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Savanna Chimpanzees (Pan troglodytes schweinfurthii)
Consume and Share Blue Duiker (Philantomba monticola)
Meat in the Issa Valley, Ugalla, Western Tanzania

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INTRODUCTION
Meat eating is pervasive across chimpanzee populations in Africa, with red colobus monkey (Piliocolobus spp.) being the most common prey (Boesch & Boesch 1989; Stanford et al. 1994a; Watts et al. 2012, Hosaka 2015) if sympatric in the same habitat. Besides colobus monkeys, chimpanzees consume a variety of other primates, including olive and yellow baboons (Papio spp.) and bushbabies (Galago spp.). In the forest habitats of western Tanzania chimpanzees have been reported to consume numerous different mammalian species: 18 at Mahale Mountains National Park (Uehara 1997; Hosaka 2015) and eight at Gombe National Park, whilst in the miombo woodland dominated Ugalla Region no direct observations have been recorded to date (Table 1). In West Africa, chimpanzees from Taï Forest, Ivory Coast consume eight different mammal species, all primates (Boesch & Boesch 1989). Wherever chimpanzees consume meat, it is almost always via hunting, as they rarely scavenge (Watts 2008).

Table 1. Species hunted at Gombe and Mahale, and whether they are present and hunted at Issa, modified from Goodall (1986) and Newton-Fisher (2014).

| Common name     | Species               | Gombe | Mahale | Ugalla |
|-----------------|-----------------------|-------|--------|--------|
| Primates        |                       |       |        |        |
| Red-tailed monkey | Cercoptethus ascanus | X     | X      | X      |
| Blue (Sykes) monkey | Cercoptethus mitis   | X     | X      | X      |
| Vervet monkey   | Chlorocebus pygerythrus | X     | X      | X      |
| Red colobus monkey | Piliocolobus tephrosceles | X     | X      | X      |
| Senegalese bushbaby | Galago senegalensis | X     | X      | X      |
| Human           | Homo sapiens          | X     | X      | X      |
| Greater galago  | Otalemur crassicaudatus | X     | X      | X      |
| Chimpanzee      | Pan troglodytes       | X     | X      | X      |
| Baboon          | Papio spp.            | X     | X      | X      |
| Ungulates       |                       |       |        |        |
| Warthog         | Phacochoerus aethiopicus | X     | X      | X      |
| Blue duiker     | Philantomba monticola | X     | X      | X      |
| Bushpig         | Potamochoerus larvatus | X     | X      | X      |
| Bushbuck        | Tragelaphus scriptus  | X     | X      | X      |
| Carnivora       |                       |       |        |        |
| African civet   | Crevicetus civetta    | X     | X      | X      |
| White-tailed mongoose | Ichneumia albicauda | X     | X**    |        |
| Afrotheria      |                       |       |        |        |
| Elephant shrew  | Rynchocyon sp.        | X     | X**    |        |
| Yellow spotted hyrax | Heterohyrax brucei | X     | X**    |        |
| Rodentia        |                       |       |        |        |
| African striped squirrel | Funisciurus sp.    | X     | X*     |        |

* The genus is present at Issa, but it is uncertain whether the species is similar across Tanzanian sites.
** Other genera of the same Family exist at Issa.

Habitat and wildlife diversity clearly influence potential prey for chimpanzees. In Fongoli, Senegal for example, chimpanzees live in a mosaic savanna landscape and prey on patas monkey (Erythrocebus patas) (Pruetz & Marshack 2009), a species that is rarely sympatric with otherwise mostly forest-dwelling chimpanzees. In Ugalla, two recent studies on the diet of wild chimpanzees each found only a paucity of animal tissue in over 1,200 combined samples. Yoshikawa and Ogawa (2015) reported a single case of bird bones and...
another of unidentified mammalian tissue in over 450 samples analyzed between 1995–2011 from the Nguye area, whilst Piel et al. (under revision) reported no mammalian tissue in over 800 samples collected from 2009–2014 from the Issa Valley. A reliance of faecal analysis to infer dietary behavior has well-discussed limitations (Boesch & Boesch 1989; McGrew et al. 2009; Phillips & McGrew 2013) and so direct observations are critical to revealing items that may be otherwise fully digested or rarely consumed.

Where chimpanzees do capture prey, researchers have long been interested in meat-sharing (reviewed in Mitani & Watts 2001). Initial hypotheses described how males monopolized meat and used it as currency, trading it for mating opportunities either on a short or long-term basis, dubbed “meat for sex” (Stanford et al. 1994a, 1994b; Gomes & Boesch 2009). Others have argued that rather than sharing with females, meat-holders share preferentially instead with other males, using meat to build alliances with other males (Nishida et al. 1992; Mitani & Watts 2001). Finally, a third hypothesis suggested that individuals share meat to reduce the number of beggars, who are otherwise energetically expensive to continuously avoid (Gilby 2006).

We report here on an opportunistic observation of chimpanzee consumption of blue duiker (*Philantomba monticola*) and subsequent acquisition of meat by party members in the Issa Valley, Ugalla, Tanzania. On 4 September, 2015 we observed multiple members of the Issa community feeding on the duiker carcass. We describe here this observation in the context of meat-eating of savanna chimpanzees and also the reliability of macro-analysis of faecal samples to infer dietary consumption.

