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ACTIVITY BUDGETS OF OLIVE BABOON (*PAPIO ANUBIS* F.) AT GASHAKA GUMTI NATIONAL PARK, NIGERIA

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ABSTRACT

This study was conducted to investigate the activity budgets of olive baboon (Papio anubis) at Gashaka Gumti National Park (GGNP). A habituated baboon troop referred to as the Gamgam / Gashaka troop was studied for a period of twelve (12) months. At the beginning of the study, there were 16 individuals in the troop comprising 4 adult females, 1 adult male, 1 sub-adult male, 3 juvenile females, 4 juvenile males and 3 infants. Time fixed-point focal sampling method was adopted to determine activity budgets. Results obtained indicated that the baboons spent 34.14% of their time feeding, 35.83% resting, 9.08% grooming, 4.47% handling infants, 11.19% travelling and 0.28% playing. Generally, activity budgets did not differ significantly ($p > 0.05$) across months. Olive baboon food habit showed that food items mostly eaten were fruits, comprising 43.98% of feeding time, while 22.41% and 7.47% were spent feeding on grasses and seeds respectively. It is recommended that GGNP management should intensify effort to check anthropogenic activities such as poaching, cattle grazing and bush burning for efficient conservation of baboon populations.

Keywords: Activity, baboon, budgets, food, habituated, investigation.

INTRODUCTION

The primate is one of the highest order of mammals which includes humans (man), apes, monkeys and prosimians. Primates have a diverse range of values. Ecologically, they play role in pollination and seed dispersal (Maynard, 1995). They can also generate significant revenues through tourism and have significant cultural value in many cultures (Cowlishaw and Dunbar, 2000). Primates exhibits a wide range of social organization. They do not live as isolated individuals (Isbel and Young, 2002). Baboon (genus *Papio*) are Old World monkeys of the family *Cercopithecidae* widely distributed across Africa and into the Arabian Peninsula (Zinner *et al*., 2009).

Climatic factors can constrain the activity budgets of an animal (Dunbar *et al*., 2009). Seasonal differences in activity budgets across months have been reported in many primate species (Sato, 2012; Majolo *et al*., 2013). Time spent moving or foraging have been found to significantly differ across months in baboons, indicating that the time necessary to search for and access food was affected by seasonal changes in diet diversity (Menard, 2002; Campos and Fedigan, 2009; Sato, 2012). Although time itself can be a limiting resource, other important subtle and complex effects of quantity and distribution of food may underlie the fairly uniform changes in activity budgets that have been recorded. Aggression normally interferes with the baboons' activities (such as feeding), and may also affect the baboons' activity patterns (Majolo *et al*., 2013).

Responses to climatic conditions are expected to be particularly pronounced in primate species living in habitats where the climate can vary dramatically during the day or across seasons. The time necessary to search for and access food is affected by seasonal changes in diet diversity among Barbary macaques and *Papio* species (Menard, 2002). How free-living baboon groups spend time is an approximate representation of the way in which they relate to their social and ecological environment (Dunbar, 1998).

One of the most obvious features of baboon society is the agonistic interactions that regularly occur between individuals (Kappeler and Watts, 2012). Different primate species may compete for the same food resources in given primate community. Primates are known to form temporary associations with members of other species (Peres, 1993b). A polyspecific association is an association between two or more groups of social animals of different species. Such

associations are widespread among sympatric non-human primates (Holenweg *et al*., 1996). Polyspecific association may be a chance encounter and thus simply a product of two species sharing a range (Waser, 1984) or they may be a result of two species being attracted to the same place at the same time by a common resource (Doncaster, 1990). A genuine polyspecific association is caused by attraction on the side of one or both species that may, for example, provide each other with services that minimize predation risk or increase food availability (Waser, 1984). One significant reason for polyspecific association is protection against predators (Noe, 1997). When animals are in a group, the predator can normally be more easily sighted from a distance because there are many eyes and ears. There is also the dilution effect, that is the individual chances of being victimized is decreased in favour of other members of the group. In addition, when there are multiple targets, the predator cannot easily concentrate on one target due to confusion effect (Adanu, 2002). Similarly, larger groups tend to hunt down a prey more easily than a solitary animal because individuals in a group combine their efforts. Also when insectivorous primates are in a group, they have chances of flushing out more insects due to the group's activities (Dunbar, 1988).

