**Supplementary Materials**

**Supplementary Material 1.** Dates and geographical locations of northern DRC transects, recce walks, composition of survey teams, number of survey days in each forest region, km of recces, and chimpanzee nest encounter rates.

We measured daily recce routes from waypoint to waypoint. We did not include return trips along the same route made on the same day in this measure. R = recces, T = line transects, R & T = recces and line transects.

Survey leaders: TH = Thurston Hicks, JS = Jeroen Swinkels, LD = Laura Darby, PK = Polycarpe Kisangola, OE = Olivier Esokeli, SK = Seba Koya, EM= Ephrem Mpaka, GP = Gilbert Paluku, HS = Henri Silegowa, BB = Bebe Bofenda

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Region | Location and survey types | GPS coordinates of camp | Surveyor(s) and survey period | Total km walked |
| North Uele | 1. Camp LouisR & T | 4°21.72’N, 24°56.72’E | TH: Aug 2004 – July 2005  TH, JS: Aug 2006 – Feb 2007  TH, GP, EM: Aug 2012 - March 2013  R: 1316.1 km; T: (TH): 99 km (2005) & 15.5 km (2012) = 114.5 km | 1430.6 |
|  | 2. Gangu NorthR & T | 4°19.34’N, 24°41.53’E | TH: March -July 2005  TH, JS: Aug 2006 – Feb 2007  TH, GP, EM: Aug 2012-March 2013  R: 762 km; T: 41 (2005) & 10.5 (2012) = 51.5 km | 813.5 |
|  | 3. Gangu South R &T | 4°17.06’N, 24°35.19’E | TH, JS: March – Feb 2007; TH, GP, EM: Aug 2012-March 2013  R: 115.9; T: (2005) 20 km | 135.9 |
|  | 4. Dume R & T | 4°24.89’N, 25°02.34’E | HS (Aug-Sept 2012)  R: 66.6 km; T: 27 km | 93.6 |
| 5. Zapay R | 4°57.01’N, 25°06.31’E | TH: Dec 2006 | 49.9 |
| 6. Gbangadi R | 4°43.40’N, 24°46.60’E | JS: Dec 2006 | 31.7 |
|  | 7. Bili South R | 4°02.42’N, 25°02.11’E | TH, JS: July–Nov2006 | 205 |
|  | 8. Nawege¹ & Zaza² R | 3°37.14’N, 25°22.55’E¹  3°28.11’N, 25°10.73’E² | TH, JS: Sept 2006 (Nawege),  Aug 2008 (Zaza) | 21.7 |
|  | 9. Bambillo R & T | 3°50.08’N, 24°38.74’E | BB: Oct 2012  R: 58.2; T: 18 km | 76.2 |
|  | **All North Uele forests** |  | 2004-2013 | 2858.1 |
|  | 10. Lebo R | 3°24.43’N, 25°20.65’E | TH, JS: Sept 06, Aug 08 | 41.3 |
| South Uele | 11. LingoR | 3°24.83’N, 23°30.11’E | TH: Nov 2008 | 38.5 |
|  | 12.Zongia R | 3°35.06’N, 23°45.75’E | TH: Nov 2008 | 35.7 |
|  | 13.Mbange East R | 3°13.73’N, 24°10.25’E | TH: Jan- 2008 | 80.9 |
|  | 14.Mbange West R | 3°09.30’N, 24°02.88’E | TH: Jan Feb 2008 | 45.5 |
|  | 15.Leguga R | 3°21.38’N, 24°57.84’E | TH: March 2008 | 48.5 |
|  | 16.Bambesa R | 3°13.70’N, 25°51.16’E | TH: April-May 2008 | 65 |
|  | 17.Akuma¹-Yoko² R | 2°29.36’N, 23°56.93’E¹2°36.43’N, 23°34.98’E² | TH: June 2008 (Akuma),  Nov 2008 (Yoko) | 22.4 |
|  | 18.Buta R | 2°48.82’N, 24°44.69’E | TH: Sept 2008 | 25.6 |
|  | 19.Ngume R | 2°45.83’N, 25°20.15’E | TH: Sept –Oct 2008 | 37.5 |
|  | **S Uele forests total** | - | 2006-2009 | 440.9 |
|  | **Total S and N Uele** | - | 2004-2013 | 3299 |
| South Uele | Rubi-Tele  *R & T* | 2°27.32’N,  25°05.90’E | 2014-2016 Pan-Africa  R: ~1000 km; T: 66 km | 1066 |

Notes: TH visited the Gangu Forest for two weeks in 2016. We did not walk any recces or transects, but we did opportunistically document two tool sites at one location.

Supplementary Material 2A. Ants found in chimpanzee fecal samples and encountered on forest walks, Gangu North Forest 2012-2013.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample ID | Date | Sample type | Ant type | Genus | Species |
| Gangu\_ant 1 | 24/10/12 | Fecal | Intermediate | *Dorylus* | *opacus* |
|  | 24/10/12 | Fecal | Weaver ant | *Oecophylla* | *longinoda* |
| Gangu\_ant 2 | 13/11/12 | Fecal | Intermediate | *Dorylus* | *opacus* |
| Gangu\_ant 3 | NR | Fecal | Intermediate | *Dorylus* | *opacus* |
| Gangu\_ant 4 | 10-11/12 | Fecal | Epigaeic | *Dorylus* | *wilverthi* |
|  | 10-11/12 | Fecal | Intermediate | *Dorylus* | *opacus* |
|  | 10-11/12 | Fecal | Beetle¹ | - | - |
| Gangu\_ant 5 | NR | Fecal | Intermediate | *Dorylus* | *kohli* complex |
| Gangu\_ant 6 | 22/10/12 | Colonies | Epigaeic | *Dorylus* | *terrificus* |
| Gangu\_ant 7 | NR | Fecal | Epigaeic | *Dorylus* | *terrificus* |
| Gangu\_ant 8 | 24/10/12 | Fecal | Epigaeic | *Dorylus* | *terrificus* |
| Gangu\_ant 9 | 03/13 | Colonies | Epigaeic | *Dorylus* | *terrificus* |
| Gangu\_ant 10 | 03/13 | Colonies | Intermediate | *Dorylus* | *opacus* |

¹ The beetle possibly contaminated the sample after it was deposited.

