

The first case of hunting and consuming an anomalure by chimpanzees (*Pan troglodytes schweinfurthii*) in Kalinzu forest, Uganda

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ABSTRACT

Hunting and meat-eating by chimpanzees have long been attracting researchers' attention. Although chimpanzees consume various vertebrate species, the frequency of meat-eating and prey species differ among populations and groups. Here, we present the first documented case of chimpanzees consuming Lord Derby's anomalure in the Kalinzu forest, Uganda. Despite anomalure species inhabit some long-term field sites of chimpanzee, reports of chimpanzees consuming anomalures are rare, with only one previous case documented in Outamba–Kilimi National Park, Sierra Leone. In the current case, three males consumed the meat and their meat-eating patterns closely resemble those of chimpanzees at this site when consuming their usual prey. Obtaining further observations of these rare events may contribute to gaining a more comprehensive understanding of chimpanzee hunting and feeding culture.

Keywords: meat eating, prey image, food sharing, Lord Derby's anomalure

INTRODUCTION

Chimpanzees hunt and consume a wide range of vertebrate species, with the frequency of meat eating and pursuit of prey species differing among populations and groups (Watts 2020; Bugir *et al.* 2021; Klein *et al.* 2021). Although group- or population-specific prey preferences are partially determined by the availability of the prey species and other food resources, in certain instances they appear to be independent of ecological variation, which may constitute one of the cultural components of chimpanzee behavior (Ebanga Ella *et al.* 2023).

In this study, we report the first case of hunting and subsequent consumption of a Lord Derby's anomalure (*Anomalurus derbianus*; Figure 1) by chimpanzees in Kalinzu Forest, Uganda. The rodent family Anomaluridae comprises seven species that are commonly referred to as anomalure. These are nocturnal mammals that are almost exclusively arboreal, gliding from tree to tree using the membranes (patagia) that stretch between their fore and hind legs, and generally spend the hours of daylight hidden within tree hollows. Anomalures are broadly distributed in different types of forests in western to central Africa and some parts of eastern Africa (Kingdon *et al.* 2014; Howell *et al.* 2016), and although they are hunted by some populations of the genetically close bonobos (Ihobe & Sakamaki 2023; Hirata *et al.* 2010), to the best of our knowledge, there has been only one other reported case of chimpanzees preying upon such animal species in Outamba–Kilimi National Park, Northern Sierra Leone (Alp 1993; Alp & Kitchener 1993).

METHODS

The observations reported herein were made on October 5, 2023, at the Kalinzu Central Forest Reserve (30°07'E, 0°17'S), Uganda. In this region, October falls during one of the two annual rainy seasons (from mid-March to the end of May, and from the mid-September to the end of December). Among the seven recorded species of Anomaluridae, only Lord Derby's anomalure is known to inhabit this area (Kingdon *et al.* 2014; Howell *et al.* 2016). A group of eastern chimpanzees, referred to



Figure 1. Lord Derby's anomalure of Kalinzu Forest. Photo taken by Haruka Kitayama.

as the M group, has been monitored daily at this site since 1992, and with the exception of some peripheral females, all group members have been identified and are fully habituated. They regularly hunt sympatric diurnal primates, namely, red-tailed monkeys (*Cercopithecus ascanius*), blue monkeys (*Cercopithecus mitis*), and Abyssinian colobus (*Colobus guereza*; our unpublished data).

During a hunting session on the aforementioned date, we conducted ad libitum observations of the chimpanzees' behaviors, which were recorded through videos and photographs. We accordingly witnessed meat-sharing interactions involving four males [Ichiro (35–38 years; high-ranking male), Goku (approx. 31 years old; alpha male), Buru (45–50 years; low-ranking male), and Deo (45–50 years old; low-ranking male)] and a single female [Ume (approx. 31–32 years old)].

OBSERVATIONS

On October 5, 2023, we started searching for chimpanzees at 06:00 h and duly located a party of chimpanzees at 07:10 h. At 08:57 h, when three adult male chimpanzees (Ichiro, Goku, Buru) were ranging using a small path, they suddenly began to run and subsequently gathered at a tree, approximately 15 m in height, at a location approximately 2 m above the tree base. Here, they commenced omitting vocalizations of excitement and screaming, and after approximately 1 minute, Ichiro be-

gan climbing the tree carrying the carcass of an animal (Figure 2). Given the presence of a distinctive patagium, we were readily able to identify this animal as an anomalure, which had body lengths of approximately 30 and 40 cm from the head to the gluteal region and head to tail, respectively.

