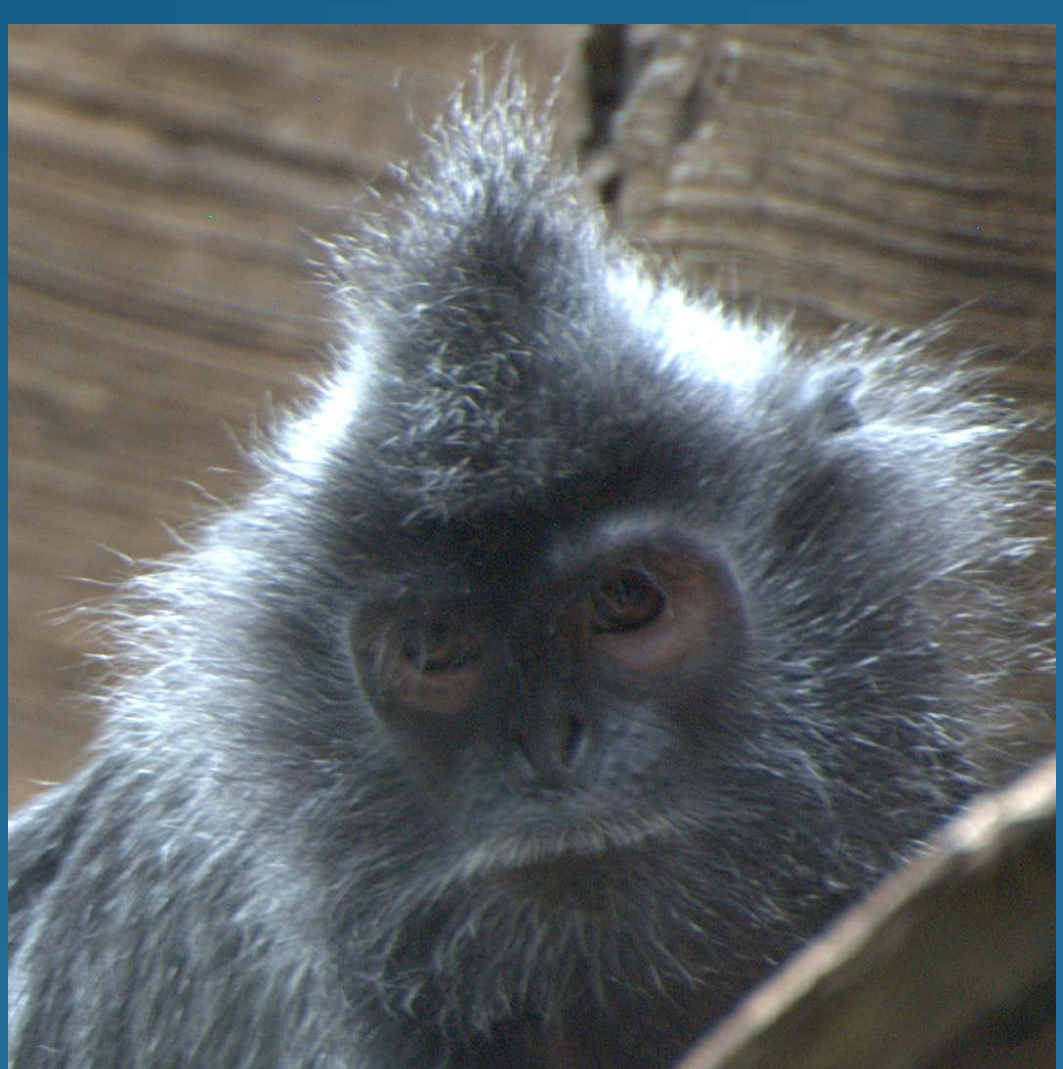


Introduction of an Unrelated Female to an Established Family Group of Silvered Langurs (*Trachypithecus cristatus*) at the Bronx Zoo