**METHODS**

The Issa Valley is located in the Ugalla region, almost 100 km east of Lake Tanganyika (Figure 1) in western Tanzania. The study area extends over 85 km². The region is characterized by extreme seasonal variation: Annual rainfall averages 1,240 mm (range: 955–1,537) and the rainy season typically lasts from October to April, whilst the dry season (months with less than 100 mm of rainfall) lasts for five to six months, from April/May to September (Piel et al. 2015). The mosaic vegetation structure of the study area is dominated by miombo woodland (*Brachystegia*, *Julbernardia*, and *Isoberlinia*) interspersed with riverine forest, grasslands, and swamps. Russak (2014) recorded 42 mammal and 12 frugivorous bird species including lion (*Panthera leo*) and leopard (*Panthera pardus*). Most recently, researchers observed wild dog (*Lycaon pictus*) (McLester et al. unpublished data) in the area.
OBSERVATIONS

At 0816 h EM and a field assistant encountered a party of at least five individuals who were foraging *Julbernardia globiflora* fruits in miombo woodland. Researchers followed the party into a riverine forest, with individuals periodically in and out of sight, when they heard a cacophony of chimpanzee vocalizations, including alarm barks. When researchers arrived, they encountered a party of nine chimpanzees and were able to approach within 10 m, although the chimpanzees were obscured in the canopy vegetation. Through a hole in the canopy, they identified an adult male climbing up whilst holding the carcass of a blue duiker in one of his hands (Figure 2). Six other individuals that clustered within 2 m around him followed him. At this time the carcass had already been dismembered, with only a portion remaining with the male in sight. The meat holder fed on and picked at the carcass whilst simultaneously allowing at least one other adult male as well as an adult female and her dependent offspring to feed from the meat by taking some pieces. Selectively, he chased and denied other individuals access to the meat.

![Figure 2. An adult male chimpanzee at Issa holds the blue duiker carcass (credit: E. McLester).](image)

After 10 min the meat holder left the tree, with some individuals in pursuit of him, whilst others remained in the tree. Researchers then saw the male climb an adjacent tree and disappear into the canopy, after which a chorus of pant hoots and screams were heard. There was a period of silence, and at 1015 h, researchers approached the location near the source of the vocalizations and identified three individuals consuming scraps of meat. By 1031 h, the chimpanzees had dispersed and researchers began searching for tissue remains and faecal samples in the surrounding area. None were recovered.

The following day, researchers tracked a chimpanzee party for over 8 h. In that time they collected six faecal samples, three of which contained vertebrate remains: either hair or bone (tooth), or both (Figure 3).
DISCUSSION

Wild chimpanzees consume at least 40 different species of vertebrates across Africa (Newton-Fisher 2014) and numerous studies have addressed the role that meat might play as a nutritional resource (Boesch & Boesch-Achermann 2000), as a social tool to build alliances (Nishida et al. 1992), recruit mates (Stanford et al. 1994b) and to reciprocate meat sharing (Mitani & Watts 2001). For savanna-woodland chimpanzees in the Issa Valley our observations represent the first direct observation of mammalian consumption and expand the number of communities that are known to consume meat.

During the last three decades of research on wild chimpanzees, discussion of chimpanzee predation focused on the consequences for arboreal prey, namely colobus populations (Stanford et al. 1994a; Hosaka et al. 2001; Mitani & Watts 2001; Newton-Fisher et al. 2002; Gomes & Boesch 2009). More recently, however, with the first habituation of savanna chimpanzees at Fongoli, more unorthodox sources of prey are being revealed, terrestrial and nocturnal, for example *Erythrocebus* (Pruetz & Marshack 2009) and *Galago* (Pruetz & Bertolani 2007). Now at Issa, we report an observation that also suggests a terrestrial capture. Issa chimpanzees are not the only community to consume antelopes. The chimpanzees of Mahale Mountains also consume blue duikers (Takahata et al. 1984). What remains poorly understood is what drives prey selection and hunting frequency.
There are at least three potential explanations for prey selection and hunting frequency variability. First, one reason for lower prevalence of meat-eating at Issa may be the population density of both chimpanzees and potential prey (Figure 4). For example, chimpanzees and red-tailed monkeys live at very low densities, reducing the likelihood of encounters between the species. It may be that with less forest available, and subsequently lower monkey density (Figure 4), chimpanzees living in more open habitats exploit alternative prey sources. More data on prey availability and preference might resolve whether an environmental explanation is sufficient. Second, an alternative explanation in terms of culture might be explored: According to Boesch & Boesch (1989), Tai forest-chimpanzees never eat blue duikers even if they capture them, although blue duikers are fairly common in their habitat, whereas Issa chimpanzees have not been reported to capture or eat arboreal prey, despite the fact that chimpanzees and arboreal monkeys live sympatric at Issa. Third, macro-analysis may be insufficient for detecting animal tissue. Whilst it reveals much about chimpanzee diet (Phillips & McGrew 2013), Boesch & Boesch (1989) have outlined its limitations. That no mammalian tissue was observed in an analysis of over 1200 faecal samples across Ugalla suggests that either meat-eating is an extremely rare event, or else not all items that chimpanzees consume are detectable in faeces. We suspect it is the former, and as chimpanzee habituation improves in the coming months, we anticipate observing more chimpanzee predation events.

ACKNOWLEDGEMENTS

The authors thank the Tanzanian Wildlife Research Institute (TAWIRI) and the Commission for Science and Technology (COSTECH) for permission to conduct research in the Issa Valley, and field assistants at the Ugalla Primate Project for efforts to track chimpanzees. Support for UPP comes from the UCSD/Salk Center for Academic Research and Training in Anthropogeny (CARTA).

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