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A New Report of Chimpanzee Ant-fishing from the Issa Valley, Tanzania

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Abstract: Tool use in chimpanzees (*Pan troglodytes*) is widespread across their geographical distribution, having been documented in all populations studied to date. Ant-fishing, specifically, is less frequently observed, reported so far in only ten different communities. We describe the first observations of ant-fishing of *Camponotus chrysurus* by chimpanzees living in the mosaic landscape of the Issa Valley, western Tanzania. After two separate bouts, both occurring in the same position in a fig tree (*Ficus lutea vahl*), we recovered five ant-fishing tools made from the liana *Dichapetalum crassifolium chodat*. Tool types closely resemble those described for earlier reports of the same behavior in near-by Mahale Mountains chimpanzees, and thus may have implications for cultural diffusion of the habit across populations.

Key words: Chimpanzee, *Camponotus*, ant-fishing, insectivory, Issa Valley

INTRODUCTION

Tool use in chimpanzees (*Pan troglodytes*) is widespread across their geographical distribution, having been documented in all populations that have been thoroughly studied to date (McGrew 2010). The type, function, and prevalence in tool use behaviors differ widely, however, suggesting that an interplay between culture, where the behavior is transmitted repeatedly through social or observational learning to become a community-level-characteristic, and the environment explains such variation (McGrew 1992; Whiten *et al.* 1999; Koops *et al.* 2013; Sanz *et al.* 2014). Chimpanzees exhibit a rich repertoire of tool-use behaviors, used most often to improve or gain access to a variety of foods including termites, bees and honeycomb, nuts, and ants (McGrew 1992). Chimpanzees of the Issa Valley are known to manufacture and use tools made from plants to fish for termites and to access plant underground storage organs (Hernandez-Aguilar *et al.* 2007; Stewart & Piel 2014).

Probably because of the lower mass intake rate of ant-fishing (chimpanzee predation of carpenter ants through the use of tools – *Camponotus* spp.), compared to that of ant-dipping for *Dorylus* ants (with a higher mass intake rate) and termite fishing, carpenter ants (*Camponotus* spp.) are not as commonly consumed by chimpanzees as are other invertebrates (O'Malley & Power 2014). Compared to the 21 communities of chimpanzees where termite fishing has been described, ant-fishing has been described in only 10 different communities (Table 1; Figure 1). This is surprising given that *Camponotus* has the most ecologically diverse geographical range, and the broadest distribution of

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Table 1. Presence or absence and type of insectivory in communities with reports of chimpanzee tool use for gathering insects or their products: +/+ present/eaten; +/− present/not eaten; +/+?, present/probably eaten; ? unknown; H consumed with hands; T consumed with tools; H? probably consumed with hands; T? probably consumed with tools. Spaces were left blank for those sites where we failed to find any report of prey's presence/absence or its consumption. Species targeted are provided when known. Note: We incorporate the Sonso, Busingiro and Kasongoire communities to the table (even though they are not known to manufacture tools for gathering insects) to address the local variability in *Pan* foraging for this region.

Country	Name of Community	Stingless Bees (*Meliponini*)	Honey Bees (*Apis mellifera*)	Termites (*Macrotermes*)	*Dorylus* ants	*Camponotus* ants	References
1. Cameroon	Campo			+/+/T *Macrotermes lilljeborgi; M. vitrialatus*			Muroyama 1991
2. Cameroon	Dja Biosphere Reserve, La Belgique	+/+/T	+/-	+/+/T *M. lilljeborgi; M. muelleri; M. nobilis*	+/+/H	+/+/H	Deblauwe *et al.* 2006; Deblauwe & Janssens 2008
3. Cameroon	Ntale				+/+/T		Ingmanson 1997
4. Central African Republic	Bai Hokou	+/+/T *Trigona gribodoi; Trigona (Meliplebia) beccardi*	+/+/T	+/+/T	?	?	Fay & Carroll 1994
5. Central African Republic	Ndakan	+/+/T *Trigona (Hypotrigona) gribodoi Mag*	+/+/T	+/+/T	?	?	Fay & Carroll 1994
6. Central African Republic	Ngotto	+/+/T	+/+/T	+?/-	+/+/T		Hicks *et al.* 2005; Hicks 2010
7. Congo Republic	Goualougo	+/+/T *Hypotrigona gribodoi; Meliponula nebulata*	+/+/T	+/+/T *M. lilljeborgi; M. muelleri; M. nobilis*	+/+/T		Sanz & Morgan 2007, 20013; Sanz *et al.* 2014
8. Congo Republic	Lossi	+/+/T		+/+/T			Bermejo & Illera 1999

Table 1. Presence or absence and type of insectivory in communities with reports of chimpanzee tool use for gathering insects or their products (continued.)

