

RESEARCH ARTICLE

A Comparison of Activity Patterns for Captive *Propithecus tattersalli* and *Propithecus coquereli*

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The activity patterns and social interactions of two species of captive sifaka were observed during a 2-year period. Allogrooming was not observed in golden-crowned sifaka and they spent significantly more time resting than the Coquerel's sifaka. Females of both species were found to be dominant to males. The golden-crowned sifaka (*Propithecus tattersalli*) spent significantly less time feeding than the Coquerel's sifaka. Temperature, time of day, species, and interpair comparisons for the golden-crowned sifaka were found to affect activity and social interactions, while gender did not. Like the Coquerel's sifaka, the golden-crowned sifaka was found to be diurnal; however, they differed in that the golden-crowned sifaka did not descend to the ground. Zoo Biol. XX:XX–XX, 2016. © 2016 Wiley Periodicals, Inc.

Keywords: female dominance; lemur; golden-crowned sifaka; social behavior; Coquerel's sifaka; allogrooming

INTRODUCTION

Indriidae include the largest extant lemurs of Madagascar and are unique in their locomotion. The family Indriidae consists of three genera (*Indri*, *Propithecus*, and *Avahi*). Both *Indri* and *Propithecus* are large-bodied and diurnal while *Avahi* are small and nocturnal [Glander et al., 1992]. All Indrids are characterized as vertical clingers and leapers (VCL), orienting themselves with the trunk of their body held vertically. They are capable of spectacular leaps powered by their robust hindlegs and are primarily arboreal, only rarely descending to the ground [Haring, 1988; Haring et al., 1988].

The golden-crowned sifaka (*Propithecus tattersalli*) first discovered in 1974, is covered by silky white hair except for the black hairless face, which reveals “highly visible ears” and orange eyes [Rowe and Myers, 2015; Tattersall, 1982]. A pale or silver tint is often found on the animals' crowns, backs, and limbs, and pale gold or brown can be seen on top of the head and on the lower part of the back [Rowe and Myers, 2015; Tattersall, 1982]. From head to tail, the adult golden-crowned sifaka measure approximately one meter, with the tail length being approximately the same length as the head and body length [Rowe and Myers, 2015; Simons, 1988]. The *P. tattersalli* wild-caught adult on average weighs 3,163 grams ($n = 10$) with a range of 2,120

grams to 3,637 grams [Rowe and Myers, 2015; Simons, 1988]. *P. tattersalli* has one of the smallest ranges of any lemur [Quéméré et al., 2010] with its distribution (Fig. 1) limited to northeast Madagascar near Daraina [Meyers, 1993]. This region has fragmented dry deciduous forests with distinct dry and wet seasons, April through November and December through March, respectively [Meyers and Wright, 1993]. The year-round temperature differs less than 10°C, with the highest in November and December and the lowest in June, July, and August [Meyers, 1993]. Wild golden-crowned sifaka have been observed eating the seeds of unripe fruit, immature and mature foliage, flowers, and fruit pulp (in descending importance), based on seasonal availability [Meyers, 1993; Rowe and Myers, 2015]. The total wild population is estimated to be 6,000–26,000 in discontinuous

