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# ROLES AND ACTIVITIES OF MALE GELADAS (*THEROPITHECUS GELADA*)

by

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## INTRODUCTION

*Theropithecus gelada* form social aggregations of individuals designated by CROOK (1966) as "herds." There are several types of subgroups of the herd (for a definition of subgroup see CARPENTER, 1968), and male geladas which have membership in these different subgroups exhibit various kinds of behavior, and different kinds of interactions with females and young. That is, geladas have more than one variation of "the male role." Their behavior seems to vary according to whether they are in a one-male subgroup (a "harem"), an all-male subgroup, a juvenile subgroup, or solitary. This study describes the different male gelada roles and their associated patterns of activities and interactions. A group of 33 geladas on Monkey Island in the San Antonio Zoological Gardens, Texas, was observed for about 85 hours between the months of September, 1969, and April, 1970. Two techniques for data collection were developed. A total of about 16½ hours of quantified data (or 50 twenty-minute tests) was obtained during the months of February through April.

*Theropithecus gelada* have been studied recently in their natural habitat in Ethiopia by CROOK (1966). Brief references to their activities in the wild are also to be found in ZUCKERMAN (1932) and KUMMER & KURT (1968). A study of the gelada group at the Yerkes Regional Primate Center was conducted by BRAMBLETT (1970); and two descriptive studies were made by students of Dr. BRAMBLETT at the University of Texas at Austin, on the gelada group at the San Antonio Zoo in the Fall of 1967 and Fall of

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1) I wish to thank Dr CLAUD BRAMBLETT, who first interested me in primate studies and provided me with the opportunity to conduct this study; Mr ERNEST E. RONEY, Jr., Assistant Director of the San Antonio Zoological Gardens, who was very cooperative and helpful during this study; and my husband, LARRY, who helped in innumerable ways.

1968. These two reported social structure for the San Antonio gelada herd is similar to that described in this paper.

The geladas in the San Antonio Zoo have lived on Monkey Island with a group of Auodad sheep since May, 1965. Monkey Island is 180 feet by 88 feet, is oval in shape, and consists of raised limestone ridges surrounded by a pit. There is a large bare tree on the north end of the island, a small pool on the south end, and "caves" on the northeast side in which the monkey chow feeders are located and into which the geladas are herded when the island is cleaned. The geladas roam over the island at will, restricted only by their own social behavior, subgroup spacing and dominance interactions.

The harem subgroups of a gelada herd contrast with bachelor subgroups, solitary males and juvenile subgroups. A harem consists of one fully adult male and one or more females with their offspring. Bachelor subgroups consist of subadult and adult males. Juvenile subgroups are extremely fluid. These are offspring past infancy in maturity who spend part of their time close to their mothers and other females of their harem, part of their time with the bachelor males, and part of their time interacting with others their own age in what might constitute a separate subgroup. During the course of the observation of these geladas in the Fall and Winter of 1969, a bachelor male detached three females from a harem male, and formed a new harem. After this development the social structure remained stable, and was the same throughout the course of this study. The subgroups of the gelada herd at San Antonio are as follows:

- 1) Beta — an adult male, his harem, consisting of six females and an uncounted number of offspring. Beta is presently believed to be the dominant male on the island.
- 2) Gamma — an adult male, and his five females. He had eight females previously, before having three detached by a bachelor male. According to the studies, at least since 1967 this group has had no offspring. No juveniles play around the group or interact with it.
- 3) Kappa — an adult male and his three females. Previously a bachelor male, he has had a harem since December, 1969. No offspring.
- 4) Bachelor male subgroup — formerly three, now two males; one adult, Lambda, and one subadult, Mu. (Subadult for the purposes of this study, meaning that mane and body size are not fully developed, although the animal is clearly distinguishable from a juvenile.) Juveniles frequently play in and around this subgroup.
- 5) Alpha — a fully grown male who is peripheral to the Beta harem. Largest male on the island.

- 6) Subadult male — this male is also peripheral to the Beta harem but seems to be allowed closer to it than Alpha, and occasionally grooms one of Beta's females. Sometimes this subadult and Alpha stay close together even when not near the Beta harem, thus appearing to form a group of their own. However, these two will be considered to be solitary or peripheral males, in that from simple observation they appear to interact less than any other animals.