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Abstract

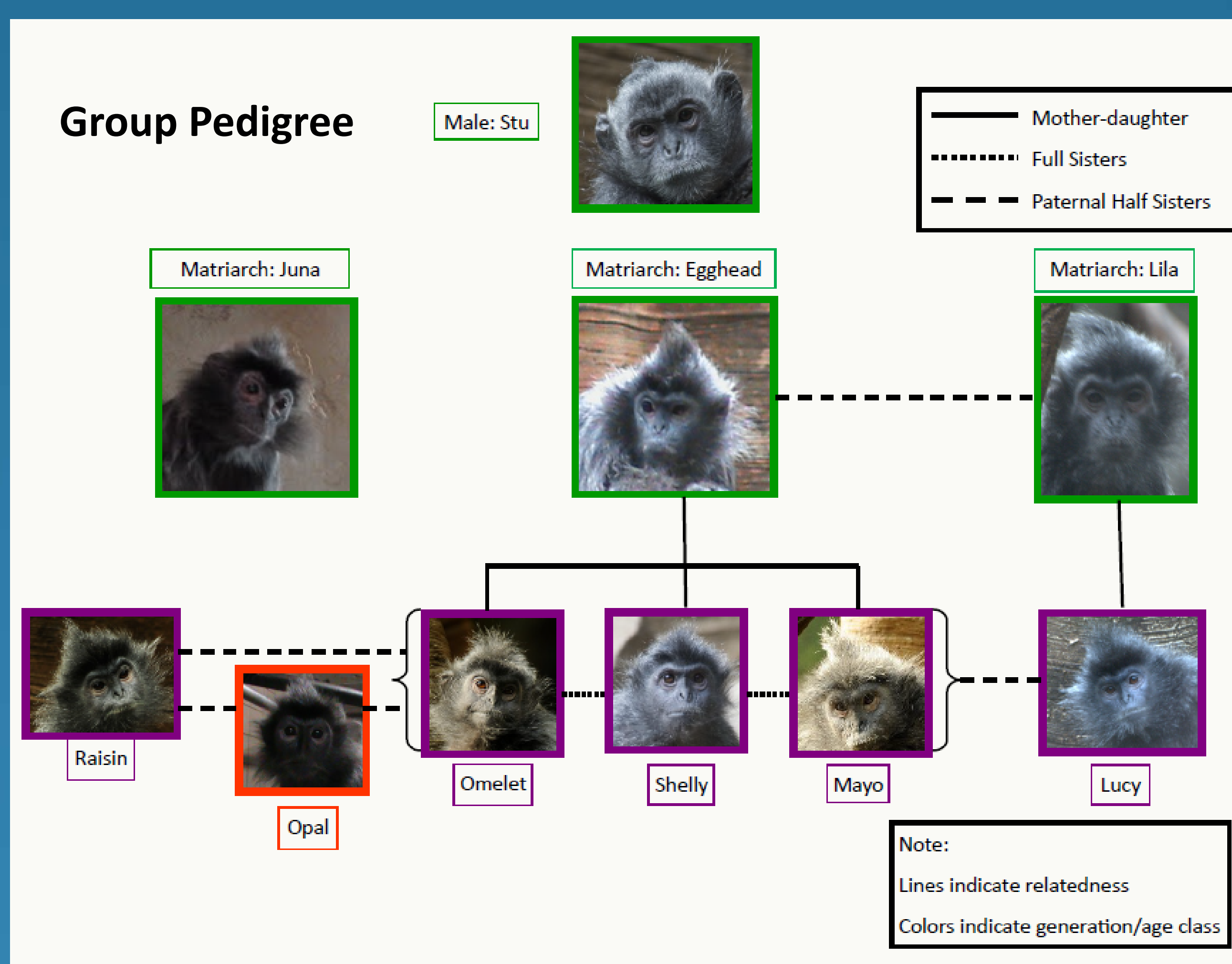
The Bronx Zoo houses a group of 1.9 silvered langurs (*Trachypithecus cristatus*), consisting of one adult male, eight adult females, and one juvenile female. This is a well-established family group whose members exhibit varying degrees of relatedness to one another. In the wild, this species is characterized by female philopatry, meaning that females tend to stay within their natal group, while males are the dispersing sex. In female philopatric systems, immigrant females are likely to face strong resistance from resident females, including reduced access to resources and social allies. This may result in an observed increase in agonistic interactions toward the immigrating female, as well as an increase in cohesion-enhancing behaviors among group members, such as grooming (Sterck *et al.* 1997). This study documents and examines the effects of the introduction of a new female on the social interactions and relationships within the silvered langur group at the Bronx Zoo. The introduced female is a three-year old juvenile, and is the first female to be introduced to this group in 15 years. Data were collected for a period of four months, including pre- and post-introduction all-occurrence sampling of social behaviors in order to measure changes in group social patterns and organization. Pre- and post-introduction proximity data were also collected to evaluate changes in coalitions among group members. Overall, we observed an increase in agonistic interactions including displacement events and aggression, however aggression was observed rarely, accounting for only 3% of all observed interactions. Grooming accounted for the majority of observed interactions and increased by 44% post-introduction. There was an overall decrease in hindquarter presentation and food-sharing events post-introduction. For all behaviors measured, the majority of post-introduction interactions occurred among the younger female group members. Social proximity data did not indicate a significant change between pre- and post-introduction coalitions.