Most primates spend much more time eating one type of food than any other (Goldstein, 1984). Most primates spend from 40% to 80% of annual feeding time on one of six types of food: insects, gums, saps, fruit, seed, leaves and ground herbs (Goldstein, 1984). Insectivores eat primarily insects; gumnivores, gums and in some cases saps; frugivores, fruits; gramnivores, seeds; and foliovores, leaves. All primates include both fruits and leaves in their diet (Strier, 1992). Some frugivores spend a substantial amount of time looking for and eating insects.

Baboons (*Papio* species) are widely regarded as dietary generalists, consuming a wide range of food items in varying proportions. Baboon diets are dominated by fruits, leaves and subterranean items, with flowers and animal matter constituting a much smaller proportion of the diet (Hill and Dunbar, 2002). A study conducted by Caley *et al*. (2010) on the dietary behaviours of olive baboons in Kibale National Park, Uganda have revealed that the baboons consumed 10 plant parts from 32 plant species. Observed foods comprised fruits (46%); stems (33%); tubers (7%); leaves (7%) seeds (4%); insects (1%); mushrooms (1%) and bark, gums and soil (1%). Olive baboons in Gilgal, Kenya, fed or foraged approximately 25% of the time if they had access to garbage and planted crops and almost 50% of the time without such access.

Baboon mating behaviour varies greatly depending on the social structure of the troop. The mating order among the males depends partially on their social ranking, and fights between males are not unusual (Wikipedia, 2010). A female initiates mating by presenting her swollen rump to the male. The dominant males often engage in what is known as a false-mount, in which they mount the submissive males. It is a sign of dominance, and happens very commonly to younger males in the troop (Wikipedia, 2010).

MATERIALS AND METHODS

The Study Area

This study was carried out in Gashaka Gumti National Park (GGNP), located between $6^{o}55^{1}$ – 8^{o} 05^{1}N and $11^{o}11^{1}$ -$12^{o}13^{1}$ E in the North-Eastern Nigeria. GGNP was established in 1991 and represents Nigeria's largest national park covering about 6600 km^2 (Dunn, 1998). From the edge of the Mambilla plateau in Taraba State, GGNP stretches northwards along the international border

with Cameroon and on into Adamawa State (Oates *et al*., 2004). The vegetation is a mosaic of Southern Guinea savannah-woodland, open (montane) grassland, lowland forest, swamps and montane forest (Warren, 2003) and is home to a highly diverse number of small and large mammals, including nine primate species. Over 100 species of mammals, at least 480 species of birds, 35 species of fish and 300 species of butterfly are found in the park (Foster, 1998).

The park harbours extensive mountainous areas. Altitude ranges from 350m to over 2,400m above sea level (Dunn, 1993a). The rainy season begins in March or early April and ends in mid November. Rainfall ranges from 1200 mm in the north to 3000 mm in the south of the park (Dunn, 1993a).

The Study Troop/Group

A habituated baboon troop referred to as the Gamgam/Gashaka troop was studied. At the beginning of the study, there were 16 individuals in the troop comprising 4 adult females, 1 adult male, 1 sub-adult male, 3 juvenile females, 4 juvenile males and 3 infants.

Study Design

Behavioural data were collected for twelve (12) months on twenty days per month. The time fixed-point focal sampling method as described by Paul and Patrick (1990) was adopted for collection of data. Data collection was done in the morning between 06:00 and 12:00 hours and in the afternoon between 12:15 and 18:00 hours in alternate manner. The method involved following a focal animal and observations on behavioural parameters were recorded at fixed time intervals. Behavioural patterns (activities) viz: feeding, resting, travelling, grooming, infant handling and playing were observed and recorded using fifteen-minute focal sampling interval and included scan sampling. The activity categories were mutually exclusive. If the baboons were sighted feeding, the category

of food (fruits, leaves, flowers, grasses, seeds, insects/invertebrates, others) were recorded. Reproductive behaviours such as copulation, mounting, mounting but no thrust were recorded using one-minute focal sampling technique.

Data Analysis

(i.) The identified behavioural patterns: feeding, travelling, resting, social (grooming, playing and infant handling) were analysed using descriptive statistics (tables, charts and percentages).

(ii.) Analysis of Variance (ANOVA) was employed to compare the activity budgets of baboons across months. Duncan multiple range test was used to compare differences among means at 0.05 ($p > 0.05$) level of significance. SPSS version 20 statistical software was used for the analysis.

