TITLE:

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

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her kidnapping behavior must have been the fall of the infant from the high tree. The scream was serious and other bonobos seemed to perceive that Ma was in a critical situation. Bk, who was a mother many years ago, might have taken her up and carried her as she did in the past. Bk did not treat Ma roughly; she even behaved protectively when other infant came to touch her. Thus, she might not have intended to harm Ma. However, if Mr did not have enough courage to snatch her back, Ma might eventually have died of starvation.

It was interesting that the low-ranking mother refrained from retrieving her infant from the high-ranking kidnapper since bonobos were considered to have more egalitarian dominance relationship than chimpanzees (de Waal & Lanting 1997). Mr followed Bk nervously and asked her to return her infant only modestly by peering and genito-genital rubbing. Also, she fled from Bk after she retrieved Ma. It appeared that Mr was aware that she should have difficulty in retrieving her infant if Bk kidnaps Ma again. The ease with which mothers can retrieve their infants from other individuals might be influenced by the strictness of dominance relationship among females (McKenna 1979; Maestripieri 1994). This kidnapping case and the previous case in Lomako (Hohmann & Fruth 2003) might suggest that there is a considerable degree of strictness in dominance relationships among wild female bonobos.

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<NOTE>
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).

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

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	
				Present	Hunted
Primates					
Red-tailed monkey	*Cercopithecus ascanius*	X	X	X	
Blue (Sykes) monkey	*Cercopithecus mitis*	X	X	X	
Vervet monkey	*Chlorocebus pygerythrus*		X	X	
Red colobus monkey	*Piliocolobus tephrosceles*	X	X	X	
Senegalese bushbaby	*Galago senegalesnsis*		X	X	
Human	*Homo sapiens*	X		X	
Greater galago	*Otolemur crassicaudatus*	X		X	
Chimpanzee	*Pan troglodytes*	X	X	X	
Baboon	*Papio* spp.	X	X	X	
Ungulates					
Warthog	*Phacochoerus aethiopicus*		X	X	
Blue duiker	*Philantomba monticola*	X	X	X	X
Bushpig	*Potamochoerus larvatus*	X	X	X	
Bushbuck	*Tragelaphus scriptus*	X	X	X	
Carnivora					
African civet	*Civettictis civetta*		X	X	
White-tailed mongoose	*Ichnuemia albicauda*		X	X*	
Afrotheria					
Elephant shrew	*Rhynchocyon* 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.

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

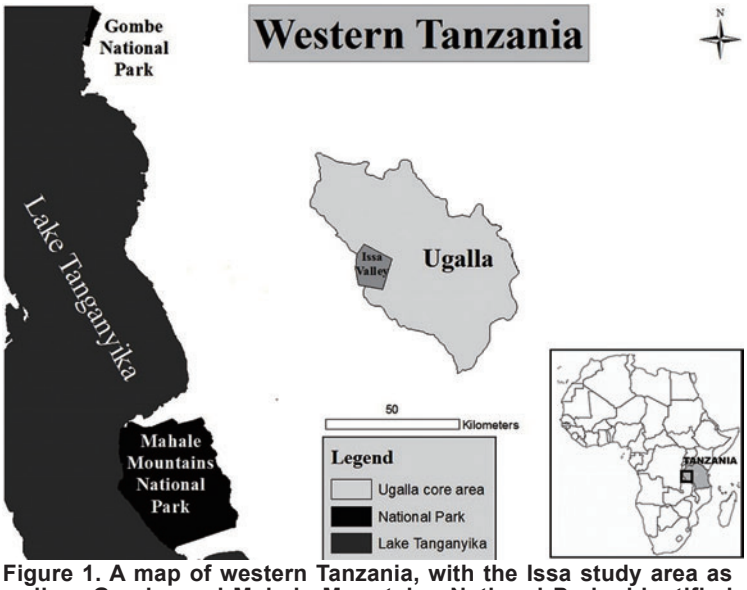

Figure 1. A map of western Tanzania, with the Issa study area as well as Gombe and Mahale Mountains National Parks identified (credit: L. Pintea, Jane Goodall Institute, USA).

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

Figure 3. Mammalian (likely blue duiker) remains from chimpanzee faeces collected the day after the observed meat consumption (credit: S. Ramirez-Amaya).

lion (*Panthera leo*) and leopard (*Panthera pardus*). Most recently, researchers observed wild dog (*Lycaon pictus*) (McLester *et al.* unpublished data) in the area.

Since 2008, there has been a continuous research presence at Issa, and chimpanzees continue to show increased comfort with human presence, rarely fleeing approaching observers (Piel *et al.* unpublished data). All individuals are considered to be part of one community with an estimated home range of between 100–200 km² (Rudicell *et al.* 2011). As of September 2015, researchers had individually identified 14 different chimpanzees.

To better understand chimpanzee dietary patterns, researchers collected faecal samples opportunistically and sluice samples in a near-by river.

OBSERVATIONS

At 0816 h EM and a field assistant encountered a party of at least five individuals who were foraging *Julbernardia globliflora* 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.