Country	Name of Community	Stingless Bees (*Meliponini*)	Honey Bees (*Apis mellifera*)	Termites (*Macrotermes*)	*Dorylus* ants	*Camponotus* ants	References
9. Congo Republic	Ndoki			+/+/T Macrotermes muelleri	+/+/H?		Suzuki *et al.* 1995; Kuroda *et al.* 1996
10. Congo Republic	Ndoumbi	+/+/T		+/+/T			Bermejo & Illera 1999
11. Côte d'Ivoire	Taï	+/+/T	+/+/T	+/+/H	+/+/T *D. nigricans; D. gerstaeckeri*	+/+/T	Boesch & Boesch 1990
12. DR Congo	Bili-Gagu Forest	+/+/T	+/-?	+/-	+/+/T *D. terrificus; D. wilverthi* (both consumed with long tools); *D. kohli* (consumed with thin wand); *D. opacus*	+/-	Hicks *et al.*, unpublished data; Hicks, C. pers. comm.
13. DR Congo	Bili-Uele Southern Forests (Leguga / Bambesa / Aketi)	+ (no evidence of consumption)	+/-?	+/-	+/+/T D. terrificus; D. wilverthi (both consumed with short tools)	+?/-	Hicks *et al.* unpublished data; Hicks, C. pers. comm.
14. DR. Congo	Kahuzi-Biega	+/+/T	+/+/H?	+/-	+/+/H?		Yamagiwa *et al.* 1988; Yamagiwa & Basabose 2009
15. Equatorial Guinea	Mboete			+/+/T			Takemoto *et al.* 2005
16. Equatorial Guinea	Okorobiko			+/+/T *M. lilljeborgi; M. muelleri*			Sabater Pi 1974; McGrew *et al.* 1979

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Country	Name of Community	Stingless Bees (*Meliponini*)	Honey Bees (*Apis mellifera*)	Termites (*Macrotermes*)	*Dorylus* ants	*Camponotus* ants	References
17. Gabon	Belinga			+/+/T *M. ?nobilis*			McGrew & Rogers 1983
18. Gabon	Loango	+/+/T *Meliponula bocandei; Meliplebeia nebulata; Meliponula lendliana; Meliponula lendiana*	+/+/T	+/-			Boesch *et al.* 2009
19. Gabon	Lope	+/+/T *Trigona, Meliponula*	+/+/T	+/-	+/-	+/+/T *C. brutus*	McGrew 1992; Tutin & Fernandez 1992; Tutin *et al* 1995
20. Gabon	Moukalaba-Doudou	+/+/T *Meliponula*		+/+?/T?			Nishimura *et al.* 2003; Wilfried & Yamagiwa 2014
21. Guinea	Bossou	+/+/T	+/-	+/+/T M. bellicosus	+/+/T *D. kohli; D. lamottei; D. militaris; D. nigricans*	+/+/T *C. brutus*	Sugiyama 1995; Humle 1999; Humle & Matsuzawa 2002; Yamamoto *et al.* 2008; Sanz *et al.* 2009
22. Guinea	Seringbara, Nimba Mountains	+/-	+/-	+/-	+/+/T *D. emeryi; D. nigricans; D. mayri; D. burmeisteri; D. gribodoi*		Koops *et al.* 2013; Koops *et al.* 2015a

Table 1. Presence or absence and type of insectivory in communities with reports of chimpanzee tool use for gathering insects or their products (continued.)

Country	Name of Community	Stingless Bees (*Meliponini*)	Honey Bees (*Apis mellifera*)	Termites (*Macrotermes*)	*Dorylus* ants	*Camponotus* ants	References
23. Nigeria	Gashaka-Gumti	+/+/T *Hypotrigona gribodoi; Meliponula erythra*	+/+/T	+/- *M. bellicosus*	+/+/T *D. rubellus*	+/+/T *C. crhysurus*	Fowler & Sommer 2007; Pascual-Garrido *et al.* 2013
24. Nigeria	Ngel Nyaki	+/+/T *Hypotrigona gribodoi; Meliponula erythra*	+/+	+/-	+/+/T	+/+/T *C. nr. perrisi*	Dutton 2012; Dutton & Chapman 2015a, 2015b
25. Rwanda	Nyungwe		+/+/T				Easton 2010
26. Senegal	Fongoli		+/+/H?	+/+/T *M. subhyalinus; M. bellicosus*	+/+/T *D. anomma* +/+/? *D. burmeisteri*		McGrew *et al.* 2005; Bogart & Pruetz 2008, 2011
27. Senegal	Mt. Assirik		+/+/T	+/+/T *M. subhyalinus*	+/+/T *D. nigricans*	+/+/T	McGrew *et al.* 1988; McBeath & McGrew 1992; McGrew 1992
28. Sierra Leone	Tenkere-Outamba-Kilimi				+/+/T *D. nigricans*		Alp 1993
29. Tanzania	Gombe (Kasekela)	+/+/H *Trigona; Hypotrigona* (use of tools seen rarely; O'Malley, R., pers. comm)	+/+/H (use of tools seen rarely; O'Malley, R., pers. comm.)	+/+/T *M. subhyalinus; Pseudacanthotermes* spp. (only alates of this species eaten with hands)	+/+/T *D. molestus; D. kohli*	+/+/T *C. chrysurus; C. vividus; C.* sp. 1	McGrew 1974; Goodall 1986; Schoning *et al.* 2008; O'Malley *et al.* 2012; O'Malley & Power 2014; O'Malley, R., pers. comm.

