

Silverback Male Presence and Group Stability in Gorillas (*Gorilla gorilla gorilla*)

Susan W. Margulis^a Jessica C. Whitham^b Kevin Ogorzalek^a

^aBrookfield Zoo, Brookfield, and ^bInstitute for Mind and Biology, University of Chicago, Chicago, Ill., USA

Key Words

Gorillas • Silverback • Control role • *Gorilla gorilla gorilla* • Intragroup interactions • Group stability

Introduction

Gorilla social organization is typically characterized by groups composed of a single adult male, commonly referred to as the silverback, who is the dominant individual and is responsible for protecting the group and maintaining stability among its members [Watts, 1996]. In the wild, it is unusual for a gorilla group to remain without a silverback for a considerable length of time [Watts, 1989; 1996].

Given the relative rarity with which an entire group remains intact during the transition to a new silverback and the unlikelihood of having the opportunity to observe such an event, captive gorillas offer insight into the changing social dynamics that may occur. In 1998, we were able to observe a silverback replacement at the Brookfield Zoo. We report the results of a year-long study of the changing social relationships among female gorillas during the transition period to the new silverback.

In previous studies of nonhuman primates, the dominant individual of a group has been described as assuming a ‘control role’ [Bernstein, 1966; Hoff et al., 1982]. As relatively little fieldwork has been conducted on western lowland gorillas (*Gorilla gorilla gorilla*), mountain gorillas (*Gorilla gorilla beringei*) remain the best available model for studying the social behavior of this species [Watts, 1996].

The silverback gorilla is responsible for protecting the group from external threats and for mitigating internal conflicts [Watts, 1996]. In both captive and wild

Table 1. Composition of Brookfield Zoo's gorilla group

Animal	Age, years (August 1998)	Information	Rearing history
Alpha	37	oldest female in the group	wild-caught
Babs	24	daughter of Alpha; dominant female; pregnant at beginning of study	mother-reared
Baraka	8	daughter of Babs; reaching sexual maturity at beginning of study	mother-reared
Bana	3.5	daughter of Babs	mother-reared
Binti	10	unrelated to other females	hand-reared
Koola	3.5	daughter of Binti	mother-reared
Ramar	~30	new silverback	wild-caught; no prior housing with a silverback

environments, the silverback's role in mediating intragroup aggression and stabilizing social relationships is assumed to be significant. While related females may regularly interact affiliatively, unrelated adult females often behave aggressively towards one another and compete for access to the silverback [Harcourt, 1979; Watts 1991; 1996], but intervention by the silverback diminishes competitive imbalances and reduces the frequency of female-female conflicts [Watts, 1996].

Previous research on the social dynamics of feral and captive western lowland gorillas suggests that levels of aggression should increase after the loss of a silverback and after the introduction of new members. In a study of captive western lowland gorillas, Hoff et al. [1982] found a significant increase in female-female aggression following the removal of the silverback. Upon his return, the silverback repeatedly displayed and charged. These behaviors reached baseline levels after 2 weeks and were correlated with a decrease in aggression among females.

We hypothesize that the absence of a silverback and the subsequent introduction of a new male will influence female-female interactions. We predict that, as the silverback assumes control of the group, aggressive behaviors are expected to decline and social affiliative behavior among females should increase.

Methods

Subjects

In August of 1998, the silverback male of Brookfield Zoo's group of western lowland gorillas (*Gorilla gorilla gorilla*) died unexpectedly. The group remained without a silverback for about 3 months. The remaining group (table 1) consisted of 6 females (4 adults and 2 juveniles). All animals were sired by different males and represented 2 matrilines. Unlike most wild groups, 3 of the 4 adult females at Brookfield were related. Ramar, the new silverback, was estimated to be 30–32 years old. He was wild-caught and, to the best of our knowledge, had never been housed with a silverback in captivity [Badal, 2000].

Procedures

We collected data for 5 weeks (35–38 observations/female) before Ramar's introduction and for 43 weeks (212–216 observations/female) following Ramar's introduction. We conducted 15-min continuous focal observations on the 4 adult females [Altmann, 1974].