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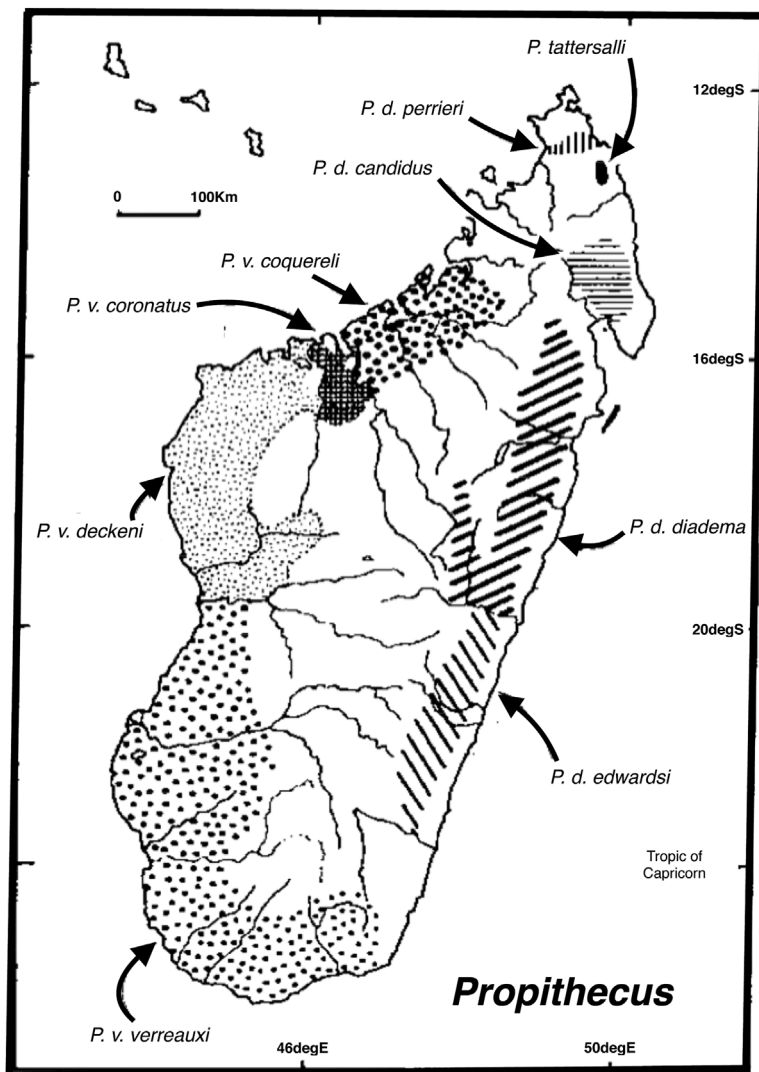


Fig. 1. *Propithecus* distribution in Madagascar (from Mittermeier et al., 2010).

forests [IUCN, 2014; Quéméré et al., 2010]. Group sizes are three to ten individuals and home ranges are four to 12 hectares [Mittermeier et al., 2010; Rowe and Myers, 2015]. In the wild, linear dominance hierarchies have been found to exist among adults. Females are dominant over the males, with one reproducing female dominant over all other members of a group and an alpha male who is submissive to all females. This dominance is tied to food competition [Meyers, 1993; Rowe and Myers, 2015].

Coquerel's sifaka (*P. coquereli*) faces are black with white hair on the muzzle, and the ears are small, but visible [Rowe and Myers, 2015; Tattersall, 1982]. Most of the body is white with significant patches of maroon color on the abdomen, inner thighs, and forelimbs; the lower area of the back may be pale silver or brown. Coquerel's sifaka usually have a white or gray tail that is approximately 5 cm longer than the body length, which when extended, gives a head to the tip of the tail length of about one meter [Rowe and Myers, 2015; Tattersall, 1982]. *P. coquereli* is similar in appearance

to *P. verreauxi*, which is naturally found in the southwestern portion of Madagascar; however, they have been determined to be genetically distinct species [Groves, 2001]. Wild-caught adult weights average 3,635 grams ($n = 22$) with a range of 2,000 grams to 5,108 grams (Duke Lemur Center [DLC] records; Rowe and Myers, 2015). The Coquerel's sifaka is found in northwestern Madagascar in areas similar to those described for *P. tattersalli* (Fig. 1). The total population of this species is estimated to be approximately 47,000 in a protected park [Kun-Rodrigues et al., 2014]. The natural home range is five to 30 hectares [McGoogan, 2011; Rowe and Myers, 2015]. Groups contain three to twelve individuals, and may have more than one reproducing member of each sex; females are dominant [Haring, 1988; McGoogan, 2011; Kun-Rodrigues et al., 2014; Rowe and Myers, 2015]. Wild Coquerel's sifaka have been observed to feed on up to 22 different types of leaves, buds, fruits, flowers, and bark, and dead wood [Haring, 1988; Haring et al., 1988; Rowe and Myers, 2015].