Note: Three dung samples were without recorded dates: one we found on October 6; the others between October and November 2012.

Supplementary Material 2B. Insects and other faunal remains found in dung washes, Rubi-Tele 2015 (N=73 fecal washes). Two reported ant samples were not available for identification.

|  |  |  |  |
| --- | --- | --- | --- |
| Insect / faunal types (identified by C. Schöning) | No. samples with this resource | % samples with this resource | Notes |
| Driver ants (epig. *Dorylus*) | 3 | 4.1 | Found in one sample on Jan 28: Three heads *D. wilverthi*, one head D. *kohli* or *D*. *congolensis*, one head of an unidentified ant genus (probably *Tetraponera* sp.)  Feb 12: Two samples, both containing heads of epig. *Dorylus*, either *D. terrificus* or D. *sjoestedti* |
| *Intermediate Dorylus* | 1 | 1.4 | See Jan 28 sample above |
| *Paltothyreus tasata* ants (formerly known as *Pachycondyla tarsata*) | 1 | 1.4 | Sample July 14 |
| Unidentifiable ant fragments (not *Dorylus*) | 2 | 2.7 | Jan 28: see above; Feb 16:  Two gaster fragments of unidentified ant genus (certainly not *Dorylus*) |
| Weaver ants (*Oecophylla longinoda*) | 1 | 1.4 | Aug 18 sample |
| Termites, bees, other insects, bones | 0 | 0 |  |

Supplementary Material 3. Tool identification at the 19 main survey regions.

3A. Summary of number of features used to identify the tools.

|  |  |  |  |
| --- | --- | --- | --- |
| Number of features |  | N | % of 239 tools |
| 1, found with other tools |  | 35 | 14.6 |
| 1, found without other tools |  | 1 | 0.4 |
| 2 |  | 55 | 23 |
| 3 |  | 58 | 24.3 |
| 4 |  | 43 | 18 |
| 5 |  | 28 | 11.7 |
| 6 |  | 6 | 2.5 |
| Details not recorded, but found with other tools¹ |  | 13 | 5.4 |

¹ Of the ten driver ant tools at Bambillo, B. Bofenda photographed the piles of large sticks associated with active driver ant nests at sites 1, 4 and 5. Two of the nests were active, with driver ants climbing up fresh tools thrust deep into the nests, visible in the photos (for an example, see Appendix 8C). At these three sites at least one or more long sticks are visibly thrust deep into the nests. Bofenda had been trained to recognise tools as branches ripped from nearby saplings and modified. Unfortunately, other than the photographs and the tools dimensions, he did not record other details of the tools, such as modification, bluntedness or whether or not they were streaked with dirt. For some of the tools, he recorded the plants from which they were made nearby. At Lebo, J. Swinkels judged a detached herb, found associated with stick tools, to be a tool as well. The other two tools in the last category, found at Gangu N and Gangu S, were associated with other stick tools and judged by their positioning on the insect nests to have been ripped off and used as tools.

3B. Details of the combinations of features of the 239 objects categorized as tools.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. of features | Features | No. of tools | | % of 239 tools (rounded) |
| 1 | Source found, with 1 or more other tools | 7 | | 2.9 |
| 1 | Projecting, with 1 or more other tools | 9 | | 3.8 |
| 1 | Projecting, with no other tools | 1 | | 0.4 |
| 1 | Modified, with 1 or more other tools | 19 | | 8.0 |
| 2 | Projecting, source found | 3 | | 1.3 |
| 2 | Projecting, modified | 6 | | 2.5 |
| 2 | Projecting, dirty | 1 | | 0.4 |
| 2 | Modified, source found | 19 | | 8.0 |
| 2 | Modified, brushtip | 1 | | 0.4 |
| 2 | Modified, dirty | 17 | | 7.1 |
| 2 | Modified, blunt | 4 | | 1.7 |
| 2 | Dirty, source found | 3 | | 1.3 |
| 2 | Dirty, blunt | 1 | | 0.4 |
| 3 | Projecting, modified, source found | 14 | | 5.9 |
| 3 | Projecting, modified, dirty | 12 | | 5 |
| 3 | Projecting, modified, blunt | 3 | | 1.3 |
| 3 | Projecting, dirty, source found | 1 | | 0.4 |
| 3 | Projecting, blunt, source found | 1 | | 0.4 |
| 3 | Modified, dirty, source found | 8 | | 3.4 |
| 3 | Modified, dirty, blunt | 8 | | 3.4 |
| 3 | Modified, blunt, source found | 6 | | 2.5 |
| 3 | Modified, blunt, brushtip | 2 | | 0.8 |
| 3 | Dirty, blunt, source found | 3 | | 1.3 |
| 4 | Projecting, modified, brushtip, source found | 1 | | 0.4 |
| 4 | Projecting, modified, dirty, source found | 9 | | 3.8 |
| 4 | Projecting, modified, dirty, blunt | 6 | | 2.5 |
| 4 | Projecting, modified, blunt, source found | 1 | | 0.4 |
| 4 | Projecting, modified, blunt, brushtip | 2 | | 0.8 |
| 4 | Modified, dirty, blunt, source found | 20 | 8.4 | |
| 4 | Modified, dirty, blunt, brushtip | 2 | 0.8 | |
| 4 | Modified, blunt, brushtip, source found | 2 | 0.8 | |
| 5 | Projecting, modified, dirty, blunt, source found | 13 | 5.4 | |
| 5 | Projecting, modified, dirty, blunt, brushtip | 3 | 1.3 | |
| 5 | Modified, dirty, blunt, brushtip, source found | 12 | 5.0 | |
| 6 | Projecting, modified, dirty, blunt, brushtip, source found | 6 | 2.5 | |
| 0 | Details not recorded, but found with other tools | 13 | 5.4 | |

