

Social encounters in two prosimian species: *Galago crassicaudatus* and *Nycticebus coucang**

TERRY G. NEWELL

Bowling Green State University†, Bowling Green, Ohio 43402

Social encounters between all possible pairings of seven thick-tailed galagos (*Galago crassicaudatus*) and eight slow lorises (*Nycticebus coucang*) were observed in an observation cage. Neither species used facial displays or vocalization during the encounters. Both species possess special urination behaviors, but these patterns were not used extensively during the encounters. Reciprocal allogrooming and olfactory investigation were prominent behaviors displayed by both species. Agonistic behavior was seen much more frequently in galagos than in lorises. Responses of a particular animal to others differed in type of behavior displayed and in the duration and intensity of the behavior; thus, individual recognition of specific species members is possible for both species.

The families composing the primate suborder *Prosimii* form a relatively unstudied evolutionary branch. One prosimian family, the *Lorisidae*, includes African galagos and pottos and the lorises of Southeast Asia. The present study is concerned with two species, *Galago crassicaudatus* (thick-tailed bushbaby) and *Nycticebus coucang* (slow loris), that belong to this family. Both species are nocturnal and arboreal. Most observations have been made on captive Ss. Buettner-Janusch (1964) has observed *Galago crassicaudatus*, while the lesser bushbaby, *Galago senegalensis*, has been observed by Sauer & Sauer (1963) and Doyle, Andersson, & Bearden (1969). Subramonian (1956) and Ilse (1955) have reported brief behavioral observations of *Loris tardigradus* and Tenaza, Ross, Tanticharoenyos, & Berkson (1969) have described the activity patterns of *Nycticebus coucang*. The only studies in which both lorises and galagos have been compared directly are a series of studies by Ehrlich dealing with sensory-motor processes and curiosity behavior (Ehrlich, 1968, 1970).

So far as social behavior is concerned, very little is known. As an initial approach, the present study provides information as to the types of behaviors that occur during brief social meetings or encounters between two members of a species.

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†Requests for reprints should be sent to Dr. Terry G. Newell, Department of Psychology, University of Washington, Seattle, Wash. 98105.

RESULTS

Galago Encounters

Facial displays. Unlike the higher primates, galagos exhibit very little change in facial expression. The resting expression is best described as a "tight grin." During the initial phases of a social encounter, the mouth was sometimes opened but no lip smacking, tooth baring, forehead wrinkling, etc., was observed.

Vocalizations. The only vocalizations noted during social encounters were growling and spitting noises when fights occurred.

Eliminative behaviors. Galagos have a ritualized urination routine in which the hand is urinated upon; urine is then rubbed onto the foot and spread around the immediate area as the animal locomotes. This behavior occurred frequently soon after the animal was placed in the observation cage and occasionally during an encounter. It might seem that the urine-washing behavior serves as a territory marking function. Preliminary tests were made in which an animal was allowed access to an empty side of the observation box which had been marked by another animal. There was no indication that the galagos were inhibited by the marking; they would immediately go to the marked side and explore and sniff. Therefore, it seems more likely that the washing routine functions as an individual identification mark without "territorial" imperative.

Grooming and olfactory investigation. In a typical meeting between two galagos, the animals sniff and lick each other's faces; licking and sniffing of the genital area is also common. Olfactory investigation is often followed by vigorous prolonged grooming during which one animal slowly licks and, using the special toothcomb, scrapes the fur of the other. Much of the grooming was directed toward the head and the neck areas; the hands were often used to hold the head of the animal being groomed.

Of special interest was the adoption by many animals of a "soliciting" posture. The animal would extend and/or lower its head while spreading its legs wider than usual. After an animal finished grooming another, it would adopt this posture and would then usually be groomed in turn. Sparks (1967) terms this reciprocal allogrooming.

Agonistic behavior. Fighting and escape behaviors were common occurrences during social encounters between galagos. The behavior varied in intensity from low-intensity chasing, nipping, and tail-pulling to a short-latency high-intensity attack in which both animals would roll

SUBJECTS

Seven galagos (five males, one juvenile male, one female) and eight lorises (five females, one male, one juvenile male, and one juvenile female) were used in this study.

Prior to testing, all animals had been housed singly for at least 3 months; thus, the animals were relatively deprived of social contacts. Estrus did not occur in any of the females during the period covered by these observations.

PROCEDURE

Social encounters were conducted between all 21 possible pairings of the galagos and all 28 possible pairings of the lorises. The encounter for all but those pairs involving the juvenile galago was replicated after a 4-week interval.

The social encounter "test" was conducted in a wood and Plexiglas observation box, 1.3 m wide, 1.0 m high, and 0.8 m deep. A removable wooden partition divided the box into two equal sections. A S was placed on each side of the partition 6 h before the actual test. The animals were maintained on a partially reversed light cycle, and the test itself began 1 h after light offset and about ½ h before feeding. Observations were made under low illumination from behind a door fitted with an insert of one-way glass.

