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Brief communication: First evidence for consumption of monkeys by bonobos (Pan paniscus)

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KEY WORDS bonobo, meat eating, hunting, diet

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ABSTRACT

The finger (bones of the 1st metacarpal) of an immature black mangabey (Lophocebus aterrimus) was found in the fresh faeces of a bonobo (Pan paniscus) at the Lui Kotal study site, Democratic Republic of Congo (DRC). The faeces with the bones and attached tissue, as well as the inside-out pelt of the monkey, were found under the night nests of a bonobo group within the study site. The Lui Kotal bonobos seem to eat more meat than other populations and have a greater variation in bonobo mammalian diet than previously thought (Hohmann and Fruth in press). However, this is the first evidence for the consumption of a diurnal group living primate by bonobos. Hunting on large and mobile prey such as diurnal primates has been associated with ecological and social factors such as the abundance of high quality plant foods (Watts and Mitani 2002), structure of forest canopy (Boesch 1994), and demographic patterns (Mitani and Watts 1999). The current finding supports Stanford’s argument (1998a) that some differences in the diet and behaviour between chimpanzees and bonobos are an artefact of the limited number of bonobo study populations. The result challenges current evolutionary models relating the intra-specific aggression and violence seen in chimpanzees and humans to hunting and meat consumption (Wrangham 1999). Provided the evidence on meat consumption can be supported by direct observations, the link between monkey consumption and other species-specific traits, such as levels of aggression and male bonds (Wrangham and Peterson 1996) may need reconsideration.
Most nonhuman primates consume a diet that is dominated by plants. In addition, many species complement plant foods with insects, meat of small vertebrates and other faunal food sources (for a review see Hohmann in press). However, the consumption of larger mammals seems to be rare. In this context Great Apes are no exception: Orang-utans, gorillas and chimpanzees feed on insects such as termites, ants, and bees but the consumption of meat from other mammals is biased towards the two Pan species. Both Pan species are known to prey on a variety of mammalian species. Frequency of hunting and prey species selection varies across populations and between species. Bonobos seem to prefer medium sized terrestrial forest antelopes and terrestrial mammals such as rodents. Carnivory and hunting in bonobos has so far been reported from three field sites: Wamba (Ihobe 1992; Kano and Mulavwa 1984), Lomako (Badrian and Malenky 1984; Hohmann and Fruth 1993), and Lui Kotal (Hohmann and Fruth in press). Prey preference varies across sites and although duikers are present at all sites (Lomako: Badrian and Badrian 1984; Wamba: Kano 1992; Lukuru: Myers-Thompson 1997; Lilungu: Sabater Pi et al. 1993), only bonobos at Lomako and Lui Kotal have been seen to hunt them. Flying squirrels, also ubiquitous, seem to be preyed upon only at Wamba (Ihobe 1992). For arboreal monkeys, present at all sites, the only record of their capture by bonobos comes from Lilungu where the monkeys - Angola pied colobus (Colobus angolensis) and red-tailed monkey (Cercopithecus ascanius) - were used as playthings instead of food (Sabater Pi et al. 1993).