The records of a bachelor male developing into a harem male provoked interest in the characteristics which make up the patterns of male gelada roles. Kappa appeared to have no difficulty in adjusting to the role change and once he had detached his three females, his group remained very cohesive. It appeared that his activities and interactions had undergone a substantial change. Thus the question asked in this study is how a male gelada's role is related to his activities and to his interactions with other animals. Two recording techniques were developed to measure male activities and male interactions.

## METHODS

### Subjects.

Five geladas were chosen to be tested, according to the author's former observation representing five possible male roles: 1) Beta — an older and more experienced harem male; 2) Kappa — a new harem male; 3) Alpha — a solitary or peripheral male; 4) Mu — a subadult bachelor male; 5) a juvenile.

### Recording techniques and procedure.

Activity Record — the idea for this instrument came from the Flander's Interaction Analysis System, which is used in the field of education to measure the activities of a teacher relative to pupils in her class. As adapted to gelada behavior, this record form consists of ten categories of possible gelada activities: 1) unclassifiable activity; 2) movement of the animal from one place to another; 3) inactivity (sleeping, sitting or laying immobile); 4) self activities such as self grooming or masturbation; 5) grooming of another gelada; 6) being groomed by another gelada; 7) eating; 8) interaction with males other than grooming; 9) interaction with females other than grooming; 10) interaction with juveniles other than grooming.

The choice of these categories of activities was based on the author's qualitative observation of the geladas during the Fall and Winter of 1969. That they are exclusive and exhaustive is partially supported by the fact that a small number of the first category (unclassifiable activities) were recorded,

and there was never any difficulty in deciding to which category a specific action belonged. An animal was watched for a twenty-minute test period, and every five seconds a number was recorded for which activity the animal was engaged in. It was seen that very seldom would an animal do something for less than five seconds, and if this occurred the activity of longer duration within the five seconds was recorded. Then the numbers, recorded were totaled and placed on a matrix. This provided for the calculation of the percentage of his time a male gelada spent in each activity, and the comparison of the percentages of the different males.

The Interactions Record — the idea for this form came from another instrument (OScar 5V) which is used in the field of education to measure pupil-teacher interactions. As modified for the study of geladas, the form provides for recording eleven types of interaction or gestures occurring between the male observed and another gelada. The discrimination of specific gestures and the author's perception of them is based on former observation of them, and information given to me by Dr. CLAUD BRAMBLETT. The gestures are as follows:

- 1) Lid — the geladas have a pink expanse of skin on their eye lids which they may literally "flash" at another animal by drawing their brow back. This is a threat gesture and may be used by males and females.
- 2) Lip roll — a more intensive threat gesture than the lid, as it usually occurs after it when the tense situation continues to build, this gesture is made by rolling the lips back from the teeth, exposing the gums and the teeth. Both males and females do this.
- 3) Chase — just what it says, this seems to be the most hostile interaction and causes the most excitement on the island. Occasionally males chase females, but the chases are more frequently between males, and often males join in who had not originally been involved. Males occasionally slap at each other during these chases and a male may bite or snap at another, although this usually occurs too rapidly to be substantiated.
- 4) Displace — not always an obvious gesture, one gelada walks toward another who immediately moves out of the former's way. Frequently the displacer will sit down or stand in the exact location the displaced has just vacated. This is considered to be the displacer showing his dominance over the displaced.
- 5) Yawn — a particular type of yawn given only by the subadult and adult males, which exposes their teeth (especially canines) fully. Males appear to yawn like this in times of anxiety or when they feel under tension, but it is always difficult to determine if the yawn is directed at another animal in particular.
- 6) Lip smack — smacking the lips together rapidly, this gesture appears to be a sign of non-aggression used in social situations in which there might be some tension between the animals. Its most frequent use is by a male preceding a sexual interaction. A recurring pattern of interaction is: the harem male lip smacks at a female, she sex presents, he inspects and/or mounts, and she grooms him.
- 7) Sex present — a female (and occasionally male) gesture of orienting the anal region toward another gelada's face while raising the tail and sometimes glancing back over the shoulder.

- 8) Inspect — a possible reaction to a sex present which consists of looking very closely at the anal region presented and/or putting the mouth to it and/or touching it with the hand.
- 9) Mount — one gelada stands up against the back of another (males brace their feet on female's hind legs) and perform mock or real coitus. This interaction is most frequently male to females, but is also possible between two males, two juveniles, or two females.
- 10) Groom — one gelada inspects and cleans the fur of another. Used by and between males and females, this appears to be a group reinforcing interaction.
- 11) Play — two or more animals wrestle with each other, usually accompanied by a play face which consists of drawing the lips back and mock-biting or mouthing the other animal. This has only been seen among juvenile and subadult males.