According to the IUCN Red List (2014), all *Propithecus* species are either endangered or critically endangered. There have been at least 17 Madagascar lemur species lost to extinction in the last 2,000 years [Crowley et al., 2012]. Most of the threat to the *Indriidae* and other lemur species in Madagascar results from habitat loss, but is also compounded by the bushmeat trade [Barrett, 2009]. Approximately, 90% of original habitat has already been destroyed [Barrett, 2009; Schwitzer et al., 2014]. With many efforts focused on halting these impacts, strategies must also be considered to develop alternative locales and methods for the protection and survival of these irreplaceable primates. Presented here are observational data describing the behavior patterns of the only documented captive *P. tattersalli*. Such information can enhance further captive efforts to preserve this unique lemur species. Also, reported for comparison purposes are the behaviors of captive *P. coquereli*, for which we hypothesized the results would be similar.

METHODS

Subjects

Four wild-caught golden-crowned sifaka and three captive-born Coquerel's sifaka were the subjects of this study (see Table 1 for information on the individual subjects; names abbreviated). During the study, Tu gave birth to a male infant on 2 February 1994. This infant was not included in our study. Co and Lu were the parents of Se. On 12 September 1994, Lu gave birth to a male; this infant was not included in our study.

Housing

The animals were observed in their home enclosures that were equipped with trees, bamboo stalks, pendulous ropes, elevated food stations, and shelter boxes with heat lamps. The heat lamps were regulated by thermostat so that activation occurred at 15.5–18°C; the heat was retained in the box by a clear Plexiglass™ front (Haring, 1990). Ti and Me were relocated often. Their first home, after an indoor quarantine, was a 3 m × 4.5 m × 3.5 m enclosure in Natural Habitat Enclosure No. 3, isolated from other sifaka, tour groups, and the DLC main building. They were then moved to an outdoor cylindrically shaped dwelling, not visible to the

other *P. tattersalli* pair, but on the tour route and near the main building. This habitat was approximately 6.5 m × 5.5 m × 7 m or the same size as the one Ag and Tu were housed in for the entire observation period. Ag and Tu could not see other *Propithecus*, but were near the main building and on the tour route. The Coquerel's sifaka were in an enclosure of the same structure, form, and size as that described for the golden-crowned sifaka. The Coquerel's sifaka were housed as a family group about seven meters away from the final enclosure of Ti and Me and each had visual access to the other.

Procedure

All observations occurred at the DLC. Observation of the *P. tattersalli* began in September 1993 and continued through January 1995 (excluding most of May through mid-August); observations of the *P. coquereli* were performed mid-August 1994 through January 1995. The research began as a study of *P. tattersalli* only; the *P. coquereli* were added later for comparison purposes. Samples were initially taken at all hours (day and night) to determine the consistency of activity/inactivity of each species. All times correspond to hours not on daylight saving time. Data were collected from the same captive group by both observers simultaneously, the exception only being the first 3 months of *P. tattersalli* observations. Initially, this pilot observation period was utilized for confirming agreement between observers. A review of data from these early daily observations affirmed consistency.

An observation session varied in length from 45 min to 4 hr and occurred with the observers outside the enclosures. One-zero time sampling was used, recording current activity at 1-min intervals. This approach was an effort to approximate frequency of each behavior in an observation session. Because small intervals were used, the data also reflect the total proportion of time spent on each activity [Leger, 1977; Kraemer, 1979; Rhine and Linville, 1980]. As one-zero sampling data correlate strongly with continuous recording [Rhine and Flanigan, 1978; Rhine and Linville, 1980; Martin and Bateson, 2007; Kaplin and William, 2013], this approach provided a well-rounded representation of the frequency of the activities constituting the subjects' days.

Also recorded were the ambient temperature (measured by mercury thermometer), weather conditions, and time of day. The categories of activity were: resting, defined

TABLE 1. Individual subject information

Name	Species	Arrival or birth date	Sex	Weight (grams)	Age (months)
Tu	<i>Propithecus tattersalli</i>	7/1/88	f	3,232 (arrival)	144
Ag	<i>Propithecus tattersalli</i>	11/30/87	m	3,637 (arrival)	108
Me	<i>Propithecus tattersalli</i>	7/5/93	f	3,500 (arrival)	156
Ti	<i>Propithecus tattersalli</i>	7/5/93	m	3,400 (arrival)	120
Lu	<i>Propithecus coquereli</i>	3/15/89	f	97.5 (birth)	48
Co	<i>Propithecus coquereli</i>	12/28/89	m	446.5 (at 3.5 months)	48
Se	<i>Propithecus coquereli</i>	9/11/93	m	141.5 (birth)	1

as sleeping or motionless (eyes open); self-grooming and grooming other; social, defined as any physical interactions between group members, as well as grooming other and supplant. Supplant was defined as one individual usurping the place of another (independent of or for food access); these data were collected only on *P. tattersalli* as the hierarchical organization of *P. coquereli* had been well described. The consumption of fruit, vegetables, and leaves was classified as feeding. When an animal was in sustained motion, its activity was specified as movement (Ethogram, Table 2).