The test procedure consisted of removing the partition to allow the animals physical access to each other. A running description by the E of the behaviors occurring during the encounter was tape-recorded. The length of the observation period varied, depending on the behaviors occurring; since the main purpose of the study was to identify behaviors associated with initial encounters, the observations usually were terminated after approximately 10 min.

Table 1
Predominant Type of Behavior Observed During Encounters Between Galagos

Response Made by Animal	Response Made to Animal							Frequency				
	1 (♂)	2 (♂)	3 (♂)	4 (♂)	5 (♂)	6 (Juv. ♂)	7 (♀)	I	G	A	E	W
1 (♂)	—	A	A	A	A+	G	G	0	5	5	0	1
	—	G	G	A	G		W					
2 (♂)	A	—	G	A+	A+	E	I	1	4	5	1	0
	G	—	G	A+	A		G					
3 (♂)	G	G	—	G	A+	W	W	0	6	2	0	3
	G	G	—	G	A+		W					
4 (♂)	E	E	G	—	I	E	E	2	2	0	7	0
	E	E	G	—	I		E					
5 (♂)	A+	A+	A+	I	—	G	E	2	2	5	2	0
	G	A	A+	I	—		E					
6 (Juv. ♂)	G	A	W	A	A	—	A+	0	1	4	0	1
	G	A	W	A	A		A+					
7 (♀)	G	I	W	A+	G	A+	—	1	3	3	0	4
	W	G	W	A+	W		—					

Frequency

IG	A	EW	IG	A	EW	IG	A	EW	IG	A	EW	IG	A	EW	IG	A	EW			
06	2	21	14	4	20	05	3	03	22	7	00	22	6	01	02	1	21	12	1	43

I = Indifferent

G = Grooming

A = Low intensity aggressive

A+ = High intensity aggressive

E = Escape (attacked)

W = Wrestling (playful fighting)

vigorously about, biting one another and pulling hair out. Responses to an aggressive approach varied from a scrambling and jumping escape response to a rapid vigorous retaliatory attack. Prior to agonistic interactions, both animals frequently adopted a "boxing" posture, wherein the animal stood on its hindlegs with hands in the air close to the body. This defensive threat posture functions as a preparatory position from which either a forward attack or a kangaroo-like escape jump can be made.

Wrestling. An infrequently occurring social interaction termed wrestling or "playful fighting" was noted. The animals would stand or sit face to face—then, interlocking hands and feet, they would kick and push each other, sometimes tipping over and rolling around in one furry mass. Frequently, they would pull at each other's fur or slap each other; there was, however, never any actual physical damage.

Indifferent response. Finally, some pairs were essentially indifferent to each other. After a brief olfactory investigation, each would independently locomote around the cage, and no further interaction was observed.

Table 1 indicates the predominant response of the animal listed at the side of the table when encountering the animal listed at the top of the table. For example, during the first encounter between Nos. 1 and 2, the predominant behavior was low-intensity aggression. The code letter for the predominant behavior

displayed during the replication of each pairing is given directly underneath.

There are 30 replications in Table 1; for 18 of them, the same behavioral response predominated on both occasions. Thus, some animals consistently fought upon encountering each other, while some animals groomed during both observations. The overall replicability can be given as 60%, suggesting that social responses are neither fixed after one meeting nor completely independent of previous meetings.

Replications were not obtained for No. 6, the juvenile male. During his first encounter with the female, No. 7, he was immediately and intensely attacked and sustained wounds such that further tests could not be conducted. Interactions between the juvenile and the adult males utilized only low-intensity fighting, grooming, or wrestling. Wrestling was noted only between the female and an adult male (Nos. 3 and 7 and Nos. 1 and 7) or between an adult male and the juvenile (Nos. 3 and 6).

To characterize overall social response patterns of individual galagos, the frequency of each type of behavior is totaled at the end of each row and at the bottom of each column. These data make clear the wide range of responses available to galagos for use in social encounters; the frequency tabulations further indicate the wide diversity and patterning of responses extant. Individual differences abound.

With so many different responses available and so many individual differences, the opportunity for

complex social interactions in natural groups of galagos is manifold. A convenient summary of Table 1 is available by summing frequencies over all columns: out of the 72 responses observed, 33% were aggressive, 32% grooming, 14% escape, 12% wrestling, and 9% indifferent.

Slow Loris Encounters

Facial displays. There were no facial expressions discernable during encounters.

Vocalizations. Vocal productions were absent during encounters.

Eliminative behaviors. Some authors (Hill, 1938; Ilse, 1955) report that a urine hand-washing routine, similar to that noted in galagos, is found with lorises. This was not observed with these particular animals, nor was it observed by Tenaza et al (1969). Some lorises, however, did display the rhythmic micturition pattern (Ilse, 1955), wherein the animal slowly moved around in a circle while urinating briefly at intermittent intervals. This resulting circular pattern was usually noted around the animal's nest box.

