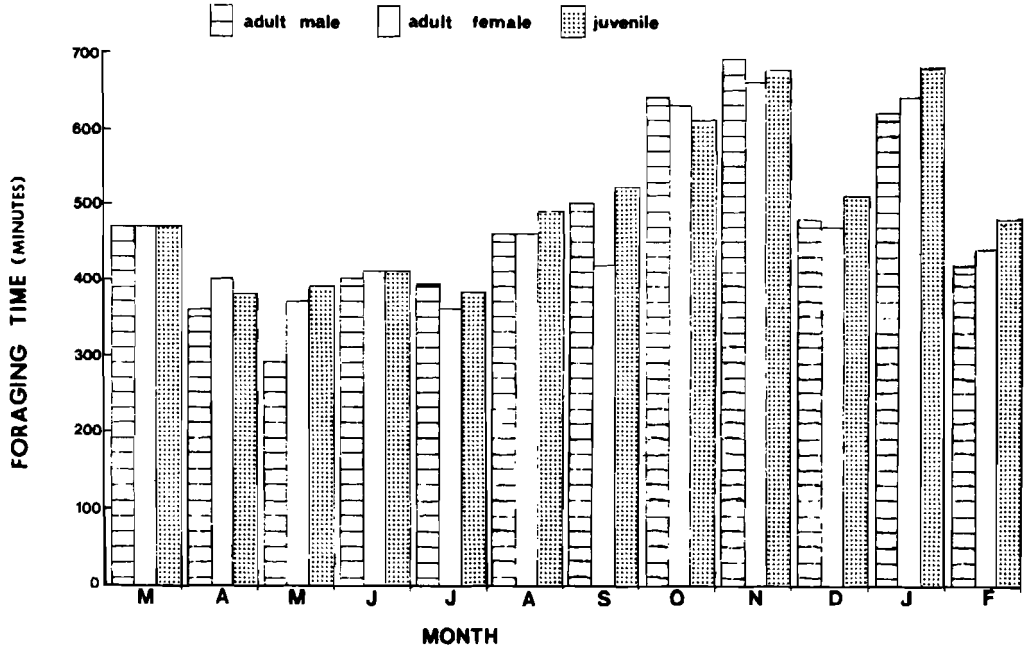

FIGURE 7

Average daily (dawn-dusk) duration (minutes) of foraging activities by baboons of *O* troop, March 1975 to February 1976. Adult female and juvenile values have been corrected with respect to those of adult males.

to November, *i.e.* concomitantly with increasing day-length. This could have been due to an increase in time spent walking, feeding, or in both activities proportionately. Feeding time for three age and sex classes (adult male, adult female and juvenile) was therefore expressed as a percentage of the foraging time for each month to determine which of the two activities more affected foraging time.

Figure 8 shows that the three age and sex classes devoted similar proportions of time to feeding in each month. The feeding component of foraging increased for all three age and sex classes from May to September, indicating a relatively large intake of freely available food. This suggests that the nutritive value of food at this time was low. The baboons fed largely on grass, leaves, berries and flowers, which have a relatively low fresh-weight nutritive value (Table 5), from May to September (Davidge in press). The walking and feeding components of foraging were roughly equal throughout the dry months (November-February), suggesting that the observed increase in foraging time (Figure 7) was due to a relative scarcity of food. The predominant food eaten by *O* troop at this time was inflorescences of *Leucospermum conocarpodendron* (Davidge in press). Walking was the major component of foraging in March and April, indicating a relatively small intake of food. The comparatively small amount of time spent foraging in these months also suggests