The interspecific comparison provided a baseline to differentiate between *P. tattersalli* specific behavior and behavior that may be due to other conditions (e.g., inclement weather). Observations began almost immediately after the arrival of Ti and Me in North Carolina. This provided an opportunity to determine if length of time in captivity affected the activities of the two *P. tattersalli* pairs. The study's duration (14 months) increased the probability of all behaviors being observed and provided a wide range of seasonal temperatures. Observations of both species were performed and recorded jointly by GW and LP.

Data Analysis

A total of 4,110 hrs of observation were collected on the golden-crowned sifaka and 497 hrs on the Coquerel's sifaka. Values from each observation period were recorded as percent of time engaged in an activity (e.g., grooming). These percentages represent the data logged for analysis and interpretation.

A comparison of data for significance at the 0.5 level was then run using the Stataquest™ software. Two nonparametric analyses were utilized, the Mann–Whitney and the Kruskal–Wallis tests. Ambient temperature during observations ranged from -1 to 32°C and was divided into four categories for analysis. Time of day was restricted to hours of greatest activity (0800–1800) and was divided into five two-hour intervals.

RESULTS

The golden-crowned sifaka were diurnal (data not shown). Additionally, this species spent statistically significant more time than the Coquerel's sifaka resting ($P < 0.005$);

accordingly, the Coquerel's sifaka spent significantly more time feeding ($P < 0.005$) and in social ($P < 0.005$) activities (Table 3, Fig. 2a–c). The golden-crowned sifaka pair which had been at the DLC longer spent significantly more time resting ($P = 0.0034$), whereas the other golden-crowned sifaka pair spent significantly more time feeding ($P = 0.0358$), moving, ($P = 0.0197$), and grooming ($P = 0.0031$) (Table 4, Fig. 2d–g). Additionally, ambient temperature predicted frequency of social ($P = 0.0119$) and grooming ($P = 0.0197$) activity in both species (Table 5, Fig. 3). The golden-crowned sifaka pairs both demonstrated female dominance (Table 6). And, of note, neither allogrooming nor descending to the ground was observed in the *P. tattersalli* subjects.

DISCUSSION

This is the only description of captive *P. tattersalli* behavior patterns with a comparison to the more familiar *P. coquereli*. It is currently accepted that all sifaka species are diurnal [Kappeler and Fichtel, 2012]; however, at the time of data collection, this had not yet been well established. Our observations correlated with data on wild *P. tattersalli* and other captive sifaka species that nighttime activity is unusual [Kappeler and Fichtel, 2012; Rea et al., 2014].

Activity budget discussions for various species of sifaka in their natural habitat are available [Richard, 1974; Meyers, 1993; Wright, 1995; Hemingway, 1999; Norscia et al., 2004; Patel, 2006; Irwin, 2007; Pichon et al., 2010; Rowe and Myers, 2015]. However, the data for sifaka species in captivity is limited. The greatest amount of information about captive behavior is available for *P. coquereli*, when our data were collected, and even to this day.

It was unexpected to find significant differences between the two species in their activity profiles. Resting time was significantly different between the species. The Coquerel's sifaka spent significantly less time resting than the golden-crowned pairs (Table 3, Fig. 2a). Part of the difference may be due to age (i.e., younger sifaka may be more active than adults). All golden-crowned sifaka subjects were at least 3 years older than the oldest Coquerel's sifaka subject.