RESULTS

The results on activity budgets (Figure 1) showed that olive baboons spent 33.14% and 35.83% of their time feeding and resting respectively, while 17.19% of the time was spent travelling/moving. In addition, 9.08% of the time was spent on grooming. Furthermore, 4.47% of the time was spent on infant handling and 0.28% on playing. The activity with the highest percentage was resting (35.83%), followed by feeding (33.14%) while the activity with the lowest percentage (0.28%) was playing. The results of food habit of olive baboons at the Gashaka Gumti National Park is presented in Figure 2. The results showed that 43.98% of the feeding time of the olive baboons was spent feeding on fruits. This indicated that food items mostly eaten during the observation periods were fruits. In addition, 22.41%; 7.47% and 5.60% of feeding time were spent on grasses, seeds Joseph, J. ′es respectively, while 4.56%, 9.96% and 6.02% were spent feeding on flowers, some arthropods and others (bark, mushroom, roots and herbs) respectively.

Comparative analysis of the activity budgets of the baboons across months

(Table 1) showed that the time allocated for feeding did not differ significantly ($p > 0.05$) between the months of February, March, May, June, July, November and December. Also, no significant difference ($p > 0.05$) was observed between January and August. In the case of resting time, January, February, and March did not differ significantly ($p > 0.05$). Similarly, the time allocated for travelling indicated no significant difference across months. The time allocated for grooming did not differ significantly ($p > 0.05$) across months. Similarly, no significant difference ($p > 0.05$) was observed across the months in the time allocated for playing and infant handling.

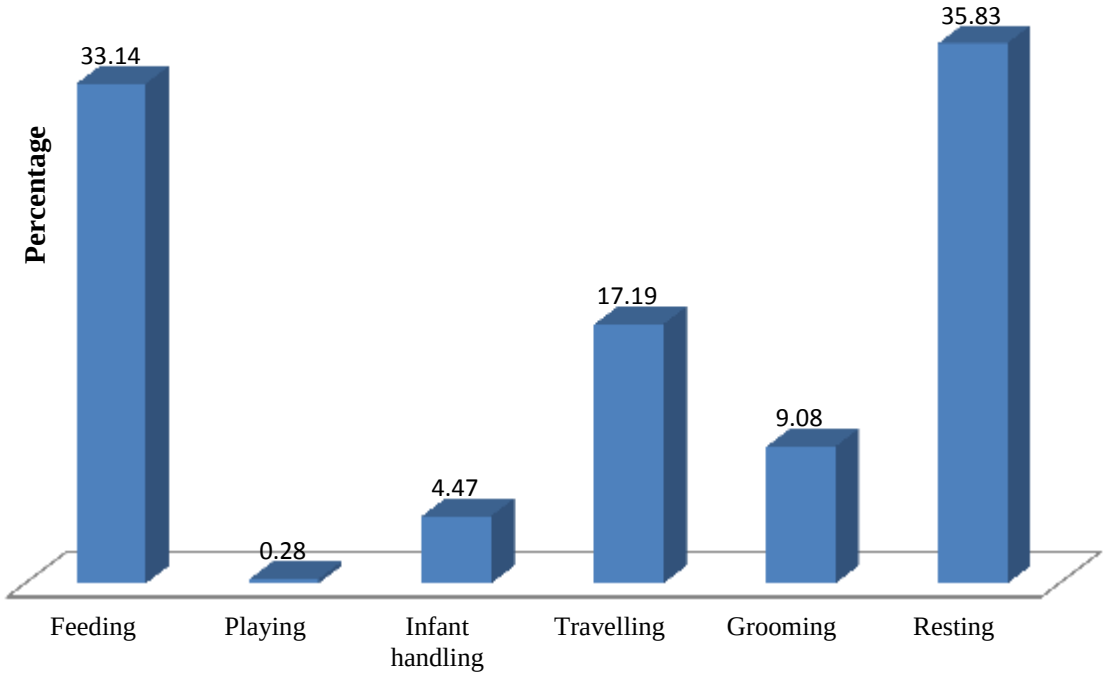

Figure 1: Percentage Activity Budgets of Olive Baboons (*Papio anubis*) in the Study Area.