**Bala:
Introduced
Female**

Introduction

At four years old, Bala has had a history of impactions due to free access to vegetation, and was sent to the Bronx Zoo to provide her with a different housing situation where there is controlled access to vegetation. Bala was introduced to a family group of 1.9 langurs over the course of one week. The introduction took place in our holding area, where a few animals were added each day to Bala's sub-group until the entire group was united. The last animals added were the ones who showed signs of aggression during the first-day introductions, such as tongue flicking, hair pulling, and slapping. The langurs who were most accepting of this new female were an unrelated matriarch, Juna, and two middle-aged adult females in the Egghead family line, Omelet and Shelly. The most difficult animals were the other two matriarchs, Egghead and Lila, and juvenile female, Opal. The breeding male, Stu, took an hour to start grooming her (reciprocal grooming was our indicator that it was time to introduce another langur), and after that, he defended her against aggression from the other females.

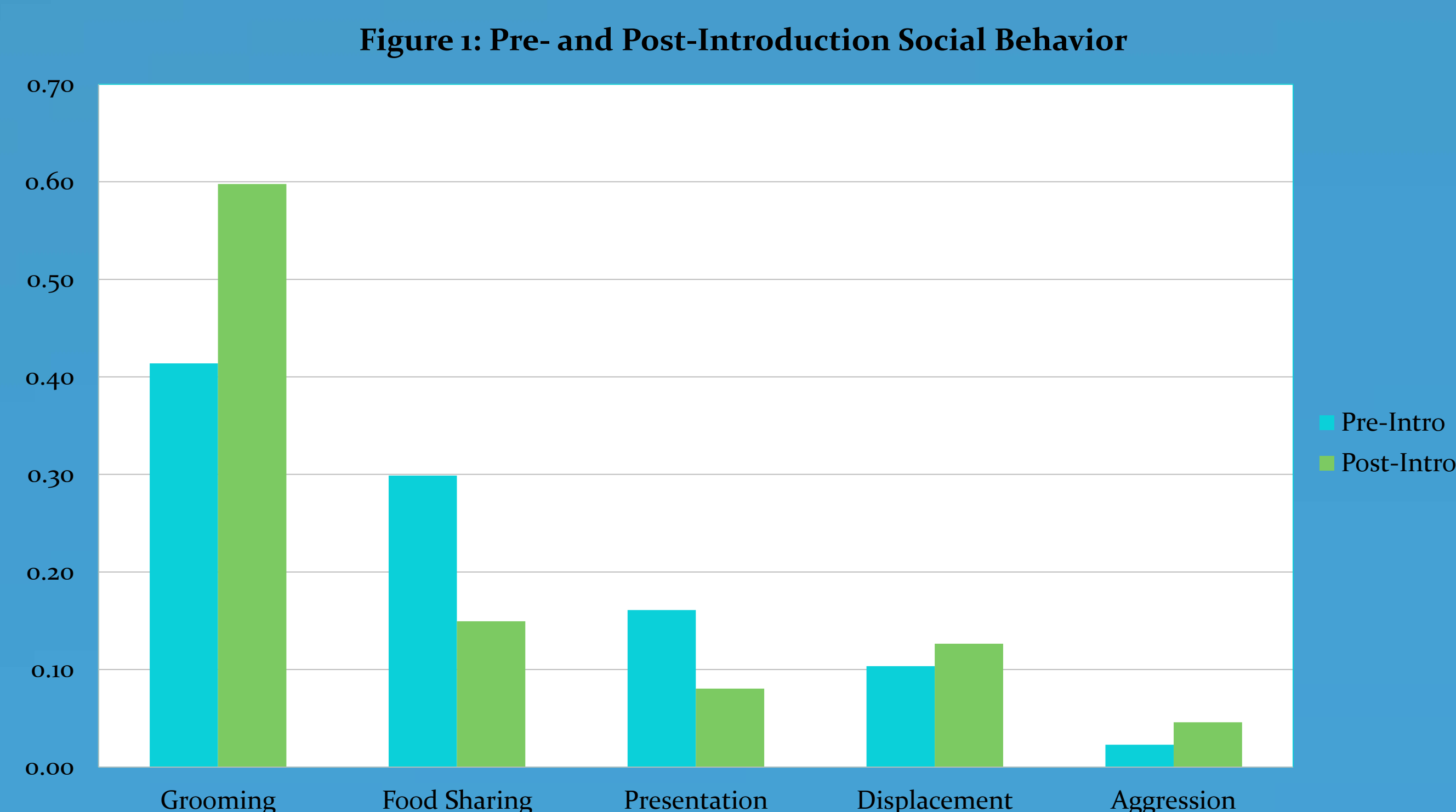


Conclusions

Overall, Bala's introduction to her new home and social group went smoothly. She has assimilated into the group and developed affiliative relationships with most of the females and is frequently seen with the adult male, both on and off exhibit. It is possible that the timely birth of an offspring to Raisin shifted the focus away from Bala, which allowed her to settle into the group faster than expected. Grooming, displacement, and aggression increased in the post-introduction phase, all of which may be expected in a situation where dominance is shifting as old bonds are being tested. Hindquarter presentation and food-sharing both decreased in frequency in the post-introduction phase. This is interesting as both of these behaviors can play an important role in the maintenance of social bonds, which can change dramatically during the introduction of a new group member. That said, some changes in behavioral frequencies and social proximity may be correlated to the birth of Raisin's baby. Grooming plays an important role in group dynamics, and Raisin's involvement in grooming tripled during the post-introduction period. Bala participated in grooming but was less involved overall than the majority of the other group members. As for the dyadic changes, where it was expected that the 'less related' dyads would increase due to the introduction of a new unrelated female, this frequency actually decreased by 10%. Where it did increase was among the 'half-sisters', specifically in dyads involving Raisin.