Se, the juvenile Coquerel's sifaka spent approximately 9% of his total time in movement and 58% of his time resting

TABLE 2. Ethogram for captive *P. tattersalli* and *P. coquereli* observations

Behavior	Working definition
Resting	Sleeping or motionless with eyes open
Grooming self	Using mouth or hands to comb, clean hair of own body parts
Grooming other	Using mouth or hands to comb, clean hair of other sifaka's body parts
Social (nose-to-nose)	Decrease in distance between two subjects followed by touching of noses [Kubzdela, 1992]
Social (cling)	Sustained physical contact between two or more subjects while they appear to be resting [Kubzela, 1992]
Social (play)	Active movement with another subject in a relaxed, nonaggressive manner such as wrestling
Feeding	Eating of fruit, leaves, or other food items
Movement	Climbing, hanging, leaping, hopping, walking—any movement to change body position in space

TABLE 3. Significant Mann–Whitney results of differences in activity frequency between *Propithecus tattersalli* and *Propithecus coquereli*

Predictor	Activity	Z-value	P-value
Species	Resting	4.526	<0.0005
Species	Social	−5.600	<0.0005
Species	Feeding	−5.128	<0.0005

while the two adult Coquerel's sifaka spent approximately 2% of their total time moving and 64% of their time resting. The Coquerel's sifaka juvenile and his father were much more active than the adults of the golden-crowned sifaka pairs. The Coquerel's sifaka often engaged in "play fighting" with one another. This discrepancy in activity level may be attributed to their youth in addition to the absence of juvenile golden-crowned sifaka. It is interesting to note that a captive Coquerel's sifaka group that was approximately 15 years older than the subjects of this study and later had an infant was reported to rest less than 15% of the time (substantially less than either subject group of this study). If the time recorded for scanning the environment with the eyes while motionless was added to the inactive time, the totals would be more in-line with those of our study [Wood et al., 2000].

The more active species also spent more time feeding. Consequently, the golden-crowned sifaka spent significantly less time feeding than the Coquerel's sifaka (Table 3, Fig. 2b). Haring [1988] noted that the proportion of total time spent feeding for the captive Coquerel's sifaka varied from 24–38%. The percent time feeding obtained from these observations (27%) paralleled Haring's findings, as well as those of Wood's observations of a captive Coquerel's sifaka group (2000). In contrast, the golden-crowned sifaka spent an average of only 12% of their total time feeding. The Coquerel's sifaka, as previously noted, were all born in captivity. A continuous supply of food may lessen the necessity for the development and honing of efficient foraging skills. In contrast, the two pairs of golden-crowned sifaka were wild-caught. They were often observed eating immediately after food presentation and remaining there until all food had been consumed. While the Coquerel's sifaka had more frequent feeding sessions, their sessions were shorter in length than the golden-crowned sifaka feeding bouts. Perhaps the abundance and availability of food in captivity conditioned the captive-born Coquerel's sifakas to visit the feeding sites more frequently, with less pressure to consume large quantities rapidly.

The difference in social activity between the two species, with the Coquerel's sifaka being significantly more active (Table 3, Fig. 2c), can be explained by the type of interactions. The Coquerel's sifaka juvenile (Se) and his father (Co) often "play-fought." The mother of Se, Lu, did not participate in this play. Due to the dominance hierarchy, male lemurs are often inhibited from interacting with females [Jolly, 1966].

In this study, activity patterns and frequency of social interaction were found to be influenced by outdoor factors,

specifically ambient temperature and daylight. Macedonia [1987] and Wood [2000] demonstrated that *P. coquereli* were more active when housed outside than when housed indoors. It is thought that sifakas adapt with a decrease in body temperature when lower ambient temperatures are present [Richard and Nicoll, 1987]. Thus, it would be predictable that increasing temperatures would be conducive to more activity. Ambient temperature was a predictor of grooming and social behavior observed in both species (Table 5, Fig. 3). Generally, as temperature increased, so did the frequency of grooming. Grooming usually occurs while sunning [Jolly, 1966]. Since sunning is frequent during the hotter times of the day, grooming would likewise increase. Social behavior in golden-crowned sifakas was at its greatest in the temperature range of 10–27°C. When the temperature was below 10°C or above 27°C, social activity was noticeably reduced. The golden-crowned sifaka were found huddling near a heat lamp (categorized as resting) when the temperature was below 10°C and found sunning (categorized as resting) when the temperature was above 27°C. Surprisingly, time of day was not found to be a predictor of any behaviors. This is especially noteworthy since the animals were on a regular feeding schedule. Data were collected on golden-crowned sifaka past sunset hours to establish their activity as diurnal or nocturnal. There were no observed activities after sunset resulting in the conclusion that golden-crowned sifaka are strictly diurnal. Diurnality has been demonstrated in captive Coquerel's sifaka, as well [Rea et al., 2014].