3C. Features used to determine whether or not an artifact was considered a tool, as well as the number and percentage of tools and tool sites with each feature, and number of artifacts considered to be tools based on that particular feature.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Feature | No. artifacts with feature | % artifacts with feature | No. sites with feature | % sites with feature | Artifacts assigned as tools using this feature | % artifacts assigned as tool using this feature |
| Projects from an insect hole | 92 | 38.5 | 47 | 61 | 92 | 38.5 |
| Modified (bark and / or leaves have been stripped from the object) | 197 | 82.4 | 69 | 89.6 | 120 | 50.2 |
| One or both ends smeared with dirt | 127 | 53.1 | 52 | 67.5 | 7 | 2.9 |
| Source plant from which object was ripped was found nearby | 130 | 54.4 | 48 | 62.3 | 7 | 2.9 |
| One or both ends blunted | 96 | 40.2 | 52 | 67.5 | 0 | 0 |
| Associated with other tools at site | 33 | 13.8 | 16 | 20.8 | 13 | 5.4 |
| Total | - | - | - | - | 239 | 100 |

Supplementary Material 4. Traits characterising the stick tools collected at Rubi-Tele.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | No other signs of use | | Blunted | | Brushtip | Muddy | Blunted & muddy | | Totals |
| No modifications | 11 | 1 | | - | | - | - | 12 | |
| Modifications on one end | 48 | 13 | |  | | 5 | 5 | 71 | |
| Modifications on both ends | 124 | 7 | | 4 | | 30 | 5 | 170 | |
| Total | 183 | 21 | | 4 | | 35 | 10 | 253 | |

Supplementary Material 5. Availability of key insect types across the 19 survey regions, and at other chimpanzee study sites.

Nr = Not recorded. (Countries of sites referred to: Budongo, Uganda; Mahale & Gombe, Tanzania; La Belgique, Cameroon; Seringbara, Guinea; Fongoli, Senegal; Gombe, Tanzania; Taï, Ivory Coast; Gashaka, Nigeria).

5A*. Macrotermes* mounds and swarms found on recces and transects by region, current study.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Survey region | Survey type | Year | Month | Dry/wet season | Evidence | Km walked | Strip width | No. items / rate (per km) | No.  Active | No.  Dead | |
| Gangu N | T & R | 2012 | 8 | Wet | Mounds | 39.6 | 10 | 42 / 1.06 | 17 / 0.43 | | 25 / 0.63 |
| Gangu N | T & R | 2012 | 9 | Wet | Mounds | 13.4 | 10 | 6 / 0.44 | 5 / 0.37 | | 1 / 0.07 |
| Camp Louis | T & R | 2012 | 9 | Wet | Mounds | 25 | 10 | 6 / 0.24 | 6 / 0.24 | | 0 |
| Camp Louis | Trans | 2005 | 4 | Early wet | Mounds | 18.3 | 10 | 6 / 0.33 | Nr | | Nr |
| Camp Louis | Trans | 2005 | 5 | Early wet | Mounds | 10 | 10 | 11 / 1.1 | Nr | | Nr |
| Camp Louis | Trans | 2005 | 6 | Early wet | Mounds | 3.3 | 10 | 4 / 1.21 | Nr | | Nr |
| Gangu N | Trans | 2005 | 5 | Early wet | Mounds | 18.7 | 10 | 44 / 2.35 | Nr | | Nr |
| Gangu S | Trans | 2005 | 6 | Early wet | Mounds | 0.26 | 10 | 1 / 3.85 | Nr | | Nr |
| Camp Louis | Trans | 2005 | 6 | Early wet | Swarms | 18.3 | 2 | 0 | Nr | | Nr |
| Camp Louis | Trans | 2005 | 6 | Early wet | Swarms | 10 | 2 | 0 | Nr | | Nr |
| Camp Louis | Trans | 2005 | 6 | Early wet | Swarms | 3.3 | 2 | 2/0.6 | Nr | | Nr |
| Camp Louis | Trans | 2012 | 9 | Wet | Swarms | 25 | 2 | 3 / 0.12 | Nr | | Nr |
| Gangu N | Trans | 2012 | 8 | Wet | Swarms | 39.6 | 2 | 6 / 0.15 | Nr | | Nr |
| Gangu N | Trans | 2012 | 9 | Wet | Swarms | 13.4 | 2 | 2 / 0.15 | Nr | | Nr |
| Gangu S | Trans | 2005 | 6 | Early wet | Swarms | 20 | 2 | 0 | Nr | | Nr |
| Gangu N | Trans | 2005 | 5 | Early wet | Swarms | 18.7 | 2 | 2 / 0.11 | Nr | | Nr |
| Lingo | Recce | 2007 | 11 | Wet | Mounds | 38.5 | 10 | 1/ 0.03 | Nr | | Nr |
| Zongia | Recce | 2007 | 11 | Wet | Mounds | 35.7 | 10 | 6 / 0.17 | Nr | | Nr |
| Mbange E | Recce | 2008 | 1 | Dry | Mounds | 80.9 | 10 | 4/ 0.05 | Nr | | Nr |
| Mbange W | Recce | 2008 | 1 | Dry | Mounds | 45.5 | 10 | 9 / 0.20 | Nr | | Nr |
| Leguga | Recce | 2008 | 3 | Dry | Mounds | 43.7 | 10 | 12 / 0.28 | Nr | | Nr |
| Bambesa | Recce | 2008 | 4 | Dry | Mounds | 65 | 10 | 8 / 0.12 | Nr | | Nr |
| Akuma-Yoko | Recce | 2008 | 6 | Wet | Mounds | 22.4 | 10 | 7 / 0.31 | Nr | | Nr |
| Buta | Recce | 2008 | 9 | Wet | Mounds | 25.6 | 10 | 1 / 0.04 | Nr | | Nr |
| Ngume | Recce | 2008 | 9 | Wet | Mounds | 37.5 | 10 | 7 / 0.19 | Nr | | Nr |