Methods and Results Part 1: Evaluating Changes in Social Behavior

In order to evaluate changes in social interactions as a result of the introduction, we measured the frequency of behaviors that are either affiliative or agonistic in pre- and post-introduction phases. We identified and defined five behaviors: aggression, displacement, food sharing, hindquarter presentation, and grooming. Data were collected via all-occurrence sampling; 30-minute observation sessions were conducted for both pre- and post-introduction phases (N=11). Pre-introduction data were collected between January and February 2013, and post-introduction data were collected between February and March 2013. Observation sessions were distributed among three times during the day when the langurs are most active: 10 am, when the group is transferred onto exhibit; 12 pm, after the morning resting period, and 3pm, when the langurs are anticipating the afternoon feed. Pre- and post-introduction behavioral frequencies are illustrated in Figure 1: grooming, displacement, and aggression increased by approximately 50%, 30%, and 150%, respectively. However aggression occurred with the lowest overall frequency in both pre- and post-introduction phases, so this increase does not represent a significant contribution to behavioral interactions within the group. Food-sharing and hindquarter presentation both decreased by 50% with Bala's introduction.



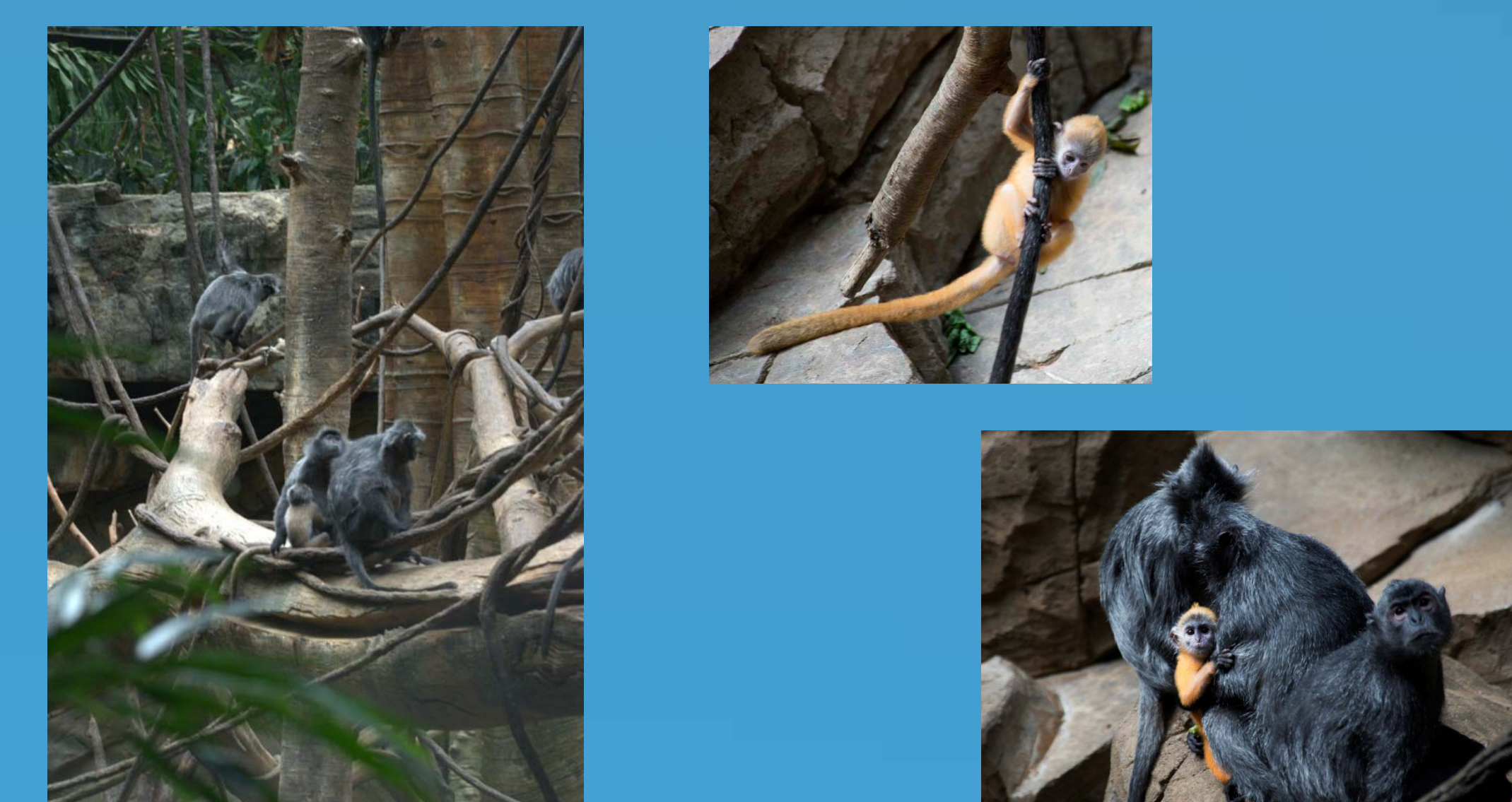
Methods and Results Part 2: Social Proximity