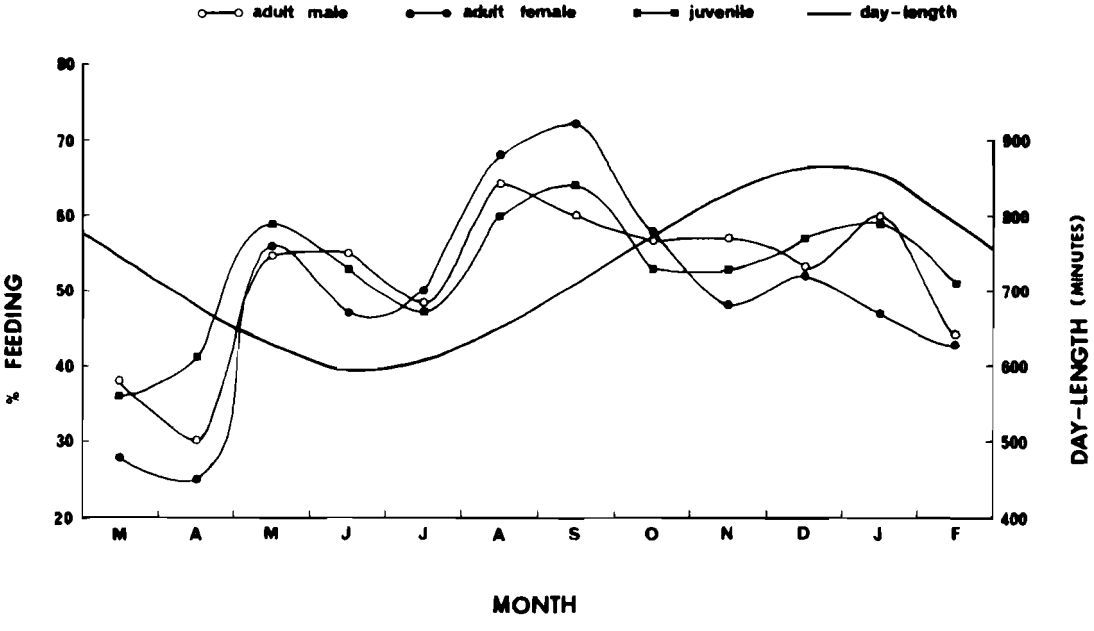

FIGURE 8
Feeding component of foraging for three age and sex classes of baboons in *O* troop, March 1975 to February 1976, plotted with day-length for comparison.

that the food ingested (predominantly *Acacia cyclops* seeds) had a relatively high fresh-weight nutritive value. This was supported by comparison of calorific and protein analyses of *A. cyclops* seeds with other food items (Table 5).

TABLE 5

Energy, water, protein and lipid content of some food items eaten by baboons in *O* troop's home-range, April - October 1975.

Food item	Month samples collected	Dry wt. sample (g)	% water	% protein content	% lipid content	kcal/g dry wt.	kJ/g dry wt.
Acacia cyclops seeds	April	6,67	1,4	24,7	10,4	4,66	19,51
A. cyclops arils	April	3,06	4,2	12,3	43,6	6,33	26,50
A. cyclops seeds & arils	Oct.		4,5	15,8	32,7	5,08	21,26
"Grass" (unidentified)	May					4,44	18,59
"Flowers" (unidentified)	May	1,30	78,7			4,82	20,18
Pelargonium "root bark"	May	2,90	71,6			4,28	17,92
"Twiner" (unidentified)	May	2,19	89,9			4,12	17,25
Arctotis (whole plant)	June	2,30				3,81	15,95
?Briza sp.	July	7,12				3,32	13,90
Medicago sp.	Aug.	5,84				5,00	20,93
Hypodiscus seeds	Aug.	7,30				4,38	18,33

ACKNOWLEDGEMENTS

This paper forms part of a thesis submitted for examination to the University of Cape Town for the degree of Master of Science. The project was supported entirely by an Overseas Students' Scholarship from the University of Cape Town.

I wish to thank Professor W R Siegfried, my supervisor, for his help and encouragement. Permission to work in the Cape of Good Hope Nature Reserve was given by the Divisional Council of the Cape. Thanks are due also to Mr G E P Wright, warden of the reserve, for providing a caravan for my use.

I wish to thank Mr S Piper for writing the computer programmes for the first data analysis, and Mr T B Crowe for his help in setting up the SS-STP analysis.

The University of Cape Town provided a grant in aid of publication.

REFERENCES

ALTMANN, J 1974. Observational study of behaviour: sampling methods. *Behaviour* 49: 227 - 265.

ALTMANN, S A & ALTMANN, J 1970. *Baboon ecology - African field research.* University of Chicago Press.

ANONYMOUS 1957. *Times of sunrise, sunset and local apparent noon.* Dept. Education, Arts & Science. Pretoria: Government Printer.

DAVIDGE, C In press. Ecology of baboons *(Papio ursinus)* at Cape Point. *Zool. afr.*

DEVORE, I (ed.) 1965. *Primate behaviour: field studies of monkeys and apes.* New York: Holt, Rinehart & Winston.

HALL, K R L 1962*a*. Numerical data, maintenance activities and locomotion in the wild chacma baboon, *Papio ursinus. Proc. zool. Soc. Lond.* 139: 181 - 220.

HALL, K R L 1962*b*. The sexual, agonistic and derived social behaviour patterns of the wild chacma baboon, *Papio ursinus. Proc. zool. Soc. Lond.* 139: 283 - 327.

HALL, K R L 1963. Variations in the ecology of the chacma baboon, *Papio ursinus. Symp. zool. Soc. Lond.* 10: 1 - 28.

KUMMER, H 1968. *Social organization of hamadryas baboons.* University of Chicago Press.

ROWELL, T W 1966. Forest-living baboons in Uganda. *J. Zool., Lond.* 149: 344 - 364.

SOKAL, R R & ROHLF, F J 1969. *Biometry.* San Francisco: W H Freeman.

STOLTZ, L P & SAAYMAN G S 1970. Ecology and behaviour of baboons in the northern Transvaal. *Ann. Transv. Mus.* 26: 99 - 143.

STRUHSAKER, T T 1967. Ecology of vervet monkeys *(Cercopithecus aethiops)* in the Masai-Amboseli Game Reserve, Kenya. *Ecology* 48: 891 - 904.