The chimpanzees subsequently spent 31 minutes consuming this prey item. Ichiro held the carcass and started eating the meat at 09:00 h, and at 09:02h, Goku began to beg Ichiro by peering and touching Ichiro's mouth and the carcass and obtained a small portion of meat. At 09:09h, Buru began grooming Ichiro and also obtained a small portion of meat at 09:11 h.

At 09:15 h (Figure 3), when Goku had forcefully seized the carcass from Ichiro, the skin of the carcass began to become detached, and Goku commandeered the torso, legs, and tail, whilst Ichiro was able to retain the skin and head (Figures 4 and 5). Thereafter, Ichiro climbed up into the tree canopy and disappeared from view. At 09:20 h, two sub-adult males, Nobita and Yubo, arrived and sat at a distance of < 10 m from Goku until he had finished eating, although showed no apparent begging behaviours. At 09:26 h, Deo and Ume appeared along with one adult male who was not involved in meat-sharing interactions. At 09:29 h, Ume was seen begging Goku, although she was attacked by Goku and failed to receive any meat. Similarly, despite begging Goku, Deo was un-

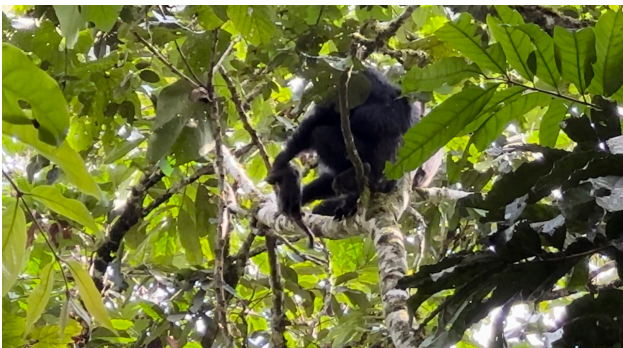


Figure 2. Ichiro clutching the anomalure immediately after capture. Photo taken by Shimei Shirasawa.

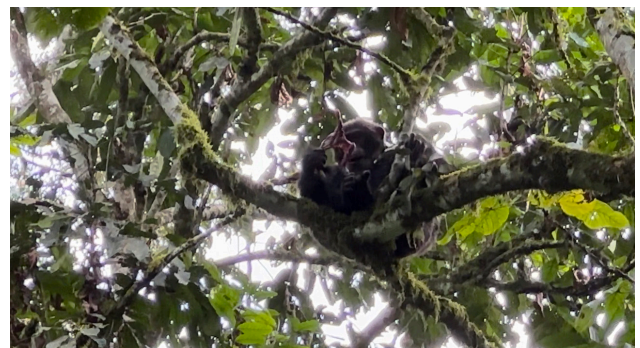


Figure 4. Goku holding the lower half of the anomalure. Photo taken by Shimei Shirasawa.

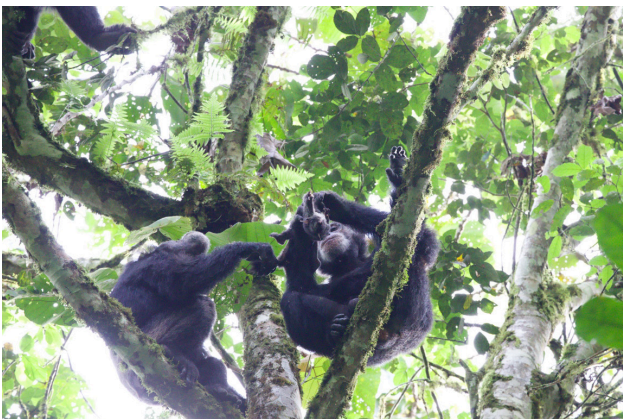


Figure 3. Buru watches Ichiro holding the anomalure. Photo taken by Nahoko Tokuyama.



Figure 5. Goku and Ichiro sitting in the same tree. Ichiro is perched above, holding the skin of the anomalure in his hand, and Goku is below, holding the lower half. Photo taken by Shimei Shirasawa.

successful in obtaining any meat. During this time, Goku occasionally consumed mature leaves plucked from the tree in which he was sitting.