5B. *Macrotermes* mounds and swarms found on recces and transects by region, other studies.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Survey region | Survey type | Year | Month | Dry/wet season | Evidence | Km walked | Strip width (m) | No. items / rate (per km) | No.  Active | No.  Dead | Chimps eat at site? | Source |
| Budongo | Trans | 2011 | 7-9 | Wet | Mounds | 6 | 6 | 0\* | Nr | Nr | N | Hedges & McGrew 2012 |
| Mahale | Trans | 1982-1983 | 9-2 | Late dry-wet | Mounds | 10.12 | 6 | 0\* | Nr | Nr | Y | McGrew et al. 2007; Collins & McGrew 1987 |
| Gombe | Trans | 1982-1983 | 9-2 | Late dry-Wet | Mounds | 2.37 | 6 | 1 / 0.42 | Nr | Nr | Y | McGrew et al. 2007; Collins & McGrew 1987 |
| Seringbara | Trails | 2008 | 3-10 | Wet | Mounds | 26.2 | 4 | 1 / 0.04 | Nr | Nr | N | Koops et al.2013 |
| Gombe | Trans | 2009-2010 | 12-1 | Wet | Mounds (active) | 12 | 6 | 9 / 0.75 | 9 / 0.75 | Nr | Y | O Malley 2011 |
| Fongoli | Trans | 2006-2007 | 8-7 | Wet and dry | Mounds (active) | 6.4 | 8 | 121 / 18.91 | 121 / 18.91 | Nr | Y | Bogart & Pruetz 2011 |
| Budongo | Trans | 2011 | 7-9 | Wet | Swarms | 6 | 6 | 0\* | Nr | Nr | N | Hedges & McGrew 2012 |
| La Belgique | Trans | 2004 | 11 | Dry | Mounds (active) | 9.8 | 10 | 9 / 0.92 | 9 / 0.92 | Nr | Y | Deblauwe 2009 |

\* = Although researchers did not find these insects on the transect, the species is known to be present at the site, according to the source cited.

5C. Mounds of *Thoracotermes macrothorax* and *Cubitermes* sp. found on transects by region. CS = current study.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Species | Survey region | Year | Month | Dry/wet season | Km walked | Strip width | No. mounds / rate (per km) | No. active | No. dead | Chimps eat at site? | Source |
| *Cubitermes* sp. | Gangu E | 2012 | 8 | Wet | 2 | 2 | 58 / 29 | Nr | Nr | Y | CS |
| *T. macrothorax* | Gangu E | 2012 | 8 | Wet | 2 | 2 | 11 / 5.5 | Nr | Nr | Y | CS |
| *Cubitermes* sp. & *T. macrothorax* combined | Camp Louis | 2005 | 6 | Early wet | 1.1 | 2 | 56 / 50.91 | Nr | Nr | Y | CS |
| *Cubitermes* sp. & *T. macrothorax* combined | Camp Louis | 2005 | 7 | Early wet | 1.1 | 2 | 25 / 22.7 | Nr | Nr | Y | CS |
| *Cubitermes* sp. & *T. macrothorax* combined | Gangu S | 2005 | 6 | Early wet | 1 | 2 | 37 / 37 | Nr | Nr | Y | CS |
| *Cubitermes* sp. | La Belgique | 2005 | 2 | Dry | 2.6 | 10 | 57 / 21.92 | 49 / 18.85 | 8 / 3.1 | N | Deblauwe 2009 |
| *Cubitermes* sp. | La Belgique | 2004 | 11 | Dry | 2.6 | 10 | 53 / 20.39 | 52 / 20 | 1 / 0.39 | N | Deblauwe 2009 |
| *Cubitermes* sp. | Seringbara | 2008 | 3 | Wet | 26.2 | 4 | 173 / 6.60 | Nr | Nr | N | Koops et al 2013 |
| *Cubitermes* sp. | Seringbara | 2008 | 10 | Wet | 26.2 | 4 | 244 / 9.31 | Nr | Nr | N | Koops et al. 2013 |
| *Cubitermes* sp. | Budongo | 2005 | 7-9 | Wet | 6 | 6 | 124 /20.67 | Nr | Nr | N | Hedges & McGrew 2012 |
| *Cubitermes* sp. | Gombe | 2004 | 12-1 | Wet | 12 | 6 | 64 / 5.33 | Nr | Nr | N | O Malley 2011 |
| *Thoracotermes* sp. | La Belgique | 2004 | 11 | Dry | 8.63 | 10 | 64 / 7.42 | 24 / 2.78 | 40 / 4.64 | N | Deblauwe 2009 |
| *Thoracotermes* sp. | La Belgique | 2005 | 2 | Dry | 8.63 | 10 | 81 / 9.39 | 27 / 3.13 | 54 / 6.25 | N | Deblauwe 2009 |
| *Thoracotermes* sp. | Taï North | 2009 | 4-6 | Early wet | 18 | 10 | 43 / 2.39 | Nr | Nr | Y | Luncz & Boesch 2015; Luncz unpublished data |
| *Thoracotermes* sp. | Taï South | 2009 | 4-6 | Early wet | 22 | 10 | 94 / 4.27 | Nr | Nr | N | Luncz & Boesch 2015; Luncz unpublished data |
| *Thoracotermes* sp. | Taï East | 2009 | 4-6 | Early wet | 25.5 | 10 | 91 / 3.57 | Nr | Nr | N | Luncz & Boesch 2015; Luncz unpublished data |

