

Seasonal hunting for red colobus monkeys by Mahale chimpanzees

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ABSTRACT

With the spread of red colobus hunting by Mahale chimpanzees after the 1990s, hunting became more concentrated from August to October when the party size of chimpanzees increased. In particular, infant red colobus monkeys seemed to be caught more frequently from July to September compared to other age-group prey.

Keywords: chimpanzee, red colobus hunting, seasonality, Mahale

INTRODUCTION

Seasonality is known to impact the activities of primates (Brockman & van Schaik 2005), and chimpanzees (*Pan troglodytes*) have been shown to exhibit seasonal changes in their hunting activities (Mitani & Watts 2005). It has been reported that the chimpanzees inhabiting the Mahale Mountains National Park (Tanzania) most frequently hunted in May and August–December (Takahata *et al.* 1984).

Here, we analyze long-term changes in hunting for red colobus (*Piliocolobus rufomitratus*) by Mahale chimpanzees. From the 1980s to the 1990s, there was a significant change from sporadic hunting for small ungulates and noncolobus monkeys to frequent hunting of red colobus (Hosaka *et al.* 2020, 2023). We analyze how the seasonality of this new hunting habit has changed over time.

We used data collected by many researchers by different sampling methods. This made it difficult to calculate the exact occurrence rate per observation time. As such, we present the data as a reference for future investigations.

METHODS

We divided the 46-year study period (1965–2010) into four subperiods: 1965–1982, 1983–1990, 1991–1998, and 1999–2010, based on observations of chimpanzee hunting activities recorded in Mahale (see Hosaka *et al.* 2020, 2023 for details).

Hunting episodes were characterized by a sequence of events, including hunting attempts, capturing, killing (inferred by calls heard out of the observer's sight), eating, prey carrying, and playing with or grooming prey without eating. The prey animals were classified into five groups: (1) red colobus, (2) primates other than red colobus (e.g., red-tailed monkey, *Cercopithecus ascanius*), (3) ungulates (e.g., blue duiker, *Philantomba monticola*), (4) birds, and (5) other animals.

At Mahale, the wet season is relatively long, from October to May, followed by a short dry season. These seasonal changes affect plant phenology and fruit production, the chimpanzee's staple food. As a result, the size of chimpanzee parties varies greatly throughout the year (Matsumoto-Oda *et al.* 1998).

RESULTS

HUNTING SEASONALITY FOR DIFFERENT PREY

Data collected over 46 years revealed that red colobus hunting peaked in September, with 54.3% of all red colobus hunting episodes occurring from August to October (Figure 1). The hunting pattern for red colobus was significantly different from that of ungulates ($\chi^2 = 26.749$, $df = 11$, $p < 0.01$), primates other than red colobus ($\chi^2 = 22.092$, $df = 11$, $p < 0.03$), and bird ($\chi^2 = 26.124$, $df = 11$, $p < 0.01$), but was not different from that of other animals ($\chi^2 = 6.513$, $df = 11$, $p > 0.8$).

LONG-TERM CHANGES OF RED COLOBUS HUNTING

The seasonality of red colobus hunting changed over

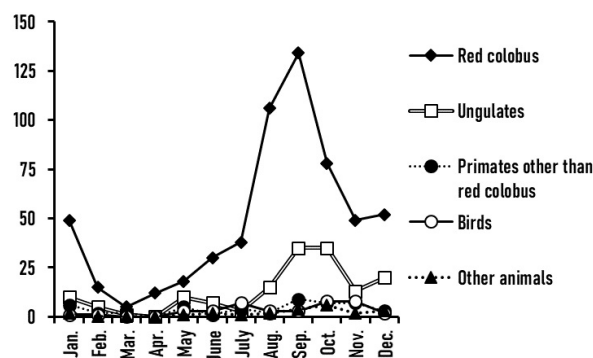


Figure 1. Number of hunting episodes for each prey group recorded monthly.

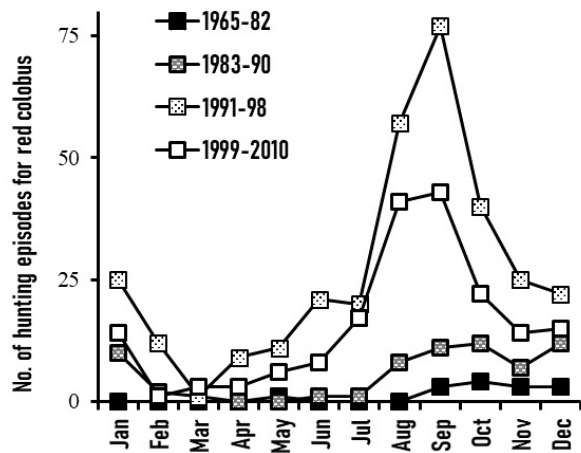


Figure 2. Long-term changes in the number of hunting episodes for red colobus monkeys recorded monthly.

the study period. It was observed more often between August and September as our study progressed (Figure 2). From 1965 to 1982, red colobus hunting was observed mainly from September to December, without a clear peak. From 1983 to 1990, the number of observed episodes increased from August to January, but no significant peak was observed. The hunting frequency exhibited a conspicuous peak in September from 1991 to 1998, a significantly different pattern than between 1983 and 1990 ($\chi^2 = 58.77$, $df = 11$, $p < 0.00001$). The hunting was more concentrated in August and September after 1999 than between 1991 and 1998 ($\chi^2 = 26.68$, $df = 11$, $p < 0.01$).