DISCUSSION

To the best of our knowledge, this is the first observed case of chimpanzees hunting and consuming an anomalure in Kalinzu, and the second case of chimpanzees consuming an anomalure. The one previous case was reported from Outamba–Kilimi National Park, Sierra Leone, in which remains of an anomalure were found from the chimpanzee faeces (Alp 1993). Chimpanzees have rarely been reported to prey upon anomalure. This behavior might be attributed in part to the distribution of the rodents, which are not found in some study sites of eastern chimpanzees; for example, Mahale and Gombe. However, according to Kingdon (2014) and Howell *et al.* (2016), at least one species of anomalures inhabits multiple sites at which long-term research on eastern chimpanzees (Kibale, Budongo, Nyungwe), central chimpanzees (Goualougo, Lopé), Nigerian-Cameroon chimpanzees (Ebo) and western chimpanzees (Taï Forest, Bossou, Fungoli, Sapou) has been conducted. Considering that chimpanzees hunt other arboreal rodents, i.e., squirrels (Bugir *et al.* 2021; Watts 2020), and that bonobos at some field sites hunt anomalures (Wamba, Kokolopori, Iyondji, and Lilungu; Ihobe & Sakamaki 2023; Hirata *et al.* 2010), it is worth mentioning that anomalure hunting by chimpanzees has not been reported from these field sites. It is plausible that this lack of sightings may simply reflect the fact that compared with diurnal mammals, chimpanzees rarely encounter nocturnal anomalures. Previous studies have identified the approximate repertoire of animal prey species consumed by chimpanzees, most of which are predominantly diurnal species (Watts 2020). However, considering that bonobos at some field sites actively hunt and consume anomalures (especially in Wamba, where bonobos almost exclusively hunt anomalures), as well as chimpanzees at some field sites have been reported to hunt nocturnal primates regularly (Fungoli: Pruetz 2006; Pruetz *et al.* 2015, Mt. Assirik: McGrew *et al.* 1988; Hunt & McGrew 2002), the nocturnality of anomalures may not be the only reason why chimpanzees rarely recognize them as prey. It is possible that chimpanzees in only a few study sites had opportunities to learn about anomalure as potential prey due to the infrequent encounters with these animals.

Although this is the first time that researchers observed anomalure hunting by chimpanzees in Kalinzu, one of the local assistants at this site has recounted observing chimpanzees eating anomalure many years ago. Whilst feeding on the anomalure, the chimpanzees observed in the present case did not appear to show any evidence of hesitation, curiosity, or play-like behavior, which tends to contrast with the behavior shown chimpanzees and bonobos when capturing an unusual prey item (e.g., Carvalho *et al.* 2010; Yokoyama 2021). Indeed, the patterns of meat-eating and sharing we recorded closely resemble those observed when they consume their more generally eaten prey species, as well as the patterns ob-

served during the consumption of anomalures by bonobos (Hirata *et al.* 2010; Ihobe & Sakamaki 2023; Tokuyama personal observation). We accordingly tend to believe that the hunting of anomalure is long-established feature of this group, although it has probably been overlooked to date on account of its infrequency. Accordingly, obtaining further observations of these rare events may contribute to gaining a more comprehensive understanding of chimpanzee hunting and feeding culture.