5D. Mounds of other types of termites found on transects in different survey regions, Northern DRC. There is no evidence that chimpanzees eat these termites at any of the survey regions. The transect strip width for all regions was 10 m.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Survey region | Year | Month | Dry/wet season | Km walked | No. mounds / rate (per km) |
| Gangu N | 2012 | 9 | Wet | 13.4 | 0 |
| Camp Louis | 2005 | 5 | Early wet | 32 | 9 / 0.28 |
| Camp Louis | 2012 | 9 | Wet | 25 | 0 |
| Gangu N | 2005 | 5 | Early wet | 18.7 | 1 / 0.05 |
| Gangu N | 2012 | 8 | Wet | 39.6 | 1/ 0.03 |
| Gangu S | 2005 | 6 | Early wet | 0.26 | 1 / 3.85 |

5E. Epigaeic *Dorylus* nests and swarms (the latter refers to both columns and swarms) found on recces and transects by region, during the current survey of Northern DRC.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Survey region | Survey type | Year | Month | Dry/wet | Evidence | Km walked | Strip width | No items / rate | No. active | No. dead | Chimps eat at site? |
| Camp Louis | T | 2005 | 4 | Early wet | Nests | 13.6 | 4 | 1 / 0.07 | 0 | 1 / 0.07 | Y |
| Camp Louis | T | 2005 | 5 | Early wet | Nests | 21.5 | 4 | 3 / 0.14 | 0 | 3 / 0.14 | Y |
| Camp Louis | T | 2005 | 6 | Early wet | Nests | 25.5 | 4 | 0 | 0 | 0 | Y |
| Camp Louis | T | 2005 | 7 | Early wet | Nests | 7.3 | 2 | 0 | 0 | 0 | Y |
| Camp Louis | T & R | 2012 | 9 | Wet | Nests | 31.3 | 4 | 0 | 0 | 0 | Y |
| Gangu N | T | 2005 | 5 | Early wet | Nests | 2.1 | 4 | 0 | 0 | 0 | Y |
| Gangu N | T & R | 2012 | 8 | Wet | Nests | 39.7 | 4 | 0 | 0 | 0 | Y |
| Gangu N | T & R | 2012 | 9 | Wet | Nests | 13.7 | 4 | 0 | 0 | 0 | Y |
| Gangu S | T | 2005 | 6 | Early wet | Nests | 20 | 4 | 0 | 0 | 0 | Y |
| Camp Louis | T | 2005 | 4 | Early wet | Swarms | 13.6 | 2 | 1/ 0.07 | Nr | Nr | Y |
| Camp Louis | T | 2005 | 5 | Early wet | Swarms | 21.5 | 2 | 1/0.05 | Nr | Nr | Y |
| Camp Louis | T | 2005 | 6 | Early wet | Swarms | 25.5 | 2 | 1 / 0.04 | Nr | Nr | Y |
| Camp Louis | T | 2005 | 7 | Early wet | Swarms | 7.3 | 2 | 1 / 0.14 | Nr | Nr | Y |
| Camp Louis | T | 2012 | 9 | Wet | Swarms | 31.3 | 2 | 8 / 0.26 | Nr | Nr | Y |
| Gangu N | T | 2005 | 5 | Early wet | Swarms | 2.1 | 2 | 0 | Nr | Nr | Y |
| Gangu N | T & R | 2012 | 8 | Wet | Swarms | 39.7 | 2 | 3 / 0.08 | Nr | Nr | Y |
| Gangu N | T | 2012 | 9 | Wet | Swarms | 13.7 | 2 | 0 | Nr | Nr | Y |
| Gangu S | T | 2005 | 6 | Early wet | Swarms | 20 | 2 | 1 / 0.05 | Nr | Nr | Y |
| Lingo | R | 2007 | 11 | Wet | Nests | 38.5 | 4 | 5 / 0.13 | 0 | 5 / 0.13 | N |
| Zongia | R | 2007 | 11 | Wet | Nests | 35.7 | 4 | 6 / 0.17 | 0 | 6 / 0.17 | N |
| Mbange W | R | 2008 | 1 | Dry | Nests | 45.5 | 4 | 1 / 0.02 | 0 | 1 / 0.02 | N |
| Akuma-Yoko | R | 2008 | 6 | Wet | Nests | 22.4 | 4 | 1 / 0.05 | 0 | 1 / 0.05 | N |
| Buta | R | 2008 | 9 | Wet | Nests | 25.6 | 4 | 1 / 0.04 | 0 | 1 / 0.04 | N |
| Leguga | R | 2008 | 3 | Dry | Nests | 43.7 | 4 | 4 / 0.09 | 1 / 0.02 | 3 / 0.07 | Y |
| Ngume | R | 2008 | 9 | Wet | Nests | 37.5 | 4 | 3 / 0.08 | 1 / 0.03 | 2 / 0.05 | N |
| Mbange E | R | 2008 | 1 | Dry | Nests | 80.9 | 4 | 10 / 0.12 | 2 / 0.03 | 8 / 0.10 | N |
| Bambesa | R | 2008 | 4 | Dry | Nests | 70 | 4 | 3 / 0.04 | 2 / 0.03 | 1 / 0.01 | N |
| Lingo | R | 2007 | 11 | Wet | Swarms | 38.5 | 2 | 5 / 0.13 | Nr | Nr | N |
| Zongia | R | 2007 | 11 | Wet | Swarms | 35.7 | 2 | 3 / 0.08 | Nr | Nr | N |
| Mbange E | R | 2008 | 1 | Dry | Swarms | 80.9 | 2 | 2 / 0.03 | Nr | Nr | N |
| Mbange W | R | 2008 | 1 | Dry | Swarms | 45.5 | 2 | 0 | Nr | Nr | N |
| Leguga | R | 2008 | 3 | Dry | Swarms | 43.7 | 2 | 0 | Nr | Nr | Y |
| Bambesa | R | 2008 | 4 | Dry | Swarms | 70 | 2 | 0 | Nr | Nr | N |
| Akuma-Yoko | R | 2008 | 6 | Wet | Swarms | 22.4 | 2 | 1 / 0.05 | Nr | Nr | N |
| Buta | R | 2008 | 9 | Wet | Swarms | 25.6 | 2 | 0 | Nr | Nr | N |
| Ngume | R | 2008 | 9 | Wet | Swarms | 37.5 | 2 | 1 / 0.03 | Nr | Nr | N |