Hunting and consumption of mammalian prey has been reported from all long term chimpanzee study sites, including numerous species of monkey, ungulates, rodents, pigs and birds (Hosaka et al. 2001; Mitani and Watts 2001; Stanford 1998a; Uehara 1997; Uehara and Ihobe 1998). Monkeys account for the majority of the meat in chimpanzee diets and their hunting is believed to necessitate a higher degree of cooperation compared to the rather
opportunistic hunting observed for other prey species (Boesch 1994). The nature of this cooperation is disputed, however, and Stevens and Gilby (2004) suggest that coordination during hunting may not correlate with the distribution of meat. Monkey hunting and consumption have been resolved to social aspects, such as bonding between males (Watts and Mitani 2002) and mating effort (Mitani and Watts 2001; Nishida et al. 1992), or nutritional aspects (Takahata et al. 1984). The occurrence and frequency of hunting varies within and between study sites according to chimpanzee population demographics (number of adult males), forest structure, presence and abundance of prey species and plant food availability (Boesch 1994; Stanford 1998b). The fact that bonobos, in contrast to chimpanzees, do not hunt and eat monkeys, has been linked to reduced levels of violence in bonobos (Wrangham 1999), a lack of male coalitionary skills in hunting, or to their displaying more sympathy with victims (Wrangham and Peterson 1996). In his review of the behavioural ecology of both Pan species, Stanford attributed the apparent differences between the species to insufficient data from different bonobo populations, incomplete habituation of study groups, and the effects of human interference, resulting in a lack of information on hunting and meat eating in bonobos. The view of the more ‘vegetarian’ bonobo (Doran et al. 2002) is challenged by recent observations of bonobos at Lui Kotal: data collected over the last four years suggest that bonobos consume meat at a similar rate to chimpanzees (Hohmann and Fruth in press), and observations show that in addition to duikers and rodents, bonobos also consume small nocturnal primates. In the following report, we present first evidence suggesting that bonobos at Lui Kotal consume the meat of diurnal arboreal monkeys.

**METHODS**
Lui Kotal (2°45.610’ S, 20°22.723’ E) is a 65 km² study site in the southern sector of Salonga National Park, Democratic Republic of the Congo (Hohmann and Fruth 2003). The most abundant monkey species in the study site are redtail monkey (*Cercopithecus ascanius*), Wolf’s monkey (*Cercopithecus wolfi*), Tshuapa red colobus (*Piliocolobus tholloni*) and black mangabey (*Lophocebus aterrimus*).

Fieldwork at Lui Kotal started in February 2002. All mature members of the Bompusa community have been identified and parties can be followed on the ground for long periods.

Since April 2002, collection of fresh faeces from bonobos has been part of the routine data collection at Lui Kotal. During the early phase of field work when the frequency of encounters was low and habituation to the presence of human observers was poor, the material was used to provide information on diet composition and food processing. While habitation allows now direct observation of focal subjects and long-term follows the sampling protocol is maintained in order to detect consumption of rare food species. In the ongoing process of fieldwork and habituation, faeces under the freshly deserted night nests in the study area are collected on a regular base. Analyses of the contents of faeces are conducted in the camp. First, intact samples are carefully disintegrated to detect larger parts of undigested matter. Later samples are washed through a wire mesh sieve to separate small items from the matrix (a detailed description of the technique of faecal analyses is given by McGrew et al. 2007).

Nesting of bonobo parties is either done by observers or by local assistants. Behavioural reaction to the observer as well as recognition of individuals is used to determine community membership of parties.
Black mangabeys are encountered daily at the study site, normally in groups between 5 - 22 individuals (unpublished data) but adult males are sometimes seen to travel alone or together with other species.

RESULTS

Bones of the first metacarpal of a black mangabey (*Lophocebus aterrimus*) were found embedded in a fresh dropping of a bonobo (Fig. 1) belonging to an unhabituated neighbouring community. The faeces and inside-out pelt of the monkey (Fig. 2) were found under freshly deserted night nests within the habituated Bompusa community range (15.5.07, S 02.78832, E 20.35363). Measurements of the digit were taken and compared to the corresponding attributes of an adult female black mangabey found dead from natural causes in the study site.

Measurements of the bones were as follows: tip to second joint: 1.9cm; second joint to third joint: 0.9cm (see figure 1). The pelt, which was in one piece, included parts of the whitish facial hair as well as the beginning of the tail (see figure 2) and enabled us to estimate a head-body length excluding tail (HB) of 35cm. Kingdon (1997) reports the HB of adult black mangabeys to range between 45 and 65 cm. Measurements of the carcass of the adult female mangabey were as follows: HB was 50 cm and the first metacarpal: tip to second joint: 2.5cm; second joint to third joint: 2.0cm. This suggests that the consumed monkey was not an adult.

DISCUSSION
The Lui Kotal field site provides the first evidence of monkey consumption by bonobos. The species eaten was a black mangabey. Prior to this, consumption of monkeys by bonobos has neither been observed nor confirmed indirectly through faecal analyses. This finding challenges the view that arboreal, highly mobile and social species are not consumed by bonobos.