For each interaction recorded, it was specified whether the gesture was directed at or received from the male under study by a female, a male, or a juvenile. Each of the five gelada males chosen to be tested were measured for five twenty-minute activity test periods, and five twenty-minute interaction test periods.

## RESULTS AND DISCUSSION

The two main questions of the study are: 1) Is a specific male role significantly related to the amount of time an animal engages in each activity? and 2) Is a specific male role significantly related to the types and amount of interaction the animal has with other geladas? These two questions were tested through the use of chi square. In both cases chi square was significant and it was concluded that a male's role is significantly related to his activities and interactions.

A further examination of the data on male roles was made by comparing former qualitative observation and the statistical data. Hypotheses and data are recorded in the chart below:

Hypotheses	Data
That a solitary or peripheral male (Alpha) would have:	
1) a large proportion of time spent in inactivity	True. 79.9% (Table 1).
2) a large proportion of time spent in self activities	False. He does not spend much time in self activities proportionally and spends less time in self activities than both Kappa and Mu. (Table 1).
3) fewer interactions in general (Categories 8, 9, 10, of Table 1)	True.
4) no friendly interaction with juveniles or females	? No friendly interactions with females but some with juveniles. (Table 2).
5) more hostile than friendly interactions with males	True. (Table 2).

Hypotheses	Data
That an older harem male (Beta) would have:	
1) a large amount of time spent being groomed	True. 33.2%. (Table 1).
2) more interactions with females than with males	True. (Table 2).
3) more interaction with females than with juveniles	True. (Table 2).
4) more friendly than hostile interactions with females	True. (Table 2).
5) more hostile than friendly interaction with males	False. (Table 2). No significant difference.
6) no friendly interactions with juveniles	True. (Tables 2 and 3).
That a new harem male (Kappa) would have:	
1) a large proportion of time spent in being groomed and in grooming	True. 52.3%. (Table 1). Noticing that there seemed to be statistical support for former qualitative observation that Beta and Kappa were groomed about the same amount but Beta groomed much less than Kappa, a chi square test was carried out and there was found to be a significant difference in the amount the two groomed at the 0.05 level. If grooming is, as has been proposed earlier in this paper, a cohesion reinforcing activity, and if Beta is an older and more dominant male with well-established control over his females, whereas Kappa must put more work into keeping his group together, then this difference in grooming follows logically.
2) more time spent in interactions with males than with females	? Here the data are contradictory. Table 1 shows 2.2% of Kappa's time devoted to interactions with females and .3% with males. However, Table 2 shows about 53% of the interactions totaled to be with males, and 43% with females. This contradiction is possible since the two recording techniques were applied to the animals during different observation periods. It is also possible that interactions with females last longer on the average than interactions with males.
3) more friendly than hostile interactions with females	True. (Table 2).
4) more hostile than friendly interactions with males	True. (Table 2).
5) no friendly interactions with juveniles	True. (Table 2).

Hypotheses	Data
That a bachelor subadult male (Mu) would have:	
1) a large proportion of time spent in inactivity	True. 40.6%. (Table 1).
2) more time spent in interactions with males than females	True. (Table 1).
3) more time spent in interactions with males than juveniles	? Again the data are contradictory. Table 1 shows 8.6% of Mu's time devoted to interactions with males and 2.3% with juveniles while Table 2 shows 53% of the interactions totaled to be with juveniles and 41% with males.
That a juvenile would have:	
1) a large proportion of time spent in movement	True, in comparison to the 4 other subjects, the juvenile spends more time moving (18.6%) than any of the others, and less time in inactivity than all but Kappa. (Table 1).
2) most interactions with juveniles	True. (Table 1 and 2).
3) more friendly than hostile interactions with juveniles	True. (Table 2).