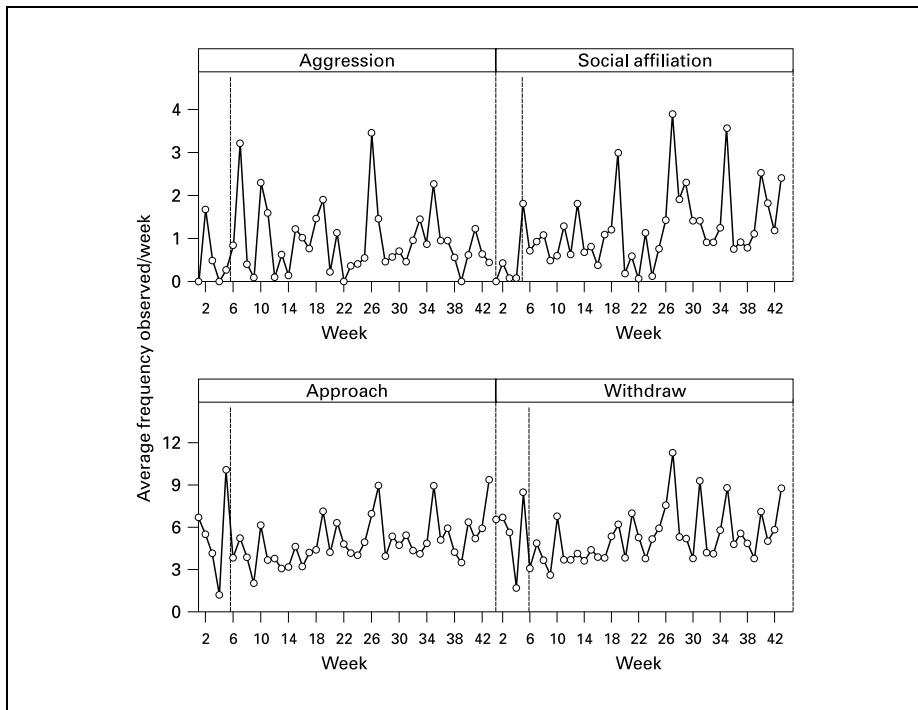


Fig. 1. The frequency of select behaviors per observation, averaged for each week. The dotted line indicates the date of Ramar's introduction. Approach, withdraw, and social affiliation show increasing trends over time, while aggression shows several peaks, the first one being immediately after Ramar's introduction.

Data were analyzed using the SAS statistical package. We used repeated measures (for the first 5 weeks following the introduction) to examine differences among females during the 'no silverback' and 'new silverback' periods of the study and overall differences among females. Changes in behavior frequencies were analyzed using Kruskal-Wallis tests. Significance level was set at $p < 0.05$.

Results

Although overall levels of aggression (contact and non-contact) remained consistently low throughout the study, they peaked during the period immediately following the new silverback's introduction (fig. 1). A comparison of data for the period during which no silverback was present and the first 5 weeks following Ramar's introduction showed a marginally significant increase in female-female threats (repeated measures ANOVA $F_{4,34} = 2.53$, $p < 0.06$). This was due to a significant effect of male presence ($F_{1,34} = 4.67$, $p < 0.04$) and did not reflect differences between the females. Females were significantly less inactive following Ramar's introduction ($F_{1,16} = 11.26$, $p < 0.004$). In addition, rates of affiliative be-