There were differences in activity and social interactions between the two species, as well as in interpair golden-crowned sifaka comparisons. The absence of allogrooming between the golden-crowned sifaka adults was the most surprising finding. In most lemurs, grooming of other individuals plays an important social role and once the adult stage has been reached, allogrooming remains a frequent activity among individuals belonging to the same social group [Charles-Dominique, 1977; Lewis, 2010].

The presence of allogrooming in the wild for the golden-crowned sifaka [Meyers, 1993] but not in captivity may be due to the age/sex composition of the captive study groups. Allogrooming in the wild "most often occurred between adult females and infants rather than between the 'main male' and adult female" [Meyers, 1993]. Individuals in the wild live in mixed age and sex groups. Golden-crowned sifaka infant observations were not utilized in this study and there have been no other juvenile golden-crowned sifaka in captivity. Lewis [2010] described that wild Verreauxi sifaka spend <2% of their time in allogrooming. Likewise, Coquerel's sifaka has been observed to allogroom in captivity approximately 1–3% of its activity budget [Wood et al., 2000].

Remarkably, the captive golden-crowned sifaka was never observed to descend to the ground, unlike the captive Coquerel's sifaka that would occasionally travel by vertical leaps on the ground. It has been described that the wild

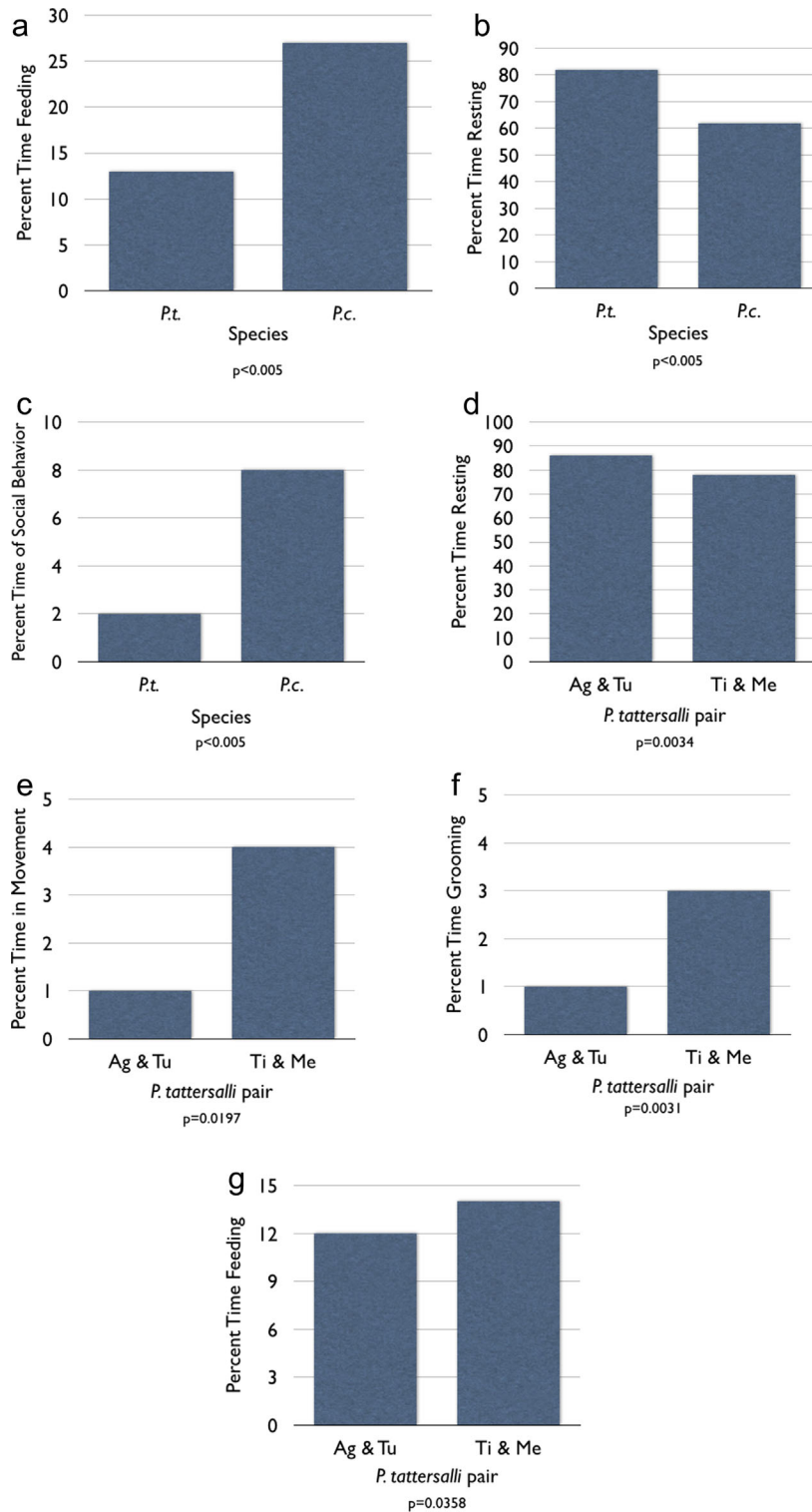


Fig. 2. (a) Interspecific comparison of feeding time. (b) Interspecific comparison for resting. (c) Interspecific comparison of social behavior. (d) *Propithecus tattersalli* pair comparison for resting time. (e) *Propithecus tattersalli* pair comparison for movement. (f) *Propithecus tattersalli* pair comparison for grooming. (g) *Propithecus tattersalli* pair comparison for feeding.

Coquerel’s sifaka spends 55% of its time in trees at a height less than 5 meters from the ground and 1% of its time on the ground (Richard, 1974). There is no data regarding ground-time for the golden-crowned sifaka.

Our results on the nature of the social structure were similar to those for other lemur species, in that females were found to be dominant to males in both sifaka species, especially within the context of encounters over food. Neither

TABLE 4. Significant Mann–Whitney results of differences in activity frequency between two pairs of *Propithecus tattersalli*

Predictor	Activity	Z-value	P-value
Pair of <i>P. tattersalli</i>	Resting	2.932	0.0034
