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SHORT COMMUNICATION

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Intrapopulation differences in ant eating in the mountain gorillas of Bwindi Impenetrable National Park, Uganda

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Abstract Variability in ant eating has been observed in several populations of eastern and western gorillas. We investigated the occurrence of ant (*Dorylus* sp.) eating in two groups of mountain gorillas (*Gorilla beringei beringei*) with overlapping home ranges within Bwindi Impenetrable National Park, Uganda from September 2001 to August 2002. We calculated the frequency of ant eating by an indirect method of analyzing fecal samples from silverbacks, adult females, and juveniles. One group consumed ants significantly more often than the other (3.3 vs 17.6% of days sampled). Furthermore, the group that consumed ants more often also consumed them on a seasonal basis (September–February monthly range: 0–8%; March–August monthly range: 30–42.9%). Finally, females and juveniles of this group consumed ants significantly more often than did the silverback (total samples containing ants: silverback, 2.1%; adult female, 13.2%; juvenile, 11.2%). Differences in ant eating between groups are likely due to variability in use of habitats where ants occur (particularly secondary forests). Surveys of ant densities in differing habitats, nutritional analysis of ants, and quantification of the amount of ants in their diets are necessary to understand if ant consumption is due to availability, nutritional value, group traditions, or taste preference.

Keywords *Gorilla beringei beringei* · Ant eating · Diet variability · Age/sex differences

Introduction

Eating insects, which are high in protein, is common among primates (McGrew 2001). Ant eating has been documented in both western (*Gorilla gorilla*) and eastern gorilla (*Gorilla beringei*) populations; the more frequent occurrence of ant eating in western gorillas compared to eastern gorillas is attributed to availability of ants (Harcourt and Harcourt 1984; Watts 1989; Williamson et al. 1990; Tutin and Fernandez 1992; Yamagiwa et al. 1991; McNeilage 1995; Deblauwe et al. 2003). Watts (1989) suggested that a negative correlation of ant availability and altitude exists. Mountain gorillas studied at the Karisoke Research Center (2,680–3,710 m) eat ants rarely (Watts 1989, McNeilage 1995) but Grauer's gorillas ranging in lowland forests (600–1,300 m) eat them considerably more often (Yamagiwa et al. 1991). In western gorillas, interpopulational differences have been attributed to local traditions and habitat types; gorillas were shown to be more insectivorous in areas dominated by secondary forest (Deblauwe et al. 2003).

Age/sex differences in ant eating may be expected. Females and juveniles need higher levels of protein in their diet than adult males because protein requirements are greater for smaller animals and for those animals that are still growing (Richard 1985). However, one study found age/sex differences in gorilla ant eating (Watts 1989) while another did not (Yamagiwa et al. 1991).

To add to the increasing knowledge of dietary variability in gorillas (Doran et al. 2002; Ganas et al. 2004), we studied inter- and intragroup differences in the frequency of ant eating in two mountain gorilla groups in Bwindi Impenetrable National Park, Uganda. The groups studied range at an altitude lower (1,450–1,800 m) than the mountain gorillas of the Karisoke Research Center in Rwanda (2,680–3,710 m). Furthermore, Bwindi gorillas live in an altitude range similar to Grauer's gorillas, where groups have been shown to eat ants frequently (37% of 171 samples contained ants, Yamagiwa et al. 1991). We predicted that Bwindi mountain gorillas would eat ants more often than Karisoke mountain gorillas, but there would be no differences between the two groups examined because they have overlapping home ranges. Additionally, we pre-

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dicted, based on differences in nutritional requirements, that females and juveniles would consume ants at a greater frequency than silverbacks.

Methods

Study site and study groups

Data on ant eating were collected on two habituated mountain gorilla groups ranging in Bwindi Impenetrable National Park (331 km^2) in southwestern Uganda (0°53′–10°8′N; 29°35′–29°50′E) for 1 year between September 2001 and August 2002. The two groups, Mubare and Habinyanja, ranged around Buhoma, in the western section of the park (1,450–1,800 m), and had home ranges that overlapped by 45% (J. Ganas and M.M. Robbins, in review).