5F. Epigaeic *Dorylus* nests and swarms (the latter here refers here to both columns and swarms) found on recces and transects by

region, in transect surveys at other research sites (Seringbara’s surveys were listed as having been

conducted on ‘trails’).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Survey region | Year | Month | Dry/wet season | Evidence | Km walked | Strip width | No. items / rate | No. active | No. dead | Chimps eat at site? | Source |
| Seringbara | 2008 | 1-12 | Wet & Dry | Swarms | 26.2 | 4 | 2 / 0.08 | Nr | Nr | Y | Koops et al 2013 |
| La Belgique | 2004 | 11 | Dry | Nests | 9.8 | 10 | 0\* | 0 | Nr | Y | Deblauwe 2009 |
| La Belgique | 2005 | 2 | Dry | Nests | 9.8 | 10 | 0\* | 0 | Nr | Y | Deblauwe 2009 |
| Budongo | 2011 | 7-9 | Wet | Nests | 6 | 6 | 0\* | 0 | Nr | N | Hedges & McGrew 2012 |
| Gombe | 2009-2010 | 12-1 | Wet | Nests | 12 | 6 | 2 / 0.17 | Nr | Nr | Y | O Malley 2011 |
| Gashaka | 2005 | 1-4 | Dry | Nests (active) | 106.2 | 10 | 3 / 0.03 | 3 / 0.03 | Nr | Y | Schöning et al. 2007 and pers. comm. |
| Gashaka | 2005 | 1-4 | Dry | Swarms | 106.2 | 10 | 43 / 0.41 | Nr | Nr | Y | Schöning et al. 2007 and pers. comm. |
| Budongo | 2011 | 7-9 | Wet | Swarms | 6 | 6 | 1 / 0.17 | Nr | Nr | N | Hedges & McGrew 2012 |
| Gombe | 2009-2010 | 12-1 | Wet | Swarms | 12 | 6 | 3 / 0.25 | Nt | Nr | Y | O Malley 2011  O Malley 2011 |

\*= Although the researchers did not find these insects on the transect, the species is known to be present at the site.

Notes:

For Seringbara, the number of ant swarms was not given; it was calculated here as x/26.2=0.08. We assume it was the same 26.2 km of transects as for the other two.

The Seringbara count included non-epigaeic (‘intermediate’) *Dorylus* as well, but these made up less than one percent of the ants encountered.

5G. Ponerinenests and swarms (the latter refers here to both columns and swarms) found on recces and transects by survey region. Source

Gombe data: O’ Malley 2011 (surveys occurred 2009-2010\*). N = nests, S = swarms.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Insect type | Survey region | Survey type | Year | Month | Dry/wet season | Evidence | Km walked | Strip width | No items/rate | Chimps eat at site? |
| Ponerinaeall spp. | Camp Louis | T & R | 2012 | 9 | Wet | N | 31.3 | 2 | 13 / 0.42 | Y |
| Ponerinaeall spp. | Gangu N | T | 2005 | 5 | Early wet | N | 2.1 | 2 | 0 | Y |
| Ponerinaeall spp. | Gangu N | T & R | 2012 | 9 | Wet | N | 13.7 | 2 | 11 / 0.80 | Y |
| Ponerinaeall spp. | Camp Louis | T | 2005 | 4 | Early wet | N | 13.6 | 2 | 2 / 0.15 | Y |
| Ponerinaeall spp. | Camp Louis | T | 2005 | 5 | Early wet | N | 21.5 | 2 | 0 | Y |
| Ponerinaeall spp. | Camp Louis | T | 2005 | 6 | Early wet | N | 25.5 | 2 | 4 / 0.16 | Y |
| Ponerinaeall spp. | Camp Louis | T | 2005 | 7 | Early wet | N | 7.3 | 2 | 1 / 0.14 | Y |
| Ponerinaeall spp. | Gangu N | T & R | 2012 | 8 | Wet | N | 39.7 | 2 | 30 / 0.76 | Y |
| Ponerinaeall spp. | Gangu S | T | 2005 | 6 | Early wet | N | 20 | 2 | 2 / 0.1 | Y |
| Ponerinaeall spp. | Camp Louis | T & R | 2012 | 9 | Wet | S | 31.3 | 2 | 3 / 0.10 | Y |
| Ponerinaeall spp. | Gangu N | T | 2005 | 5 | Early wet | S | 2.1 | 2 | 0 | Y |
| Ponerinaeall spp. | Gangu N | T & R | 2012 | 8 | Wet | S | 39.7 | 2 | 12 / 0.30 | Y |
| Ponerinaeall spp. | Gangu N | T & R | 2012 | 9 | Wet | S | 13.7 | 2 | 0 | Y |
| Ponerinaeall spp. | Lingo | R | 2007 | 11 | Wet | N | 38.5 | 2 | 0 | N |
| Ponerinaeall spp. | Leguga | R | 2008 | 3 | Dry | N | 43.7 | 2 | 3 / 0.07 | Prob |
| Ponerinaeall spp. | Akuma-Yoko | R | 2008 | 6 | Wet | N | 22.4 | 2 | 0 | N |
| Ponerinae all spp. | Zongia | R | 2007 | 11 | Wet | N | 35.7 | 2 | 4 / 0.11 | N |
| Ponerinaeall spp. | Mbange E | R | 2008 | 1 | Dry | N | 80.9 | 2 | 2 / 0.03 | N |
| Ponerinaeall spp. | Mbange W | R | 2008 | 1 | Dry | N | 45.5 | 2 | 1 / 0.02 | N |
| Ponerinaeall spp. | Bambesa | R | 2008 | 4 | Dry | N | 65 | 2 | 14 / 0.22 | Y |
| Ponerinaeall spp. | Buta | R | 2008 | 9 | Wet | N | 25.6 | 2 | 4 / 0.16 | Y |
| Ponerinaeall spp. | Ngume | R | 2008 | 9 | Wet | N | 37.5 | 2 | 9 / 0.24 | Y |
| Ponerinaeall spp. | Gombe | T | \* | 12-1 | Wet | N | 12 | 6 | 36 / 3 | N |
| Ponerinaeall spp. | Gombe | T | \* | 12-1 | Wet | S | 12 | 6 | 40 / 3.33 | N |
| Ponerinae all spp. | Gombe | T | \* | 12-1 | Wet | N & S | 12 | 6 | 76 / 6.33 | N |
| *M. analis* only | Gombe | T | \* | 12-1 | Wet | N | 12 | 6 | 4 / 0.33 | N |
| *M. analis* only | Gombe | T | \* | 12-1 | Wet | S | 12 | 6 | 5 / 0.42 | N |
| *M. analis* only | Gombe | T | \* | 12-1 | Wet | N & S | 12 | 6 | 9 / 0.75 | N |