Table 1. Presence or absence and type of insectivory in communities with reports of chimpanzee tool use for gathering insects or their products (continued.)

Country	Name of Community	Stingless Bees (*Meliponini*)	Honey Bees (*Apis mellifera*)	Termites (*Macrotermes*)	*Dorylus* ants	*Camponotus* ants	References
30. Tanzania	Gombe (Mitumba)	+/+/H *Trigona?; Hypotrigona?* (use of tools only rarely to widen entrance of nest, Mjungu, D. pers. comm.)	+/+/H (use of tools only rarely to widen entrance of nest, Mjungu, D. pers. comm.)	+/+/T *M. subhyalinus; Pseudacantho-termes* spp. (only alates of this species are eaten with hands)	+/+/T *D. molestus; D. kohli*	+/+/T *C. chrysurus; C. vividus* (maybe); *C. brutus*	Schoning et al. 2008; O'Malley 2011; O'Malley & Power 2014; Mjunju, D., pers. comm.; O'Malley, R. pers. comm.
31. Tanzania	Issa	+/-	+/-	+/+T	+/-	Current study	Stewart & Piel 2014
32. Tanzania	Kasakati	+/+/T *Trigona*	+/?	+/+/T	?	+/+/?	Izawa & Itani 1966; Suzuki 1966
33. Tanzania	Mahale (B-Group)	?	+/-	+/+/T *M. ?herus*	+/-	?	Uehara 1982; McGrew & Collins 1985
34. Tanzania	Mahale (K-Group; extinct)	+/+/T *Trigona*	+/+/?	+/+/T *Pseudacanthotermes spiniger* (tools were rarely used; alates were eaten with hands)	+/- *D. molestus*	+/+/T *C. vividus; C. maculatus; C. brutus; C.*. sp.	Nishida & Hiraiwa 1982; Uehara 1982; Nishida & Uehara 1983; Schoning *et al.* 2008; Sanz *et al.* 2009; Kiyono 2015; Nakamura, M., pers. comm.
35. Tanzania	Mahale (M-Group)	+/+/T *Trigona*	+/+/?	+/+/T *Pseudacanthotermes spiniger* (tools are rarely used, alates are eaten with hands)	+/- *D. molestus*	+/+/T *C. chrysurus; C. brutus*	Nishida & Uehara 1983; McGrew & Collins 1985; Schoning *et al.* 2008; Nishie 2011; Kiyono 2015; Nakamura, M., pers. comm.

Table 1. Presence or absence and type of insectivory in communities with reports of chimpanzee tool use for gathering insects or their products (continued.)

Country	Name of Community	Stingless Bees (*Meliponini*)	Honey Bees (*Apis mellifera*)	Termites (*Macrotermes*)	*Dorylus* ants	*Camponotus* ants	References
36. Uganda	Budongo (Busingiro)	+/?	+/?	+/?	+/?	+/+/H (one single observation reported)	Newton-Fisher 1999; Reynolds, V., pers. comm.
37. Uganda	Budongo (Kasokwa)	+/-	+/+/T? (use of tools primarily for acquiring honey)	+/H	+/-	?	Wallis, J., pers. comm.
38. Uganda	Budongo (Kasongoire)					+/+?/H (one possible observation reported)	Oxley, A., pers. comm.
39. Uganda	Budongo (Sonso)	+/+/H	+/-	+/+/H *Macrotermes* (present only in clearings, rarely eaten) +/+?/H (*Pseudocanthotermes spiniger* rarely seen)	+/-	+/-	Hedges & McGrew 2012
40. Uganda	Budongo (Waibira)	+/-	+/-	+/?	+/+/T	+/-	Mugisha *et al.*, in press; Hobatier, C., pers. comm.
41. Uganda	Bulindi	+/+/T *Meliponula lendliana*	+/+/H	+/+/H *Macrotermes* and *Pseudocanthotermes* (alates eaten only)	+/+/H *D. wilverthi* (rare)	+/+/H *C. vividus* (*C. brutus* found once in dung)	McLennan 2011; 2014

Table 1. Presence or absence and type of insectivory in communities with reports of chimpanzee tool use for gathering insects or their products (continued.)