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), Taï 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.

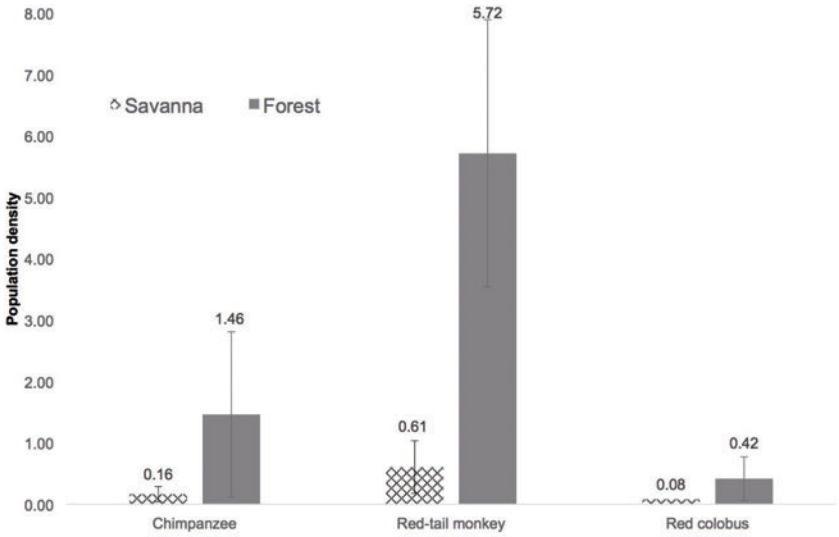

Figure 4. Population density variation between forest-dwelling and savanna primates, with error bars indicating standard deviations (source: Plumptre & Reynolds 1996; Chapman & Lambert 2000; Moyer *et al.* 2006; Rode *et al.* 2006; Davenport *et al.* 2007; Petre *et al.* 2007; Kouakou *et al.* 2009; Moore & Vigilant 2013; Samson & Hunt 2014; Piel *et al.* 2015). A single record exists from Issa's red colobus population, hence the lack of error bars.

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<NOTE>
A Wild Chimpanzee's Newly Invented Play Pattern towards an Artifact after a Short Exploration

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INTRODUCTION

Wild chimpanzees hold and manipulate various types of objects found in their habitat not only as tools, but also as objects to play with or to inspect (Ramsey & McGrew 2005; Nishida *et al.* 2010; Matsusaka *et al.* 2015). The shapes, weights, and other physical features of these target objects inevitably restrict the object manipulation patterns. Matsusaka *et al.* (2015) listed the diversity of object play among wild chimpanzees in Mahale, Tanzania. Infant or juvenile chimpanzees play with spherical objects or lumps, such as stones or fruits. These objects can be picked up, carried, raised and/or dropped, rotated with hands and/or feet laying supine on the ground, put on the chimpanzee's back, held in the groin pocket, or thrown forward or backward under- or overarm. The chimpanzees also play with string-like objects, such as animal tails and skins, or vines, which they drag, drape, flail, and move, among others. Mahale chimpanzees handle not only natural objects, but occasionally, also human artifacts. It has been reported that when Mahale chimpanzees encounter artifacts such as an old abandoned native Tongwe clay pot, wooden boards, or plastic tags used for plant phenological research, they playfully dragged and carried them, or put these artifacts on their head. However, since only several cases are known of chimpanzees trying to steal human belongings throughout Mahale's long research history (Matsusaka *et al.* 2015), chimpanzees are expected to have little idea how to handle the artifacts carried into the forest by the human observers. Intentional presentation or conferment of artifacts to wild chimpanzees should be avoided, because of the risk of disease transmission from humans to chimpanzees. Nonetheless, it is important to analyze how chimpanzees respond to artifacts they occasionally find in the forest, in order to manage such incidents when they happen by chance.

In this article, I report a case of how a juvenile wild chimpanzee in Mahale got hold of a digital video handycam (hereafter, camcorder) in the environment by chance, focusing on how the holder handled and manipulated the camcorder.

METHODS AND MATERIALS

Well-habituated wild chimpanzees of the M group in Mahale Mountains National Park, Tanzania, were studied from August to September 2014 (17 observation days and 86.6 observation hours in total) (see Nakamura *et al.* 2015 for details of the research site). The M group consisted of 63 members in the study period. The number and symbol in parentheses after each individual's name represents his/her age and sex, respectively. I used a camcorder (SONY HDR CX430V: weight 420 g including a battery, size of the main body 58×66×128 mm, length of expanded grip belt 230 mm), a digital photo camera, and field notes to record the behavioral data.

OBSERVATION

On September 1, 2014, I started to follow an adult male CE (16♂). I started recording his behavior using the camcorder at 0905 h. A juvenile female QL (7♀), an infant female AY (4♀), a young male IH (11♂), an adult male DW (25♂), and CE were playing socially in turns, until 1058 h. CE moved into the wood, separating about 50 m away from the other members of the party. I started following CE, and put the camcorder in a pocket of my