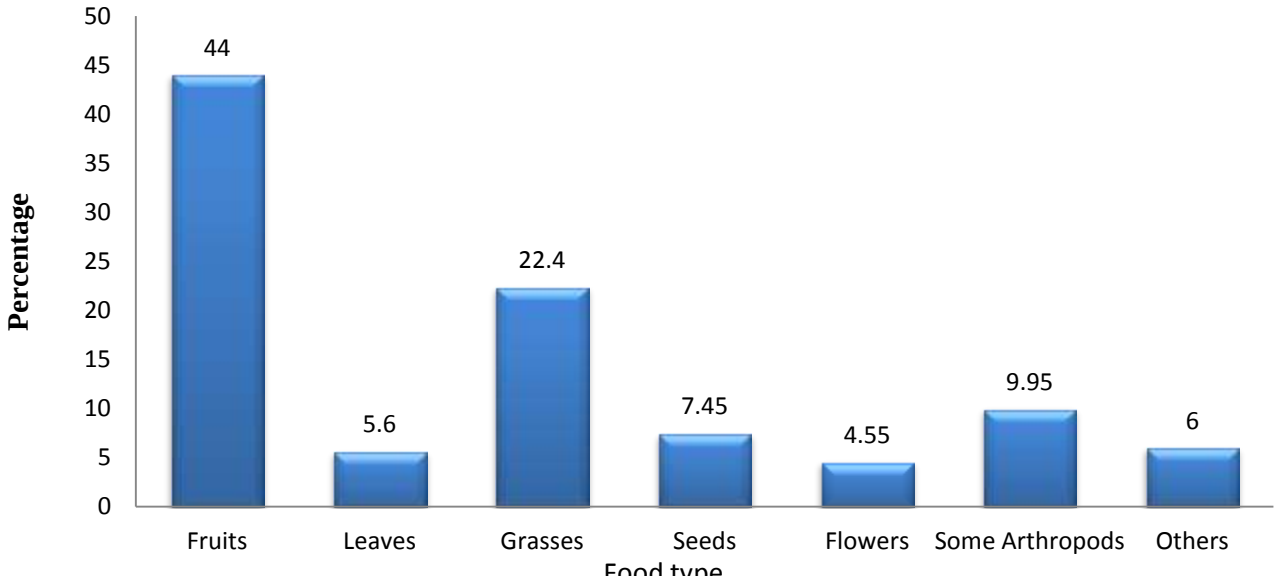

Figure 2: Percentage of Food Types Eaten by Olive Baboons (*Papio anubis*) in the Study Area.

Table 1: Comparative Analysis of Activity Budgets Across Months in the Study Area Between January to December, 2013

Month	Parameters (Mean±SEM)					
	Feeding	**Resting**	**Travelling**	**Infant handling**	**Grooming**	**Playing**
January	5.43±0.88^{b}	7.07±0.62^{b}	2.50±0.31^{b}	0.29±0.13^{a}	1.50±0.27^{a}	0.00±0.00^{a}
February	5.71±0.78^{a}	6.79±0.66^{b}	2.43±0.37^{b}	0.29±0.16^{a}	1.50±0.31^{a}	0.07±0.07^{a}
March	5.57±0.91^{a}	6.93±0.78^{b}	2.36±0.36^{b}	0.29±0.16^{a}	1.64±0.33^{a}	0.00±0.00^{a}
April	8.17±0.54^{e}	8.67±0.42^{d}	4.83±0.48^{d}	0.00±0.00^{c}	2.00±0.45^{a}	0.00±0.00^{a}
May	6.29±1.09^{a}	7.57±1.02^{e}	3.86±1.01^{e}	0.57±0.57^{a}	1.86±0.60^{a}	0.00±0.00^{a}
June	6.13±0.82^{a}	5.53±0.64^{a}	3.53±0.41^{c}	1.40±0.46^{b}	1.67±0.37^{a}	0.00±0.00^{a}
July	6.07±0.74^{a}	5.67±0.60^{a}	3.33±0.42^{a}	1.47±0.44^{e}	1.73±0.33^{a}	0.00±0.00^{a}
August	5.00±1.23^{b}	4.25±0.25^{g}	3.25±1.38^{a}	2.25±0.63^{d}	1.25±0.63^{a}	0.00±0.00^{a}
September	3.57±0.87^{c}	9.57±1.13^{f}	1.43±0.43^{f}	1.43±0.81^{b}	1.29±0.52^{a}	0.00±0.00^{a}
October	2.25±0.85^{d}	5.75±1.80^{a}	1.75±0.85^{g}	0.25±0.25^{a}	0.50±0.50^{a}	0.00±0.00^{a}
November	6.50±0.73^{a}	4.83±0.63^{a}	2.94±0.54^{a}	0.83±0.28^{a}	1.67±0.45^{a}	0.22±0.10^{a}
December	6.85±1.20^{a}	6.29±0.99^{c}	3.57±0.75^{c}	0.14±0.14^{a}	1.86±0.60^{a}	0.00±0.00^{a}