Supplementary Material 6. Encounter rates of insects on recces and transects: epigaeic *Dorylus* ant swarms and nests, *M. analis* swarms, ponerine ant nests and *Macrotermes* swarms and mounds. We divided *Macrotermes* mounds into active and inactive mounds (the latter were old and crumbled and show no signs of insect presence).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Camp Louis recces  16.1 km | Camp Louis transects  15.5 km | Gangu N recces  43.3 km | Gangu N transects  10.5 km | Total recces  59.4 km | Total transects  26 km |
| 1. Epig. *Dorylus* swarms | 4  0.249 | 4  0.258 | 2  0.046 | 1  0.095 | 6  0.10 | 5  0.19 |
| 1. Epig. *Dorylus* nests | 0  0 | 0  0 | 0  0 | 0  0 | 0  0 | 0  0 |
| 1. Epig. *Dorylus* total | 4  0.249 | 4  0.258 | 2  0.046 | 1  0.095 | 6  0.10 | 5  0.19 |
| 1. *M. analis* swarms | 0  0 | 3  0.194 | 8  0.185 | 4  0.381 | 8  0.135 | 7  0.269 |
| 1. Ponerinenests | 5  0.311 | 7  0.452 | 29  0.6698 | 10  0.952 | 34  0.572 | 17  0.654 |
| *D + E.* Ponerinaetotal | 5  0.311 | 10  0.645 | 37  0.855 | 14  1.333 | 42  0.707 | 24  0.923 |
| C + E. Total Epig. *Dorylus* plus ponerine antnests | 9  0.559 | 11  0.710 | 31  0.716 | 11  1.048 | 40  0.673 | 22  0.846 |
| 1. *Macrotermes* swarms | 1  0.062 | 2  0.129 | 6  0.139 | 2  0.190 | 7  0.118 | 4  0.154 |
| 1. *Macrotermes* active mounds | 2  0.124 | 4  0.258 | 9  0.208 | 13  1.24 | 11  0.185 | 17  0.654 |
| 1. *Macrotermes* inactive mounds | 0  0 | 0  0 | 13  0.300 | 13  1.24 | 13  0.219 | 13  0.500 |
| *F + G. Macrotermes* swarms and active mounds | 3  0.186 | 6  0.387 | 15  0.346 | 15  1.43 | 18  0.303 | 21  0.808 |
| C + E + F + G. Total Epig. *Dorylus*, ponerinenests and active *Macrotermes* mounds / swarms | 12  0.745 | 17  1.10 | 46  1.062 | 26  2.48 | 58  0.976 | 43  0.165 |

Supplementary Material 7. Details of each of the tool sites found over the course of the study period, separated by tool type. Here we present each tool site as it was tentatively judged in the field, followed by the final resource assignment based on our criteria.

Age: F=Fresh, R=Recent, O=Old.