Country	Name of Community	Stingless Bees (*Meliponini*)	Honey Bees (*Apis mellifera*)	Termites (*Macrotermes*)	*Dorylus* ants	*Camponotus* ants	References
42. Uganda	Bwindi	+/+/T *Meliponula bocandei, M. nebulata; M. ferruginea; M. lendliana*	+/+/T		+/+/H		Stanford *et al.* 2000; Stanford & Nkurununngi 2003; Kajobe & Roubik 2006
43. Uganda	Kalinzu (M-Group)			=	+/+/T *D. terrificus; D. wilverthi*		Koops *et al.* 2015b
44. Uganda	Kalinzu (S-Group)			-	+/+/T *D. terrificus; D. wilverthi*		Koops *et al.* 2015b
45. Uganda	Kibale (Kanyawara)	+/+/T		+/-	+/-	+/-	Wrangham *et al.* 1991; Schoning *et al.* 2008; Sanz *et al.* 2009; Potts *et al.* 2011; Nelson 2013
46. Uganda	Kibale (Ngogo)	+/+/T*		+/+/H	+/-	+/-	Watts 2008; McLennan 2014; *Bee taxa were not listed in the reports of tool use by Watts (2008) but this site is located 10km from Kanyawara
47. Uganda	Toro-Semliki	+/+/T	+/+/T	+/-	+/-	+/-	Webster *et al.* 2014

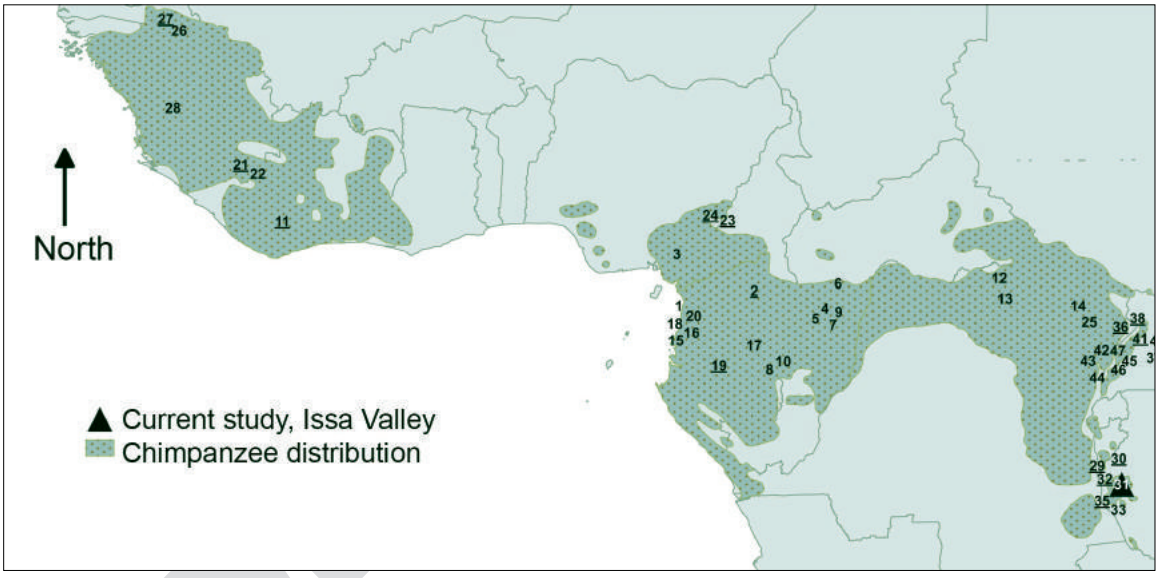

Figure 1. Map of reported tool-use for insectivory by chimpanzees. Those communities with *Camponotus* consumption are underlined. The Issa Valley study area is denoted with a triangle.

all ant genera across Africa (Wilson 1975; Nishida & Hiraiwa 1982; McGrew 1992). Their colonies of hundreds to thousands of soldier and worker ants are commonly found in nests made in the trunks of trees, dry branches, or hollow grass stems from dispersed-open to dense-tropical forests (Nishida & Hiraiwa 1982). Direct observations of chimpanzees preying on *Camponotus* have been described from Gashaka-Gumti National Park, Nigeria (Fowler & Sommer 2007), Bossou, Guinea (Yamamoto *et al.* 2008), Lope Reserve, Gabon (Tutin & Fernandez 1992), Mahale, Tanzania (Nishida & Hiraiwa 1982; Nishie 2011) and Gombe, Tanzania (O'Malley *et al.* 2012), while at Mt. Assirik (Senegal), also a dry, open, mosaic habitat such as Issa, McGrew (1992) inferred their consumption from tool remains at a disturbed ant colony. Other sites where consumption has been inferred from tools left abandoned at targeted nests include Ngel Nyaki (Nigeria) and Taï National Park (Ivory Coast) (Boesch & Boesch 1990; Dutton 2012).