A previous study carried out on the pre-introduction group of 1.9 langurs in October 2012 by a former Bronx Zoo keeper, Alexis Amann, aimed to investigate whether social proximity was correlated with kinship. The hypothesis tested is that related individuals will spend more time in close spatial proximity to one other compared to less-related or unrelated individuals. In the present study, data were collected following the same methods: instantaneous scan sampling every 5 minutes, recording all dyads within 1 meter of one other. Dyads were categorized as: mother-daughter, full-sisters, half-sisters, and less-related (i.e. did not share at least one parent). Table 1 indicates the percentages of occurrences of dyads. Instances of 0% do not always indicate no occurrences but rather a very small occurrence rate. The individuals with whom Bala spent the most time were the adult male, Stu, and the three females who were least accepting of Bala during the introduction (Egghead, Lila, and Opal). The only observed changes in dyads was a 10% increase in the amount of time half-sisters spent in proximity to one another, as well as a 10% decrease in the amount of time "less related" individuals spent in proximity to one another. Other dyad groupings did not change during the post-introduction phase. During post-introduction Juna interacted the least with other individuals, and Raisin exhibited the most frequent interactions with other group members.

	St	Ju	Eg	Li	Om	Ra	Sh	Lu	Ma	Op	Ba
St	*										
Ju	5% 0%	*									
Eg	8% 2%	0% 0%	*								
Li	3% 2%	4% 0%	3% 1%	*							
Om	0% 1%	0% 4%	3% 1%	7% 0%	*						
Ra	2% 5%	2% 1%	0% 2%	0% 1%	0% 6%	*					
Sh	4% 0%	2% 0%	3% 2%	5% 0%	3% 6%	1% 4%	*				
Lu	1% 1%	0% 0%	0% 1%	2% 3%	0% 2%	1% 3%	2% 3%	*			
Ma	0% 2%	0% 0%	4% 8%	1% 1%	5% 3%	1% 6%	3% 3%	3% 1%	*		
Op	3% 3%	0% 0%	4% 3%	3% 1%	0% 0%	0% 1%	3% 1%	3% 0%	5% 3%	*	
Ba	NA 5%	NA 0%	NA 3%	NA 3%	NA 0%	NA 1%	NA 1%	NA 0%	NA 1%	NA 1%	*

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We all know the connection between keepers and the animals we care for is more than just special, the relationship is important for their daily husbandry. The better we understand what our animals' "normal" is (whether that is playful, aggressive, shy, curious...), the faster we can determine when something is wrong. In a large group of primates it can be difficult to keep up with the constant shifting of relationships among individuals, and the best thing we can do is observe them. I encourage all to create projects like this when you have a question about how something (such as a new animal) will impact the status quo, because it forces you to look at the situation objectively. The most surprising thing I found was that Bala spent the most time on exhibit with the male and the females that were least accepting of her during introductions (keep your friends close and your enemies closer?). This experience really gave me the opportunity to, in a short span of time, know my animals better. That means I can do my job better. At the end of the day we are always looking for new ways to learn about the animals in our care and projects like this one provide an opportunity to take a closer look. So take a closer look- the results might surprise you!



Special thanks to Alexis Amann, Julie Maher, Colleen McCann, and all of the Jungle World staff for help with this study from ideas, to editing, to photos.