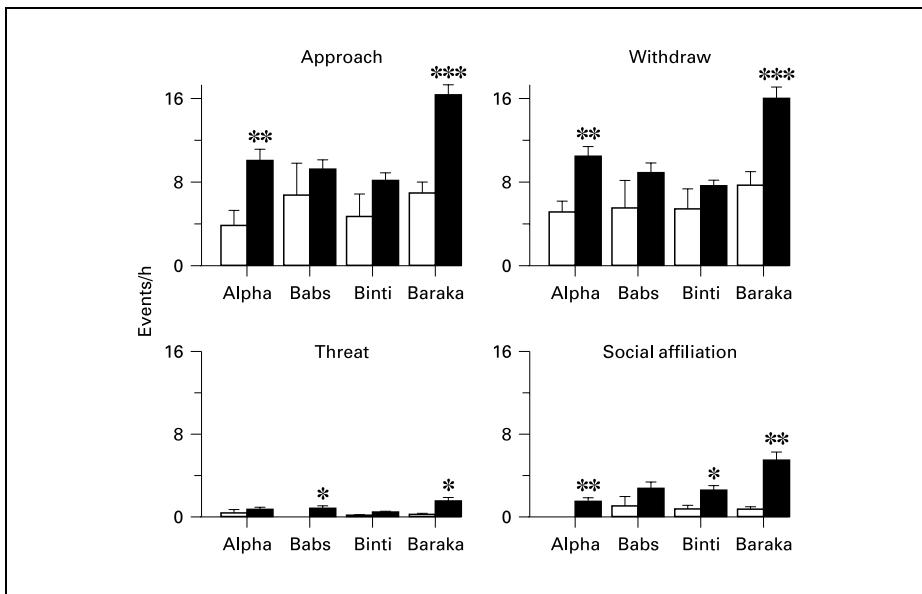


Fig. 2. Frequency of selected event behaviors in the ‘no silverback’ (open bars) vs. the ‘new silverback’ (solid bars) conditions for the four females. Kruskal-Wallis test: * p < 0.10; ** p < 0.05; *** p ≤ 0.005.

havior (allogrooming, resting in contact, touching, embracing) increased during the first 5 weeks for all females following Ramar’s introduction (repeated measures ANOVA $F_{1,16} = 5.075$, $p < 0.04$).

Figure 2 illustrates changes in the frequency of selected event behaviors (approach, withdraw, threat, and social affiliation) for the entire 43 weeks following Ramar’s introduction. There were significant increases in the frequency of approaching, withdrawing (behaviors involved in the maintenance of proximity) and social affiliative behavior for 2 of the 4 females (Kruskal-Wallis test, approach: $\chi_1^2 = 9.76$, $p < 0.002$ and $\chi_1^2 = 5.5853$, $p < 0.02$, respectively; withdraw: $\chi_1^2 = 7.86$, $p < 0.005$ and $\chi_1^2 = 4.58$, $p < 0.03$, respectively; social affiliation: $\chi_1^2 = 5.13$, $p < 0.02$ and $\chi_1^2 = 4.10$, $p < 0.04$, respectively). A third female exhibited a marginal increase in social affiliative behavior ($\chi_1^2 = 3.30$, $p < 0.07$).

Discussion

In the present study, we observed surprisingly low levels of female-female aggression in both the ‘no silverback’ and the ‘new silverback’ conditions. Following the introduction of the new male, there was a slight peak in non-contact aggression. In a previous captive study, female-female aggression increased significantly after the removal of the silverback, but returned to baseline levels within 2 weeks of his reintroduction [Hoff et al., 1982].

Perhaps the most striking finding in the present study is the increase in affiliative behavior following the introduction of the new silverback. This increase was not associated with high levels of interaction with the silverback. Had the increase in female-female social affiliation been associated with high levels of male-female interaction, there would be evidence for the male *actively* establishing control. Conversely, our results suggest that even low levels of male-female interaction allow the male to maintain group cohesion *passively*. Given the lack of direct interaction with the silverback, we suggest that group stability may be conferred by this individual's de facto presence in the group.

Acknowledgments

We thank our volunteer observers and volunteer coordinator, Linda Reiter. We are indebted to Melinda Pruitt-Jones, Jay Petersen, Craig Demitros and the Tropic World keepers for their logistical support. Dario Maestripieri and Subir Trivedi provided valuable comments on the manuscript.

References

- Altmann J (1974). Observational study of behavior: Sampling methods. *Behaviour* 49: 227–267.
Badal J (2000). Jungle to Stage. Fullerton, Jack Badal.
Bernstein IS (1966). A field study of the male role in *Presbytis cristatus* (lutong). *Primates* 7: 402–403.
Harcourt AH (1979). Social relationships among adult female mountain gorillas. *Animal Behaviour* 27: 251–264.
Hoff MP, Nadler RD, Maple TL (1982). Control role of an adult male in a captive group of lowland gorillas. *Folia Primatologica* 38: 72–85.
Watts DP (1989). Infanticide in mountain gorillas: New cases and a reconsideration of the evidence. *Ethology* 81: 1–18.
Watts DP (1991). Harassment of immigrant female mountain gorillas by resident females. *Ethology* 89: 135–153.
Watts DP (1996). Comparative socio-ecology of gorillas. In Great Ape Societies (McGrew WC, Marchant LF, Nishida T, eds.), pp 16–28. Cambridge, Cambridge University Press.