Similar to how researchers document chimpanzee ant-dipping, researchers have noted the various techniques that chimpanzees employ when fishing for carpenter ants, the reduction processes involved during tool manufacture, as well as the diverse types of raw material used (Nishida & Hiraiwa 1982). Tool structure is not only important for efficiency, but also for avoiding the aggressive biting defenses of carpenter ants, which appear to discourage chimpanzees from predation (Nishida & Hiraiwa 1982). Even within consumption of a single prey species, chimpanzees may manufacture tools from various plant parts and exhibit multiple extraction techniques (Nishida & Hiraiwa 1982). For example, in the Mahale Mountains National Park, Tanzania, Nishida (1973) discussed three different types of techniques (wiping handkerchief, expelling stick, and poking rod) in his description of how chimpanzees consumed *Camponotus* ants (see also Nishie 2011), as well as twenty-two different species of plants used as raw material and six different types of tools according to the physical characteristics and technique used for each tool (Nishida & Hiraiwa 1982). At Gombe, only 150 km north of Mahale, decades of intense research initially resulted in the acceptance that *Camponotus* was never consumed (Nishida & Hiraiwa 1982), followed by the possibility of their consumption (Goodall 1986), and more recently, a detailed analysis of the dissemination of the behavior across numerous members of the Kasekela community (O'Malley *et al.* 2012). About halfway between Gombe and Mahale, in Kasakati, Suzuki (1966) reported *Camponotus* consumption through analysis of chimpanzee fecal remains, but ant-fishing was never confirmed with behavioral observations or through the indirect evidence of tools.

Here we report on the first direct observations of ant-fishing of *Camponotus* by chimpanzees in the Issa Valley, adding this type of tool use to the repertoire of tool using behavior for this community and describing a third occurrence of the behavior in western Tanzania.

METHODS

Study Site

The Issa Valley is located about 100km east of Lake Tanganyika, almost halfway between Gombe and Mahale Mountains National Parks (Figure 2). The region is one of the driest, most open and seasonally extreme habitats in which chimpanzees live (Moore 1992), with the landscape characterized by miombo woodland (dominated by *Brachystegia* and *Julbernardia*), interspersed with grasslands, swamps and steep gallery forest ravines (Piel *et al.* 2015). Annual temperature and precipitation ranges from 11° to 35°C, and 900-1400mm, respectively.

The Ugalla Primate Project established a permanent research presence at Issa in 2008, but shorter-term (temporary) studies have occurred in the area since 2001. As of May 2016, the Issa community was partially habituated: fourteen chimpanzees were individually identifiable and the community size was estimated to be at least 67 individuals based on genetic analyses, with a minimum estimated home range of 85km^2 (Rudicell *et al.* 2011).

Data Collection

Research teams consisting of two people searched for chimpanzees on a near-daily basis. Usually, we relied on known feeding trees, preferred nesting sites, and dawn vocalizations to locate chimpanzee parties. When we encountered chimpanzees, we recorded data on party size, location, habitat, demography, and behavior. For the current observations, chimpanzees were found in a tree that was already being monitored because its fruit had recently ripened and we had observed chimpanzees feeding there for several days. All research complied with protocols approved by the Tanzania Wildlife Research Institute and adhered to the legal requirements of Tanzania and the American Society of Primatologists Principles for the Ethical Treatment of Non-Human Primates.

RESULTS

Observation

On July 2, 2015, researchers encountered five chimpanzees feeding in a *Ficus lutea vahl* tree in the core study area. At 09:15, EW and field assistant MR observed one young adult female perched on a tree with a vine for balance 19 meters above the ground, using a tool with her right hand to fish ants from the crux of the tree, before the four others later joined her. Only an estrous female then fished as well, while the other three chimpanzees remained close by, including two adult males and one adult female. We observed them directly consuming ants directly by their mouths or by using their hands, sweeping them across the surface of the tree. After a few minutes, the young female reached down and broke off a piece from a liana, before inserting it into a tree-hole (Figure 3; see supplementary video[1]). She repeated this process multiple times, making numerous new tools, using them briefly, and then changing tools until approximately 11:30 when she left the tree, after over two hours of fishing. Given our obscured visibility of the ant-fishers, details of the manufacturing process, technique used and whether the new tools were taken from the same liana, or a stem or branch could not be seen.