SEASONAL VARIATION IN AGE STRUCTURE OF RED COLOBUS

Figure 3 shows the changes in the age groups of red colobus prey recorded monthly. The proportion of infant prey increased consistently from 0% in 1965–1982 to 35.2% in 1999–2010 ($\chi^2 = 10.902$, $df = 3$, $p < 0.025$). Infant prey red colobus monkeys were also slightly more likely to be killed by chimpanzees from July to September than other age groups ($\chi^2 = 8.786$, $df = 3$, $p < 0.05$).

DISCUSSION

Mitani & Watts (2005) reviewed seasonal hunting for nonhuman primates. They identified four potential factors that may contribute to seasonal hunting changes in chimpanzees: (1) direct and indirect seasonal variation effects of plant foods/nutrients, (2) breeding seasonality of the prey, (3) seasonal variations in the number of estrous female chimpanzees as a motivation for hunting, and (4) hunting efficiency that may increase as the chimpanzee party becomes larger.

Due to the lack of a standardized observation method, our data do not allow definitive conclusions to be drawn. However, they exhibit several trends that warrant further investigation. First, the spread of red colobus hunting after the 1990s resulted in marked seasonal changes, with a more pronounced peak occurring from August to October when chimpanzee party size increased. This is consistent with the findings of previous studies (e.g., Mitani & Watts 2005), which have shown that the best predictors of chimpanzees' decision to hunt red colobus are the overall party size and the number of males that often engaged in hunting. As a result, hunting red colobus by chimpanzees may

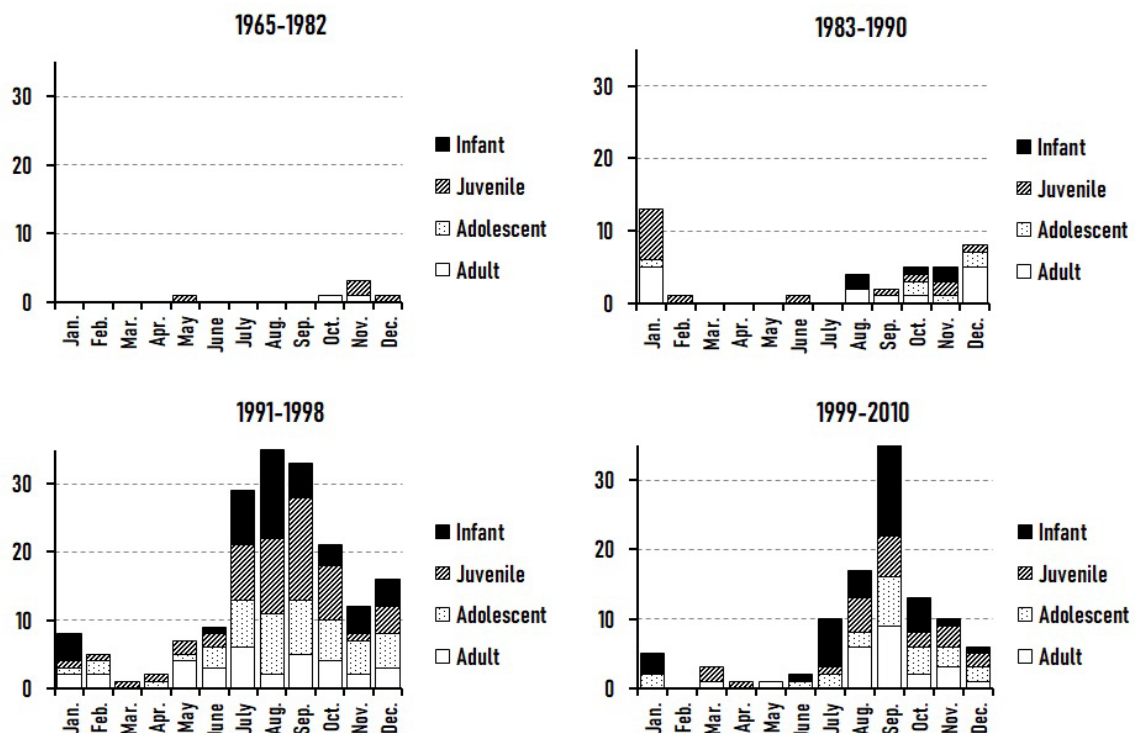


Figure 3. The number of red colobus prey within age groups monthly.

be strongly influenced by the fluctuation of the nomadic party size, which is also affected by fruit production (Itoh & Nishida 2007).

Second, the August–September period is when large parties of the Mahale chimpanzees start to form, but it is not always the period when party size is at its largest (Matsumoto-Oda *et al.* 1998). One possibility for the decrease in hunting of red colobus between October and December is that the frequent hunting in August–September may be associated with a craze- or binge-like tendency (Hosaka 2015). After such a craze/binge subsides, the hunting frequency may decrease.

Third, the hunting of infant colobus monkeys increased significantly after 1990, with a notable seasonal peak from July to September. The breeding seasonality of red colobus monkeys may explain this tendency. Unfortunately, reliable data on the breeding patterns of red colobus monkeys at Mahale do not exist. Although Stanford & Wrangham (1998) found no evidence of seasonal breeding in red colobus at Gombe (about 170 km north of Mahale), their data highlight mild seasonal variation with a small peak in June. The combination of this mild seasonal variation of red colobus births and the fluctuation of the nomadic party size of chimpanzees may create conditions favorable for chimpanzee hunting.

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