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Male chimpanzee age affects red colobus monkey hunting success

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ABSTRACT

We used data collected from 1976 to 2010 in Mahale, Tanzania, to explore longitudinal changes in red colobus hunting throughout the life histories of individual male chimpanzees. The relative frequency (z-scores) of successful red colobus hunts by male chimpanzees exhibited an inverted U-shaped distribution with age. Hunting success increases when males are between 8–20 years old. Males in adulthood (20–35 years of age) made the highest number of kills. After 39 years of age, male chimpanzees were not observed to kill red colobus monkeys. These results were discussed in terms of their implications for understanding changes in the social status of male chimpanzees over time.

Keywords: male chimpanzee, red colobus hunting, age, life history, Mahale

INTRODUCTION

Chimpanzees (*Pan troglodytes*) have very long lifespans. Therefore, it is difficult to study longitudinal changes in hunting behavior throughout an individual's life. We conducted a preliminary analysis of the relative annual frequency of red colobus (*Piliocolobus rufomitratus*) killing by mature and adolescent male chimpanzees using long-term data recorded in the Mahale Mountains National Park, Tanzania. We detected a trend in the relationship between the age of the male chimpanzees and the frequency of red colobus killing. We hope our data will be useful for future studies on chimpanzee hunting behavior.

METHODS

We investigated male chimpanzees in M group in the Mahale Mountains National Park, Tanzania. This group has been studied starting in the 1960s (Nakamura *et al*. 2015). The ages of male chimpanzees born after 1980 were known, with a few exceptions. The ages of some males were inferred by comparing their physical characteristics (body size, face color, and genital size) to those of males with known ages.

We used chimpanzee hunting data from 1976 to 2010 by gathering published work available in databases after 1979 and unpublished data (see Hosaka *et al*. 2020, 2023 for details). To evaluate individual differences in the frequency of red colobus hunting among male chimpanzees, we calculated the z-scores of the observed number of red colobus kills by males of different ages. The z-score is calculated as $z = (x - \mu)/\sigma$, where x is the number of red colobus monkeys killed by a male at a certain age, μ is the average number of red colobus monkeys killed by all the mature/adolescent male chimpanzees of that age, and σ is the standard deviation.

RESULTS

In the M group, 375 successful hunts of red colobus were observed, with 528 red colobus prey killed in total. Out of these killings, the age–sex classes of captors were identified in 235 cases. The distribution of prey by captor was as follows: 137 prey monkeys killed by mature male chimpanzees, 45 prey monkeys by adolescent male chimpanzees, 41 prey monkeys by mature female chimpanzees, seven prey monkeys by adolescent female chimpanzees, four prey by juvenile chimpanzees, and one prey which was secured by a mature and adolescent male chimpanzee at the same time.

The pooled data of the relative frequency of red colobus killing by male chimpanzees (z-scores) showed an inverted U-shaped distribution according to age (Figure

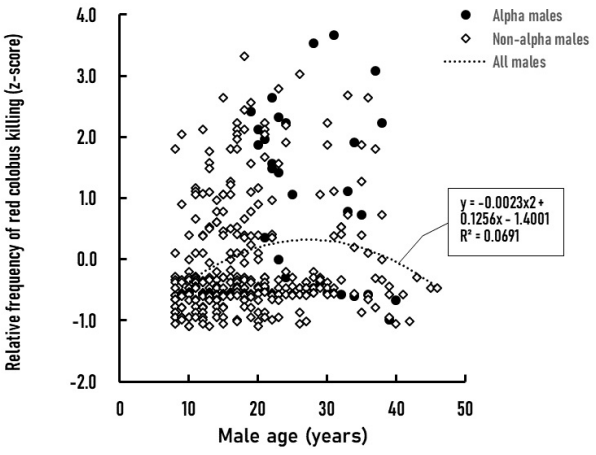

Figure 1. Relative frequency of red colobus killing by male chimpanzees (8–50 years of age).

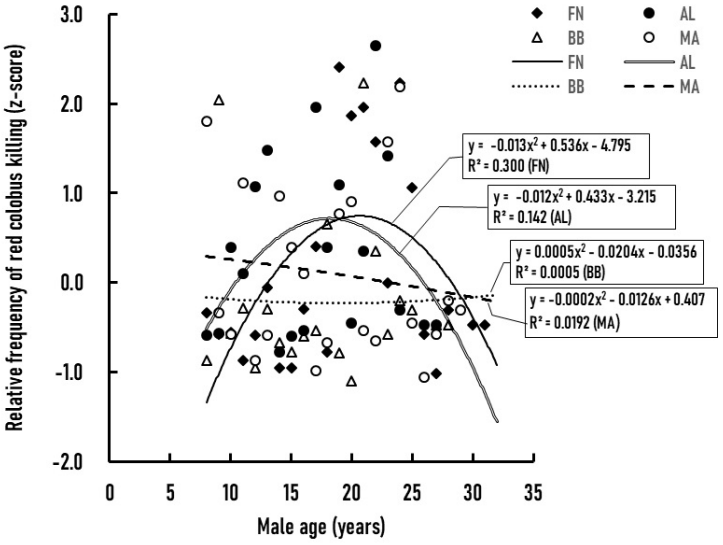

Figure 2. Relative frequencies of red colobus killing by two males who held alpha status (FN and AL), and by two other males who never held an alpha position (BB and MA).

1). The z-scores showed a monotonic increase from 8 to 20 years of age, followed by a plateau until about 35 years of age, and then a decline. No red colobus killing was observed after 39 years of age. The youngest captor was a male named PM, who captured a red colobus at the age of six years, and the oldest captors were three males (BA, DE, NT) who captured red colobus at the age of 38, all of whom had once been high-ranking, alpha or beta. Figure 1 also reveals that males with alpha status tended to have higher z-scores than non-alpha males (Mann–Whitney U test, $U = 2{,}757.5$, $z = 4.470$, $p < 0.01$).

As shown in Figure 2, the relative frequency of red colobus killing varied significantly among male chimpanzees. The z-scores of two males named FN and AL who held alpha status for seven and five years respectively, exhibited inverted U-shaped curves, while the z-scores of two males named BB and MA, who never held an alpha position, did not show this trend (Figure 2).

DISCUSSION

This study revealed that successful hunts of red colobus monkeys showed an inverted U-shape curve with male chimpanzee age. Hunting success increases between 8–20 years of age. The most successful hunters are between 21 and 30 years old. This pattern is similar to those reported for the males of Kasekela and Mitumba communities from Gombe, Tanzania, and the males in the Kanyawara community of Kibale, Uganda by Gilby *et al.* (2015). At Mahale, the frequency of red colobus killing by male chimpanzees showed an abrupt decline for males at ≥ 40 years of age (Figure 1). However, there are only a few data points for these old-aged males.

There was a considerable variation in the frequency of red colobus hunting success among the individual males, as previously reported by Gilby *et al.* (2015). Hosaka *et al.* (2023) noted that the male chimpanzees at Mahale were more likely to kill red colobus monkeys when they held an alpha position. As shown in Figure 2, the two males that had held alpha status clearly showed inverted U-shaped curves, while the two other males that had not held alpha status did not. This suggests that alpha males may hunt red colobus to share meat as a strategy to maintain and reinforce alliances with nonrival and influential males (Nishida *et al.* 1992). We hope that our findings will stimulate additional studies that will contribute to our understanding of the factors that influence the hunting behavior of male chimpanzees.

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