In a second observation on July 8, 2015, AVC observed an adult female (possibly the same as previously observed) ant-fishing. On this occasion the individual was alone, fishing in the same location of the same tree, and also fishing with her right hand. Fishing occurred between 10:00 and 11:00, lasting almost one hour. Despite visiting the tree on subsequent days, we observed no further fishing bouts.

Subsequent tool collection and botanical identification revealed all tools to be manufactured from *Dichapetalum crassifolium chodat* (Table 2) and the host tree of the ant colony to be *Ficus lutea vahl*. Tool types (Figure 4) most closely resembled Type B, described in Nishida and Hiraiwa (1982) as a tool made from the bark fiber of a liana, peeled off and often divided into thin strips used for small nest entrances. One other tool that we recovered suggested a similarity to Type BBr - made of a branch of a liana that has had its bark partially or completely removed, to facilitate it fitting into a small ant hole, and with its distal end showing evidence of wear with a slightly split end. Two additional plant remains were also collected from the same area that may have been tool fragments that had detached from the tool during the course of its use or manufacture. However, their small size makes validity or tool type classification unreliable, although they seem to be of similar age based on color and condition (Figure 4).

DISCUSSION

Whereas tool use for insectivory is nearly pervasive across chimpanzee communities, ant-

[1] Supplementary video may be viewed at: https://youtu.be/ejGiYbEljrs.