Pair of <i>P. tattersalli</i>	Movement	−2.332	0.0197
Pair of <i>P. tattersalli</i>	Feeding	−2.099	0.0358
Pair of <i>P. tattersalli</i>	Grooming	−2.954	0.0031

the male golden-crowned sifaka nor the male Coquerel's sifaka were ever observed supplanting the female of either pair, while the reverse happened regularly. Most of these supplants occurred during periods of feeding. Many times the male golden-crowned sifaka of each pair would be the first individual to the feeding station only to be replaced by the female. Supplants also occurred over resting spots and sunning areas; however, they were never observed in the heating boxes; sitting side by side in the boxes was observed regularly. These findings are in alignment with observations of captive Coquerel's sifaka [Kubzdela et al., 1992].

When comparing the two pairs of golden-crowned sifaka, there were significant differences for the amount of time spent resting and in movement. Ti and Me rested significantly less and moved significantly more than Ag and Tu (Table 4, Figs. 2d and e). There are several possible explanations for this difference. Ti and Me had been in the Northern Hemisphere for only one and a half years at the conclusion of data collection. Adjustment to the daylight and seasonal changes of such a move takes approximately 2 years (DLC records). Having been in captivity for approximately five times as long as Ti and Me, Ag and Tu were much more acclimated to the environmental conditions of North Carolina. In addition, numerous moves of Ti and Me from enclosure to enclosure may have caused restlessness due to a lack of

TABLE 5. Significant Kruskal–Wallis results of environmental factors predicting activity frequency of *Propithecus tattersalli* and *Propithecus coquereli*

Predictor	Activity	Chi squared	Degrees of freedom	P-value
Ambient temperature	Social	50.173	30	0.0119
Ambient temperature	Grooming	53.068	34	0.0197

environmental stability and a need to explore and scent-mark their new enclosure. Also, tour groups may have been a disturbance to the resting patterns of Ti and Me. At one time, this pair's enclosure was along the main tour path contributing to many interruptions and distractions. Finally, the novelty of humans and the surrounding environment could have increased the pair's general vigilance and activity level, resulting in lesser amounts of resting. Ag and Tu were housed off of the tour path, but near the center of staff activity. However, they were habituated because they saw the same people (DLC staff) daily while Ti and Me were presented novel sensory stimulation in the form of tour groups.