Bwindi experienced two wet seasons (September–November and March–May) and two dry seasons (December–February and June–August). Data on rainfall and maximum and minimum mean temperatures were collected daily from a station in Buhoma monitored by the Uganda Wildlife Authority.

Ant eating

Both groups are used for a tourist program, requiring us to minimize human contact with the gorillas. We therefore used indirect data collection methods. To determine if the gorillas consumed ants, we collected fecal samples from night nests (< 48 h old) and assigned each a sex and age class based on bolus size (see Schaller 1963). Samples were collected daily from nests of a silverback, an adult female/blackback (indistinguishable based on size), and a juvenile (defined as sleeps in his/her own nest, sexually immature). Ant eating was recorded based on the presence or absence of ants in the dung samples. Ant remains (with only chitinous exoskeletons left behind) were embedded within the dung, and therefore the possibility that ants simply crawled on the dung could be excluded. We calculated the percentage of samples containing ants monthly, seasonally, and yearly for each group and for age/sex class categories within each group. A group was recorded as eating ants if any of the samples collected from the three age/sex categories contained ants on a particular day. The Mubare group did not contain a blackback, so all dung samples could be assigned a age class. The Habinyanja group contained a blackback and therefore could only be used for comparisons of sex class.

Samples weighed approximately 250 g for silverbacks and adult females and 150 g for juveniles. We analyzed a total of 840 samples for the Mubare group (silverback: 281; adult female: 281; juvenile: 278) and 795 samples for the Habinyanja group (silverback: 267; adult female/blackback: 270; juvenile: 258), with an average of 23 (SD = 3.18) sample days per month (Mubare mean = 23.7, monthly range: 20–30, SD = 2.96; Habinyanja mean = 22.4, monthly range: 13–26, SD = 3.4).

Statistics

All values were calculated as a monthly percentage of samples containing ants. We used the Mann–Whitney *U*-test to examine differences between groups. Differences between age/sex classes were analyzed first using a Friedman analysis of variance (ANOVA). Following a significant result, we used a Wilcoxon test to determine where the differences occurred.

Results

The Mubare group significantly consumed ants on a greater number of days (17.6%) than the Habinyanja group (3.3%; Mann–Whitney *U*-test: $Z = -2.474$, $P = 0.013$), Fig. 1. The Mubare group ate ants seasonally with the majority of ant eating occurring more during the second wet and the second dry seasons (March–August; monthly range: 30–42.9%, SD = 4%) than during the first wet and the first dry seasons; September–February: monthly range: 0–8%, SD = 5.3%, Fig. 1.In contrast, the Habinyanja group did not consume ants seasonally (monthly range: 0–8.3%, SD = 3.9%), Fig. 1.

There were significant differences in the frequency of ant eating between the age/sex classes in the Mubare Group (Friedman ANOVA: $\chi^2 = 14.389$, $df = 3$, $P = 0.001$). Ants occurred significantly more in adult female (AF) and juvenile (JUV) samples than in silverback (SB) samples (SB: 2.1%, AF: 13.2%, JUV: 11.2%; SB and AF Wilcoxon: $Z = -2.855$, $P = 0.005$; SB vs JUV Wilcoxon: $Z = -2.366$, $P = 0.018$, Fig. 2). There was a statistical trend for the adult female samples to contain ants more often than juvenile samples (Wilcoxon: $Z = -1.955$, $P = 0.051$; Fig. 2). These differences were most pronounced during the months of March through August when the most ant eating occurred. There were no age class differences in ant eating in the Habinyanja

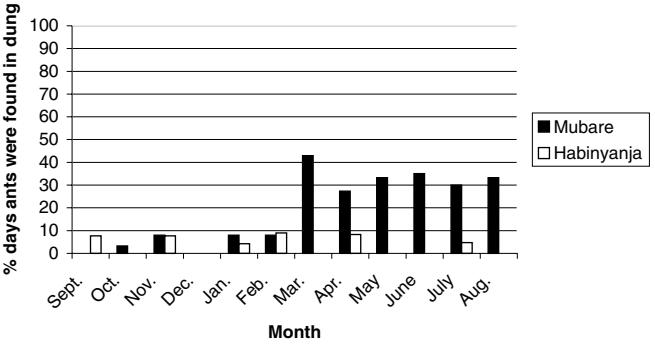

Fig. 1 The percentage of days each month ants were found in the dung for the Mubare and Habinyanja groups