TABLE 1

*Percentage of time spent by each animal in each activity*

		1	2	3	4	5	6	7	8	9	10
Alpha	1	4.2	3.2	79.9	8	0	.3	1.4	1.7	.08	1.1
Beta	2	1.9	8	26.2	6	7	33.2	13.3	1.5	2.4	.1
Kappa	3	.1	3.5	17.3	11.5	20.4	31.9	12.6	.3	2.2	0
Mu	4	1.4	5.2	40.6	21.7	3.8	.5	23.5	8.6	0	2.3
Juv	5	7.9	18.6	24.2	2.6	0	0	30.8	1.5	0	14.6

Key to vertical columns: 1 — unclassifiable activity, 2 — moving, 3 — inactivity, 4 — self activities, 5 — grooms, 6 — is groomed, 7 — eats, 8 — interacts with male, 9 — interacts with female, 10 — interacts with juvenile.

TABLE 2

*Interaction percentages*

		1	2	3	4	5	6
Alpha	1	43.6	7.5	3	37.8	0	7.5
Beta	2	11.1	18	8.3	12.5	50	0
Kappa	3	52.3	15.2	2.8	.9	28.5	0
Mu	4	21.4	1.8	10.7	19.8	3.5	42.8
Juv	5	0	7.8	27.4	1.9	0	63

Key to vertical columns: 1 — hostile interactions with males, 2 — hostile interactions with females, 3 — hostile interactions with juveniles, 4 — friendly interactions with males, 5 — friendly interactions with females, 6 — friendly interactions with juveniles.



TABLE 3

*Total number of interactions with males, females and juveniles*

	Alpha		Beta		Kappa		Mu		Juv	
	Give	Receive	Give	Receive	Give	Receive	Give	Receive	Give	Receive
M Lip Roll	8	2	2		3		1	2	1	
M Lid	13		5		31	17	1	1		
M Chase							2			
M Displace		6	1			4		5		
F Lip Roll			5	1						
F Lid	3		6		14					7
F Chase			1							1
F Displace		2				1		1		
J Lip Roll	1								1	1
J Lid	1		2		3		2		1	
J Chase							1		10	14
J Displace			1				3		1	
J Yawn			4		5					
M Lip Smack	18	5	4	2	1		9	2		
M Sex Pres.				1						
M Inspect			1							
M Mount										
M Groom				1						2
M Play									1	1
F Lip Smack			5		2	1		2		
F Sex Pres				4		2				
F Inspect			4		2					
F Mount			1		2					
F Groom			5	17	8	13				
F Play										
J Lip Smack	5						1		1	
J Sex Pres										
J Inspect										
J Mount							1			2
J Groom							12	6		2
J Play							2	2	33	29

Of the twenty-two hypotheses, seventeen are statistically supported, three are uncertain, and 2 are not statistically supported.

There are many further questions one could ask about male gelada behavior. What is the relationship between the five roles that have been outlined? What exactly happens when a male changes or progresses from one role to another? Exactly what changes occurred in Kappa's activities and

interactions when he progressed to a harem male from a bachelor male? Were there elements in his former role behavior that eased his transition into the new role? What in a males' background, if anything, prepares him to exhibit the appropriate behavior of a harem male? In order to answer these questions, at least in part, the activities and interactions of an animal could be observed in an in-depth time study as he progressed through various roles. Statistical data on activities and interactions would also be valuable in studying the role behavior of female geladas, and in comparative studies of the male and female roles in various primate species. (For example, how does an Alpha vervet male role differ from a gelada harem male role in terms of the animals' activities and interactions?) Because role behavior is so essential to the social structure of any group, these suggested studies would be very worthwhile, in that they would lead to a greater understanding of exactly what kinds of behavior make up a role, and how roles differ from species to species.

#### SUMMARY

*Theropithecus gelada* males may live in all-male groups, one-male groups, or in isolation. They play different roles in these different groups. Two recording techniques were developed to quantify the activities and interactions of the male geladas. There was found to be a significant relationship between a male's activities and interactions and the role he plays. There were found to be patterns of activities and interactions which correspond to male roles. These are described.

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#### RÉSUMÉ

Les mâles du *Theropithecus gelada* peuvent vivre soit dans des groupes composés de plusieurs mâles, soit dans des groupes de femelles avec un seul mâle, soit dans isolement. Ils jouent des rôles divers dans ces différents groupes. Deux techniques ont été utilisées pour l'enregistrement systématique des activités et des actions réciproques des mâles du *Theropithecus gelada*. On a trouvé qu'un rapport existe entre les activités et les actions réciproques d'un mâle et le rôle qu'il tient. On a reconnu des modèles d'activités et d'actions réciproques qui correspondent aux rôles des mâles. Ces modèles sont décrits.