Means carrying the same superscript along columns are not significantly different at 5% level of significance ($p = 0.05$)

DISCUSSION

The findings on activity budgets of olive baboons showed that they spent 33.14% and 35.83% of their time on feeding and resting respectively, while 17.19% was travelling. In addition, 9.08% of their time was spent on grooming. Furthermore, 4.47% of their time was spent on infant handling and 0.28% on playing. The activity with the highest percentage of time was resting (35.83%), followed by feeding (33.14%) while the activity with the lowest percentage (0.28%) was playing. The proportion of time the baboons spent on feeding and resting was at variance with the findings of Akosim *et al*. (2005) who reported 50.00% for feeding and 8.50% for resting for the Kwano forest baboons. In this study, the Kwano baboons spent relatively higher proportion of time resting and lesser proportion of the time feeding probably due to the level of availability and distribution of food resources at the site. The result of this study however, agrees with Buba (2013) who reported higher resting period than feeding period. They observed that the Gashaka baboons engaged in crop raiding, and as such had access to crops that have high concentration of proteins and calories but low in toxins when compared to the wild foods available in Kwano habitat, hence they were able to obtain enough food that could sustain them for a longer period, thus making for the extra time spent on resting. Previous studies revealed that baboons that feed on crops have several behavioural effects such as decreased foraging time, increased resting time and increased social time (Warren, 2003; Naughton-Treves *et al.,* 1998). The result of this study is in contrast with that of Akosim *et al*. (2005), and in which resting time exceeded feeding time suggesting that there could have been an improvement in the quality, quantity and distribution of food resources of baboons in Kwano habitat over the years due to effective management.

The findings on food habit of olive baboons indicated that 43.98% of the feeding time of olive baboons was spent on feeding on fruits, 22.41% on grasses, 7.47% on seeds, 5.60% on leaves, while 4.56% feeding time was spent on flowers. Similarly, 9.96% was spent on some arthropods and 6.02% on others (bark, roots, mushroom and herbs). The food type (items) mostly eaten by the baboons during the observation period was fruits, followed by grasses. On the other hand, food types that were least eaten were flowers and leaves. This result is in consonance with the report of Goldstein (1984) who observed that most primates spent much of their time eating one type of food than any other and that 40% to 80% of their time was spent on one of the six types of food: insects, gums, saps, fruits, seeds, leaves and ground herbs. In this study, fruits were found to be the preferred food type for baboons. This finding is similar to results obtained by Caley *et al*. (2010) who reported that the preferred food of olive baboons in Kibale, Uganda was fruit, comprising 46% of feeding time.

Comparative analysis of activity budgets of the baboons across months showed that the time allocated for feeding did not differ significantly ($p > 0.05$) between the months of February, March, May, June, July, November and December. Also, no significant difference ($p > 0.05$) was observed between January and August. However, April, September and October differed significantly ($p < 0.05$) in the time allocated for feeding. In the case of resting time, January, February, and March did not differ significantly ($p > 0.05$). Also, June, July, October and November did not differ significantly ($p > 0.05$). However, there was significant difference ($p < 0.05$) between April, May, August, September and October. The time allocated for travelling indicated no significant difference ($p > 0.05$) between July,

August, and November. Similarly, June and December did not differ significantly ($p > 0.05$), but there was significant difference ($p < 0.05$) between April, May, September, and October. This finding to some extent did not concur with the findings of Sato (2012) and Majolo *et al* (2013) who reported that time spent moving or foraging significantly differ across months in baboons. This lack of agreement may be attributed to the relatively little variation in terms of seasonal changes in diet diversity in the study area. In the case of infant handling, no significant difference ($p > 0.05$) was observed between January, February, March, May, October, November and December. Similarly, there was no significant difference in June and September. But, there was significant difference ($p < 0.05$) between April, July, and August. The time allocated for grooming did not differ significantly ($p > 0.05$) across months. Similarly, no significant difference ($p > 0.05$) was observed across the months in the time allocated for playing.

CONCLUSION

This study have revealed that baboons at Gashaka Gumti National Park spent 33.14% and 35.83% of their time on feeding and resting respectively, while 17.19% was spent on travelling. In addition, 9.08% of the time was spent on grooming. Similarly, 4.47% and 0.28% of the time were spent on infant handling and playing respectively. This indicates that the highest proportion of time was spent on resting, followed by feeding, while the lowest proportion of time was spent on playing. Comparative analysis of activity budgets of the baboons across months indicated that there was no significant difference in the time allocated for feeding, resting, playing and infant handling.

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