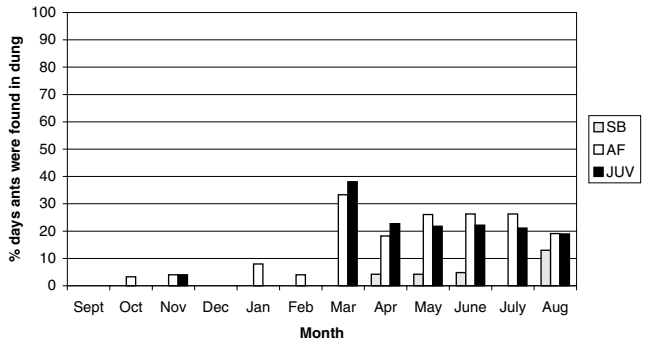

Fig. 2 The percentage of days each month ants were found in the dung for the Mubare group silverback (*SB*), adult female (*AF*), and juvenile (*JUV*) samples

group (SB: 0.4%, AF/blackback: 1.5%, JUV: 1.6%; Friedman ANOVA $\chi^2 = 1.368$, $df = 2$, $P = 0.504$).

Discussion

We found differences in the frequency of ant eating between two mountain gorilla groups with overlapping home ranges in Bwindi Impenetrable National Park, Uganda. The Mubare group significantly ate ants more often than the Habinyanja group (17.6 vs 3.3%) and ate them seasonally.

The differences in frequency and seasonality in ant eating between groups in Bwindi may be due to the localization of ant colonies. During March through August, the Mubare group ranged primarily in areas of secondary or regenerating forest, while the Habinyanja group ranged primarily in open and mixed forests throughout the year (J. Ganas and M.M. Robbins, unpublished data). In a comparison of insectivory among five different western lowland gorilla sites, Deblauwe et al. (2003) found that gorillas were more insectivorous in areas of secondary forest. *Dorylus* sp. colonies in Bwindi may be found primarily in secondary forests, but surveys are needed to determine their distribution and its influence on intergroup differences in ant eating. Differences in ant eating may also be due to local traditions, which has been suggested to explain interpopulation differences in ant eating between western gorilla populations (Tutin and Fernandez 1992).

Furthermore, adult females and juveniles of the Mubare group ate ants more frequently than the silverback. The requirement of greater levels of protein for adult females and juveniles could explain this finding (Richard 1985). However, greater interest by juveniles and taste preferences between individuals has also been suggested to explain age/sex class differences in ant eating by apes (Nishida 1987; Watts 1989). Female chimpanzees (*Pan troglodytes schweinfurthii*) eat insects more frequently than males at Gombe and in the Mahale Mountains in Tanzania, but considering that males also eat meat, it is unlikely they receive less protein than females (McGrew 1979; Goodall 1986; Uehara 1986). Quantifying the amount of ants eaten, coupled with nutritional analysis, will help better explain age/sex differences found.

Availability in relation to altitude may explain why ant-eating behavior differs within eastern gorillas. Grauer's gorillas at Kahuzi-Biega (Itebero: 600–1,300 m) consume ants regularly (Yamagiwa et al. 1991) but mountain gorillas at the Karisoke Research Center in the Virungas (2,680–3,710 m) rarely consume them (Watts 1989). In the Virungas, McNeilage (1995) found that a group at a lower altitude (2,500–2,800 m) occasionally consumed ants while a higher altitude group (2,680–3,710 m) did not. Furthermore a gorilla group in Bwindi at a higher altitude (2,100–2,500 m) was observed to consume ants only once during more than 300 days of observation (M.M. Robbins, personal observation). Ant eating is probably not crucial for mountain gorilla diets since some groups do not consume them and the contribution of ants to protein intake may be negligible, but this only leads to the intriguing question of why ant eating does occur at all.

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