When frightened, the loris adopts a particular posture in which the head is lowered and the arms wrapped around the head. Accompanying this "head shielding" response is a definite acrid odor which apparently comes from a special gland located on the forearms. This "fear odor" was never detected during or after a social encounter, indicating that the behavior probably is not used in dealing with conspecifics. It may serve as a defense against predators and/or warning to others of the presence of a predator.

Table 2
Percentage of Observation Period in Which Reciprocal Grooming
Between Slow Lorises was Observed

Grooming Response Made by Animal	Grooming Response Made to Animal								Mean
	1 (♀)	2 (♀)	3 (♀)	4 (♀)	5 (♀)	6 (♂)	7 (Juv. ♂)	8 (Juv. ♀)	
1 (♀)	—	38	22	26	35	42	35	15	30.7
	—	46	29	00	52	41	25	24	
2 (♀)	36	—	00	00	08	48	16	33†	28.4
	49	—	00	42	31	59	39	36†	
3 (♀)	59	00	—	00	45	49	31	15	32.4
	20	00	—	58	61	49	42	24	
4 (♀)	07	00	00	—	07	00	01	00	4.5
	00	27	07	—	00	12*	02	00	
5 (♀)	38	50	40	39	—	38	25	34	31.8
	31	54	18	23	—	02*	25	28	
6 (♂)	16	13	05	00	16	—	10	16	11.7
	22	12	22	06*	00*	—	18	08	
7 (Juv. ♂)	48	40	45	60	67	81	—	51	55.8
	61	50	47	48	65	50	—	69	
8 (Juv. ♀)	20	45†	16	20	24	42	21	—	25.3
	19	27†	26	19	30	27	18	—	
Mean	30.4	28.7	19.8	24.4	31.5	38.6	22.0	18.1	

†Mutual grooming also occurred; *agonistic behavior also occurred

Grooming and olfactory investigation. Reciprocal allogrooming was by far the most pronounced type of social interaction observed during loris encounters. In the general pattern of loris encounters, one loris slowly approached the other; they sniffed and then started to groom—first one and then the other. Only rarely did they groom simultaneously. Often a definite soliciting posture was adopted by one loris. The head was lowered, and the shoulder and the back of the neck were exposed. The second animal would then groom the soliciting animal. After a time, the grooming animal would stop, adopt the soliciting posture, and the first loris would groom.

Since grooming was such a common mode of social interaction in this species, a quantitative analysis of grooming behavior was possible. Table 2 summarizes the intensity and variability of reciprocal allogrooming relationships in slow lorises. The table lists the percentage of the total observation time that the animal listed on the side of the table groomed the animal listed at the top of the table. The percentage for the replication of the encounter is given directly below.

The product-moment correlation between the percentages for original and replication observations for the 56 pairings was .64. Since the pair combinations are not really independent, this correlation is not truly a reliability coefficient, but it offers some indication that the grooming relationships had some stability.

The final column of Table 2

presents the average grooming behavior score of each animal toward all the other animals; the final row of Table 2 indicates the average amount of time an animal was groomed by the others. No. 1, therefore, groomed other lorises about 30% of the time. An exceptional animal was No. 4, which groomed very little (4.5%) and was groomed only 20% of the time. Except for No. 4, the animal doing the least grooming was No. 6, the adult male (12%), but he, on the other hand, was groomed more than any other animal (39%). Also of interest was the large percentage of time the juvenile male, No. 7, groomed others (56%).

Agonistic behavior. Fighting occurred on only one occasion for two of the pairings and are noted in Table 2. Agonistic behavior in the slow loris is in marked contrast to that in the galago. Both animals lower their heads; then, suddenly and quickly, one "butts" the other's head. The attacker then lowers his head and the other "butts" him. The speed with which these thrusts are delivered is amazing, considering the usual lethargic activities of this species. These observations of slow loris agonistic behavior are remarkably similar to those reported for the morphologically similar *Periodocus potto* (Bishop, 1964). The ear-pulling behavior described by Subramonian (1965) for *Loris tardigradus* was not observed.

DISCUSSION

Studies of social encounters, as illustrated by the present research, provide data as to the key types or patterns of behavior displayed during social encounters. Information

collected in the observations of *Galago crassicaudatus* individuals indicated that this species has a number of modes of social interaction. In this situation, grooming, agonistic behavior, and playful fighting or wrestling were observed most frequently. Individual recognition of species members was indicated by the consistency of the mode of encounter displayed during replication. Social relationships based on grooming and agonistic behaviors are undoubtedly possible. Special soliciting and defensive postures are used as part of these social behaviors.

Observations of the slow loris indicated that reciprocal allogrooming was the predominant type of behavior displayed during social encounters. The intensity of this grooming behavior was variable across animals and indicated that individual recognition was possible. Social relationships in the slow loris may be more highly dependent on grooming behavior than on agonistic behavior, since aggressive behavior was observed infrequently. The aggressive attacks were highly stereotyped, however, and social relationships may be partially dependent on ritualized agonistic behavior.

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