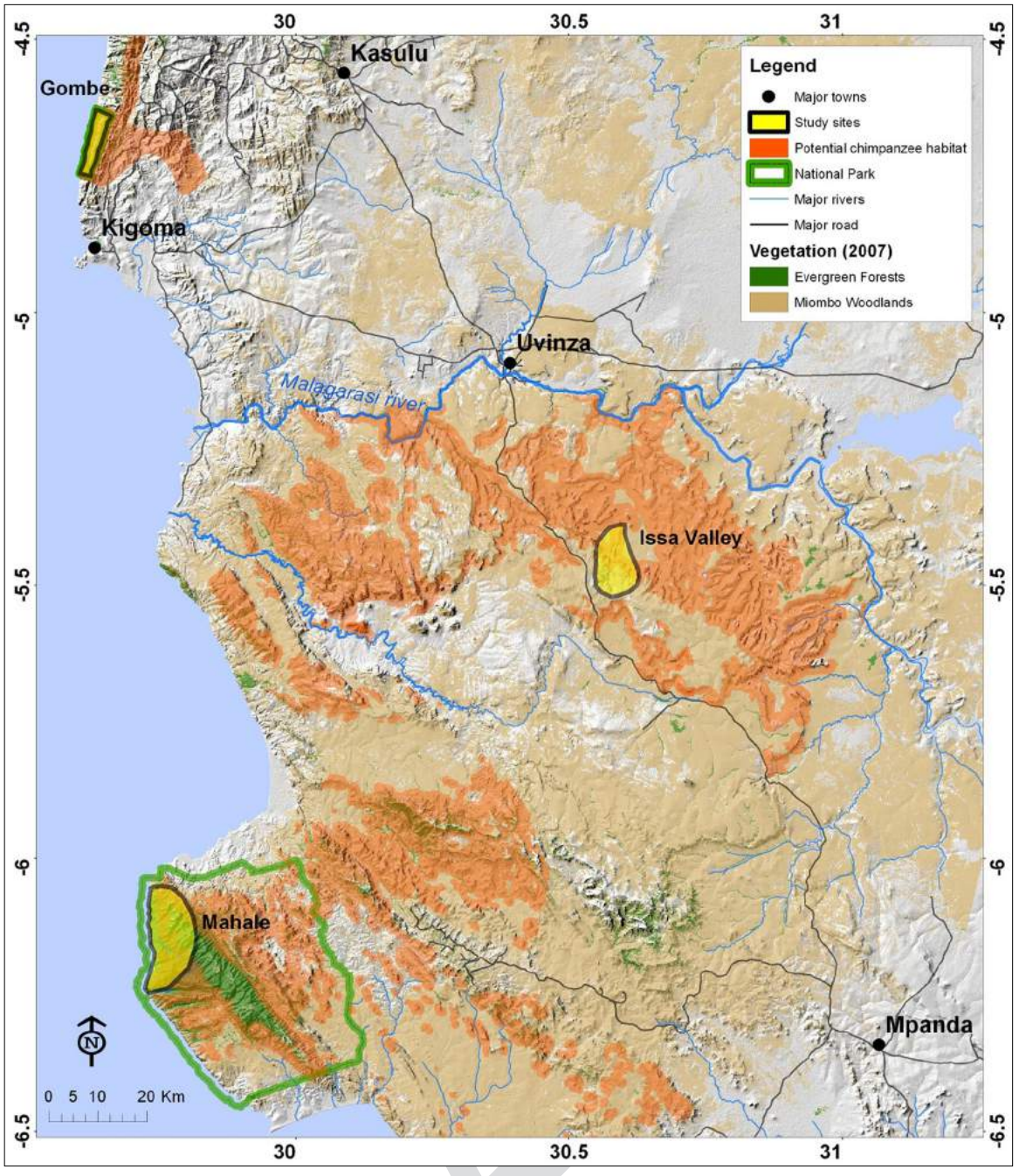

Figure 2. Map of western Tanzania with the Issa study site highlighted in the center. The two closest study sites where ant-fishing has also been recorded, Gombe and Mahale National Park, to the north and south, respectively, are also highlighted. Vegetation, river and roads that may act as barriers between these populations and could influence cultural transmission are indicated.

fishing has been reported in only 10 communities (Figure 1), surprising given the widespread distribution of *Camponotus* across Africa (although possibly under-represented due to the elusiveness of the tools [Bolton 1995]). We have now added to this list with two observations of ant-fishing of *Camponotus chrysurus* in the Issa chimpanzees of western Tanzania, making it the third description for the region. Given the previous reports of this behavior, where chimpanzees were preying on the same species of arboreal ants at nearby Mahale (Nishida & Hiraiwa 1982; Nishie 2011) and further

Table 2. Dimensions and types of tools found at site of fishing. Type B = strip of bark removed from a liana; Type BBr = branch of liana with some or all bark removed.

Tool number	Length (mm)	Width (mm)	Material	Match to Nishida and Hiraiwa (Nishida & Hiraiwa 1982)
1	214	< 1	*Dichapetalum crassifolium chodat*	Type B[a]
2	109.48	< 1	*D. c. chodat*	Type B
3	88.34	1.48	*D. c. chodat*	Type BBr[b]
4	97.78	1.38	*D. c. chodat*	Type B
5	99.80	1.82	*D. c. chodat*	Type B

Types are taken from Nishida and Hiraiwa's (1982) descriptions of the variations of ant-fishing tools made by chimpanzees.

[a] Type B = a tool made from the bark fiber of a liana, pealed off and divided into thin strips used for small nest entrances.

[b] Type BBr = a tool made of a branch that has had its bark partially or completely removed to facilitate it fitting an ant hole.

Figure 3. Picture of *Camponotus chrysurus* and the area where ants were observed on the *Ficus* tree where fishing occurred. Photograph by A. van Casteren.