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REFERENCES

- Alp R 1993. Meat eating and ant dipping by wild chimpanzees in Sierra Leone. *Primates* **34**(4):463–468. <https://doi.org/10.1007/BF02382656>
- Alp R, Kitchener AC 1993. Carnivory in wild chimpanzees, *Pan troglodytes verus*, in Sierra Leone. *Mammalia* **57**: 273–274. <https://doi.org/10.1515/mamm.1993.57.2.273>
- Bugir CK, Butynski TM, Hayward MW 2021. Prey preferences of the chimpanzee (*Pan troglodytes*). *Ecol Evol* **11**:7138–7146. <https://doi.org/10.1002/ece3.7633>
- Carvalho S, Yamanashi Y, Yamakoshi G, Matsuzawa T 2010. Bird in the hand: Bossou chimpanzees (*Pan troglodytes*) capture West African wood-owls (*Ciccaba woodfordi*) but not to eat. *Pan Afr News* **17**:6–9. <https://doi.org/10.5134/143514>
- Ebang Ella GW, Takenoshita Y, Koumba LBM, Nguet FLM, Iwata Y, Ando C, Mavoungou JF, Abernethy K 2023. Diet composition and feeding ecology of chimpanzees (*Pan troglodytes troglodytes*) in a lowland tropical forest in Moukalaba-Doudou National Park, Gabon. *Afr Stud Monogr* **43**:42–60. <https://doi.org/10.34548/asm.43.42>
- Hirata S, Yamamoto S, Takemoto H, Matsuzawa T 2010. A case report of meat and fruit sharing in a pair of wild bonobos. *Pan Afr News* **17**: 21–23. <https://doi.org/10.5134/143519>
- Howell K, Hutterer R, Ekué M 2016. *Anomalurus derbianus* (errata version published in 2017). In: *The IUCN Red List of Threatened Species 2016* e.T1550A115056429. <https://doi.org/10.2305/IUCN.UK.2016-3.RLTS.T1550A22183081.en>
- Howard P 1991. *Nature conservation in Uganda's tropical forest reserves*. International Union for Conservation of Nature and Gland, Switzerland and Cambridge.
- Hunt KD, McGrew WC 2002. Chimpanzees in the dry habitats of Assirik, Senegal and Semliki Wildlife Reserve, Uganda. In: *Behavioural diversity in chimpanzees and bonobos*. Boesch C, Hohmann G, Marchant L (eds), Cambridge University Press, Cambridge, pp. 35–51. <http://dx.doi.org/10.1017/CBO9780511606397>
- Ihobe H, Sakamaki T 2023. Hunting and meat-eating behaviors of bonobos at Wamba: Comparison with other bonobo study sites. In: *Bonobos and people at Wamba: 50 years*

- of research. Furuichi T, Idani G, Kimura D, Ihobe H, Hashimoto C (eds), Springer, Singapore, pp. 115–132.
https://doi.org/10.1007/978-981-99-4788-1_11
- Kingdon J 2014. *Mammals of Africa: Volume III: Rodents, Hares and Rabbits*. Bloomsbury Publishing, New York.
- Klein H, Bocksberger G, Baas P, Bunel S, Théleste E, Pika S, Deschner T 2021. Hunting of mammals by central chimpanzees (*Pan troglodytes troglodytes*) in the Loango National Park, Gabon. *Primates* **62**: 267–278.
<https://doi.org/10.1007/s10329-020-00885-4>
- McGrew WC, Baldwin PJ, Tutin CEG 1988. Diet of wild chimpanzees (*Pan troglodytes verus*) at Mt. Assirik, Senegal: I. Composition. *Am J Primatol* **16**: 213–226.
<https://doi.org/10.1002/ajp.1350160304>
- Pruetz JD 2006. Feeding ecology of savanna chimpanzees (*Pan troglodytes verus*) at Fongoli, Senegal. In: *Feeding Ecology in Apes and Other Primates*. Hohmann G, Robbins MM, Boesch C (eds), Cambridge University Press, Cambridge, pp. 161–183.
- Pruetz JD, Bertolani P, Ontl KB, Lindshield S, Shelley M, Wessling EG 2015. New evidence on the tool-assisted hunting exhibited by chimpanzees (*Pan troglodytes verus*) in a savannah habitat at Fongoli, Sénégal. *R Soc Open Sci* **2**: 140507.
<http://doi.org/10.1098/rsos.140507>
- Uehara S, Ihobe H 1998. Distribution and abundance of diurnal mammals, especially monkeys, at Kasoje, Mahale Mountains, Tanzania. *Anthropol Sci* **106**: 349–369.
<https://doi.org/10.1537/ase.106.349>
- Watts DP 2020. Meat eating by nonhuman primates: A review and synthesis. *J Hum Evol* **149**: 102882.
<https://doi.org/10.1016/j.jhevol.2020.102882>
- Wrangham RW, van Zinnicq Bergmann Riss E 1990. Rates of predation on mammals by Gombe chimpanzees, 1972–1975. *Primates* **31**: 157–170.
<https://doi.org/10.1007/BF02380938>
- Yokoyama T 2021. Non-lethal handling of a captured duiker by a bonobo (*Pan paniscus*) at Wamba: implications for prey image in bonobos. *Pan Afr News* **28**: 5–7.
<https://doi.org/10.5134/265353>

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