The amount of time spent grooming and feeding was also found to be significantly different between the two pairs of *P. tattersalli*. Ti and Me auto-groomed and fed significantly more often than did Ag and Tu (Table 3, Figs. 2f and g). The need for self-soothing behaviors, such as auto-grooming, may be greater in the pair yet to fully acclimate (Me and Ti). Furthermore, sifaka may groom more frequently in the uncontrolled environs of the wild. The difference in feeding was probably the result of a dramatic weight loss during their adjustment to captivity (DLC Records). At capture, Ti and Me weighed more than Ag and Tu, but they lost weight in the

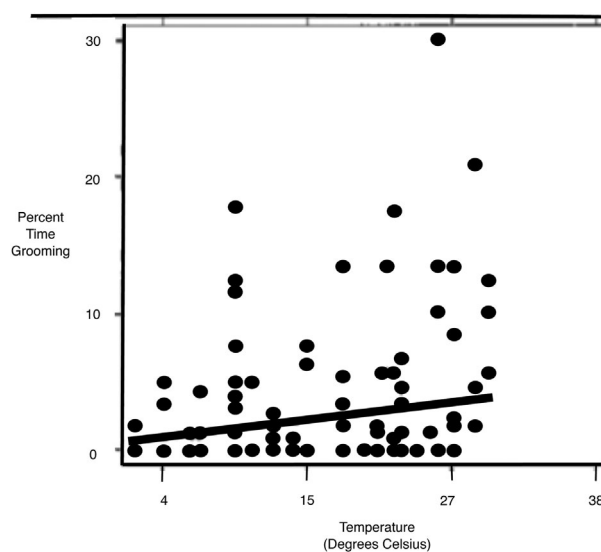


Fig. 3. The relationship between temperature (degree C) and frequency of grooming (% of observation period) for *P. tattersalli* and *P. coquereli*.

TABLE 6. Supplant data for captive *P. tattersalli*

Type of supplant	Working definition	Me & Ti percent of supplant time (%)	Tu & Ag percent of supplant time (%)
Supplant by male (not over food)	Female subject displaced by male, not to gain access to food	0	0
Supplant by male (over food)	Female subject displaced by male, in order to gain access to food	12	7
Supplant by female (not over food)	Male subject displaced by female, not to gain access to food	21	21
Supplant by female (over food)	Male subject displaced by female, in order to gain access to food	67	71
Total percent of supplant time of female per pair		88	92

transition to captivity. This resulted in a 3-year period of recovery to their normal weight through more frequent and longer feeding bouts. The only activity budget data for comparison for golden-crowned sifaka is that wild individuals spend 48–54% of their time foraging; which is very difficult to extrapolate to captive conditions and is a larger number than the combination of movement and feeding for either of our captive pairs [Meyers, 1993].

These results demonstrate that there are individual differences within and between closely related species. Our humble overall experience with these two captive species of sifaka would lead us to share the following regarding the husbandry: both species would benefit from having access to outside housing; golden-crowned sifakas need at least 24 months to acclimate to the Northern Hemisphere; and the young should be allowed to mature within the social group for both species. The application of knowledge gained from studies such as this may enhance individualized conservation efforts for these precious lemur species.

CONCLUSIONS

1. Allogrooming was not observed in the golden-crowned sifaka adults while it was a common occurrence for the Coquerel's sifaka.
2. Females were dominant to males in both species of sifaka. The male was never observed supplanting the female in golden-crowned sifaka over food, while the female often supplanted the male.
3. Significant differences were found in the amount of time spent resting, feeding, and participating in social interactions between the golden-crowned and Coquerel's sifaka.
4. There were also significant differences between the two pairs of golden-crowned sifaka in the amount of time spent resting, moving, feeding, and grooming.
5. Ambient temperature predicted the amount of time spent engaging in social activity and grooming for both species.
6. The captive golden-crowned sifaka was never observed to descend to the ground.
7. The captive golden-crowned sifaka is diurnal.

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