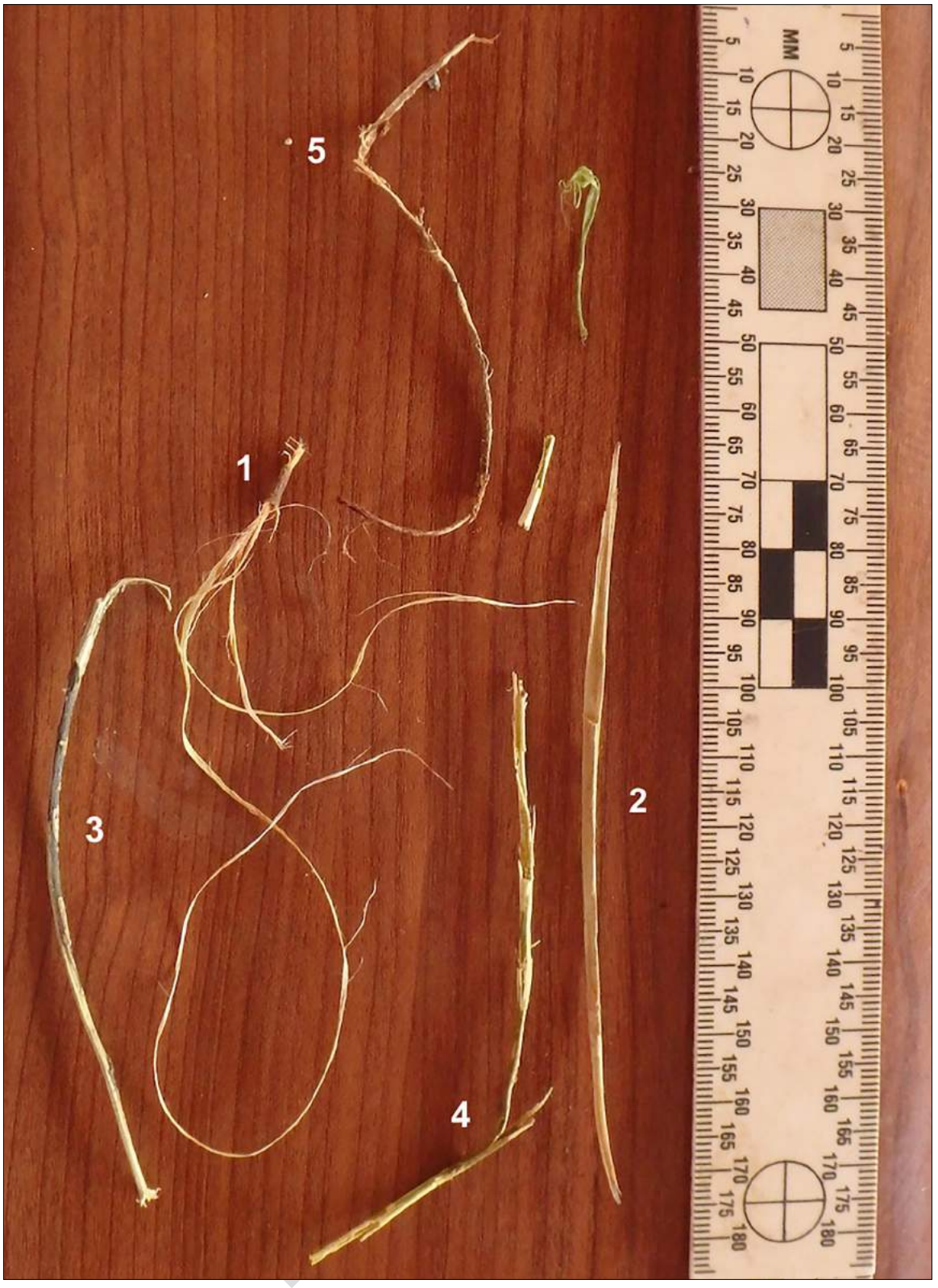

Figure 4. All five tools made from the bark of *Dichapetalum crassifolium chodat*, and additional fragments that we collected from the fork of the *Ficus* tree where ant-fishing was observed. Photograph by E. Wondra.

north, Gombe (O'Malley *et al.* 2012), this could be a case of diffusion of the habit, where the behavior spread from one or both of the other study sites east to Issa, by social learning (Whiten *et al.* 2001, 2007; McGrew 2004). However, an independent invention in similar ecological contexts cannot be ruled out: ant-fishing has been recognized as habitual in chimpanzees from the Mitumba community living in the northern parts of Gombe for decades, while remaining absent from neighboring Kasekela community. It was only relatively recent that ant-fishing became a customary behavior in Kasekela, practiced exclusively by younger individuals and immigrant females (O'Malley *et al.* 2012). This suggests that a possibility of ant-fishing traditions, even if having a common origin, going extinct and subsequently becoming re-established might exist. Only further observations of the behavior will allow for more detailed comparisons of tools and extraction techniques between communities.

Regardless of whether techniques overlap across communities, *Ficus* appears not to be a commonly used tool source anywhere. In his summary analysis of over a half-century of *Camponotus* fishing in Mahale, Nishie (2011) described chimpanzee use of 92 different trees to ant fish representing 24 different tree species, of which only one was *Ficus* (*exasperata*). Also at Gombe, O'Malley *et al.* (2012) reported eighteen different observations that occurred over two years in seven different tree species (three sources were unidentified) and again, only one was *Ficus* sp. Continued monitoring at Issa will reveal whether a similar pattern holds.

At Issa, fruit availability peaks in the late dry season when *Parinari curatellifolia* and *Strychnos* spp. comprise a large proportion of chimpanzee diet (Piel *et al.* unpublished data), whereas termite fishing is most frequent at the onset of the rains, in October-November (Stewart & Piel 2014). O'Malley *et al.* (2012) do not discuss seasonal differences of ant-fishing at Gombe, and Nishida's (2011) data suggest a bimodal distribution, of peak fishing in the late dry (August-September) and mid wet (December-January) seasons, when 62/99 (62.6%) sessions were observed. It is worth noting that these observed encounters do not control for search effort, which may bias the results. At Issa, we do not yet have sufficient data to assess seasonal patterns, but we predict that consumption rate will be similar to Mahale, given the proximity to Issa and ecological similarity between the two areas (Collins & McGrew 1988). The chimpanzees at Issa will have to be carefully monitored to collect these data and details of any future ant-fishing events to conduct a more thorough comparative study. More information on the abundance of carpenter ants in Issa, their range in habitat and altitude will be essential to addressing this. This is both a rare and important occasion to document and pursue for it may help to increase our understanding of tool use, cultural transmission and insect foraging in chimpanzees, which is a viable approach to anthropology and cultural evolution (McGrew 2004, O'Malley & Power 2014).

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