Bonobos have been reported to eat flying squirrels at Wamba (Ihobe 1992) and forest antelopes at Lomako (Badrian and Malenky 1984). The Lui Kotal bonobo population, which is known to eat duikers as well as small mammals including nocturnal primates (Hohmann and Fruth in press), adds monkeys to the bonobo diet. This suggests that bonobos do perceive monkeys as prey species, and that they are able to catch them. The ability to catch monkeys has already been documented by Sabater Pi et al. (1993) and the playful interactions witnessed at the site of Lilungu may correspond to the observed chimpanzee-duiker interactions at Tai, where a common chimpanzee prey species is not consumed, but played with (Taï: Boesch and Boesch-Ackermann 2000).

In the absence of direct observations, the acquisition of the mangabey by bonobos remains speculative. The black mangabey pelt is not from an adult individual, so it was unlikely to have been encountered alone. This suggests either that the hunting of group-living monkeys may require less cooperation than that reported among chimpanzees in tall tropical primary rain forests (Boesch and Boesch-Ackermann 2000) or that bonobos do in fact hunt cooperatively. If bonobos hunt monkeys in a similar way to that described for chimpanzees, either male coalitionary skills are not a prerequisite for monkey-hunting, or they do exist in bonobos (Hare et al. 2007) and have not been lost due to female bonding (Wrangham and Peterson 1996). Alternatively, the hunting of monkeys by bonobos may not be a primarily
male activity and might invoke a different repertoire of coalitionary bonds; female-female or
male-female cooperation may be involved. Pruetz and Bertolani (2007) suggest that female
chimpanzees at Fongoli hunt prosimian prey more frequently than adult males, although
cooperation is not involved. Until direct observations of hunting have been made, it cannot be
excluded that the consumption reported here resulted from meat-stealing from other predators
(e.g. crowned eagle, golden cat or leopard) as practised by the local human population, or
from the perpetrator of an infanticide, as reported for chimpanzees (Reynolds 2005).

The finger was found in the faeces of an unhabituated neighbouring group, nested
without visual contact, suggesting that there is still an observer effect on the hunting
behaviour of bonobos at Lui Kotal. This may lend some support to Stanford’s (1998a)
prediction that interspecies differences will become less significant as information from more
bonobo populations accumulates.

The perceived absence of monkey hunting and consumption by bonobos, in contrast to
chimpanzees, has given rise to various speculations concerning its origin. It has been argued that
cognitive architecture, uniting predation and ‘social demonism’, evolved in a common ancestry
between chimpanzees and humans but has been lost again with the evolution into bonobos (Wrangham
and Peterson 1996). So the absence of hunting of highly mobile prey such as other primates has been
associated with the lack of violence in bonobos (Wrangham 1999). It has even been speculated that
bonobos are more ‘sympathetic to a victim’ (Wrangham and Peterson 1996 p.219). However, this view
is not unchallenged. In an elaborate revision of field data from both Pan species, Stanford (1998a)
proposed that some differences in the diet and behaviour between chimpanzees and bonobos may be
an artefact of the small number of bonobo study populations. The current finding supports the notion
that part of the dichotomy in behavioural ecology of chimpanzees and bonobos is based on the absence of detailed data from bonobos.

The Pan-Pan-model has been widely used for testing theories on the evolution of a variety of behaviors such as sexuality (Wrangham 1993), cognition (Wynn 2003), bipedalism (Videan and McGrew 2002), and feeding behavior (Lambert 2007). Because of ecological conditions, data from bonobos at Lui Kotal have the potential to fill large gaps in our understanding of the behavioral ecology of bonobos and by doing so, refine existing models of hominoid evolution.

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Fig. 1. Bones and attached tissue of the first metacarpal of a black mangabey (Lophocebus aterrimus) found in the faeces of a bonobo (Pan paniscus)

548x541mm (72 x 72 DPI)
Fig. 2. Inside-out pelt of a black mangabey (*Lophocebus aterrimus*) found next to the bonobo faeces containing the monkey digit

1119x808mm (72 x 72 DPI)