Supplementary Material 7A. Epigaeic driver ant tool sites found on recces and transects in the 19 main survey regions.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Site name | Found by | Date | Location | GPS | Age | Tool type | No. tools | Notes | Ant type |
| 1 | 4 | TCH | 24 Oct 04 | Camp Louis forest savanna edge | 4º23.083’N  24º52.640’ E | R | Long probe | 6 | Ants present. | Epigaeic *Dorylus* |
| 2 | 5 | TCH | 23 Nov 04 | Camp Louis Forest | 4º23.140’N  24º52.768’ E | R | Long probe | 2 | - | Epigaeic *Dorylus* |
| 3 | 6 | TCH | 5 Dec 04 | Camp Louis Forest | 4º23.718’N  24º53.457’ E | R | Long probe | 7 | Chimpanzee food remains, contact with old female chimpanzee, ants present. | Epigaeic *Dorylus* |
| 4 | 8 | TCH | 7 Apr 05 | Camp Louis savanna woodland | 4º21.027’N  24º47.794’E | F | Long probe | 1 | Ants present. | Epigaeic *Dorylus* |
| 5 | 10 | TCH | 21 May 05 | Camp Louis Forest | 4º22.569’N  24º54.982’ E | R | Long probe | 4 | - | Epigaeic *Dorylus* |
| 6 | 11 | TCH | 24 May 05 | Camp Louis Forest | 4º20.435’N  24º52.377’E | O | Long probe | 1 | - | Epigaeic *Dorylus* |
| 7 | 12 | TCH | 26 May 05 | Camp Louis Forest | 4º19.646’N  24º47.902’ E | O | Long probe | 1 | - | Epigaeic *Dorylus* |
| 8 | 19 | TCH | 7 Aug 06 | Bili South savanna mosaic | 4º03.550’N  25º04.428’ E | O | Long probe | 3 | - | Epigaeic *Dorylus* |
| 9 | 20 | TCH | 25 Aug 06 | Camp Louis Forest | 4º20.303’N  24º49.739’E | R | Long probe | 3 | Ants present, collected. | *Dorylus wilverthii*  (C. Schöning) |
| 10 | 22 | TCH | 30 Aug 06 | Gangu North | 4º19.530’N  24º41.610’E | O | Long probe | 9 | - | Epigaeic *Dorylus* |
| 11 | 33 | TCH | 24 Dec 06 | Zapay | 4º54.662’N  25º10.001’E | R | Long probe | 10 | - | Epigaeic *Dorylus* |
| 12 | 35 | TCH | 29 Dec 06 | Zapay | 4º56.461’N  25º13.663’ E | O | Long probe | 4 | - | Epigaeic *Dorylus* |
| 13 | 40 | TCH | 13 Mar 08 | Leguga (South Uele) | 3º21.032’N  24º58.504’E | R | Short probe | 2 | Ants present, collected. | *Dorylus terrificus*  (C. Schöning) |
| 14 | Gan1 | TCH | 3 Aug 12 | Camp Louis Forest | 4º20.256’N  24º51.754’ E | F | Long probe | 1 | Chimpanzee food remains. | Epigaeic *Dorylus* |
| 15 | Gan4 | GP | 12 Aug 12 | Gangu South | 4º17.679’N  24º43.020’ E | F | Long probe | 2 | Ants present. | Epigaeic *Dorylus* |
| 16 | Gan5 | GP | 14 Aug 12 | Gangu North | 4º18.018’N  24º37.082’ E | R | Long probe | 1 | - | Epigaeic *Dorylus* |
| 17 | Gan8 | EM | 3 Sep 12 | Gangu South | 4º17.617’N  24º41.931’ E | R | Long probe | 5 | Chimpanzee knuckle-print, ants present. | Epigaeic *Dorylus* |
| 18 | Gan9 | EM | 3 Sep 12 | Gangu South | 4º17.574’N  24º41.671’ E | R | Long probe | 7 | Very old chimpanzee nest. | Epigaeic *Dorylus* |
| 19 | Bam1 | BB | 27 Oct | Bambillo | 3º50.616’N  24º39.409’ E | R | Long probe | 6 | Chimpanzee nest site, other kind of tool site, ants present. | Epigaeic *Dorylus* |
| 20 | Bam3 | BB | 27 Oct 12 | Bambillo | 3º50.086’N  24º38.747’ E | O | Long probe | 2 | - | Epigaeic *Dorylus* |
| 21 | Bam4 | BB | 28 Oct 12 | Bambillo | 3º48.036’N  24º38.758’ E | R | Long probe | 6 | Ants present. | Epigaeic *Dorylus* |
| 22 | Dem | EM | 30 Oct 12 | Gangu North | 4º23.924’N  24º40.011’ E | R | Long probe | 3 | Ants present. | Epigaeic *Dorylus* |
| 23 | Bam5 | BB | 30 Oct 12 | Bambillo | 3º43.165’N  24º41.801’E | O | Long probe | 2 | Ants present. | Epigaeic *Dorylus* |

|  |
| --- |
|  |

Supplementary Materials 7B. Potential and assigned ponerine ant tool sites found on recces and transects in the 19 main survey regions.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Site name | Found by | Date | Location | GPS | Age | Tool type | No. tools | Notes | Ant species | Final assignment |
| 1 | 1 | TCH | 26 Aug 04 | Camp Louis Forest | 4º20.765’N  24º56.481’E | R | Probe | 1 | - | Unknown | Ponerinae |
| 2 | 13 | TCH | 30 May 05 | Gangu North | 4º19.503’N  24º42.174’E | R | Probe | 7 | Approx. 100 m S: Chimpanzee contact plus another ant tool site. | Ponerinae  (probably  *Paltothyreus tarsatus*) | Ponerinae |
| 3 | 14 | TCH | 30 May 05 | Gangu North | 4º19.440’N  24º42.033’E | F | Probe | 6 | Chimpanzee contact plus another ant tool site approx. 100 m N. Ants present. | Ponerinae  (probably  *Paltothyreus tarsatus*) | Ponerinae |
| 4 | 24 | JS | 15 Sept 06 | Lebo | 3º25.330’N  25º20.962’E | R | Probe | 6 | Snail pound site. Ants present, collected. | *Megaponera analis*  (C. Schöning) | *Megaponera*  *analis* |
| 5 | 28 | TCH | 11 Oct 06 | Gangu North | 4º19.797’N  24º42.291’E | O | Dig and / or probe | 3 | - | Unknown | Unknown |
| 6 | 31 | TCH | 24 Oct 06 | Gangu North | 4º19.574’N  24º44.127’E | O | Probe | 1 | Chimpanzee contact, nests. | Unkown | Unknown |
| 7 | 34 | TCH | 27 Dec 06 | Zapay West | 4º56.694’N  25º06.256’E | O | Probe | 2 | Ant seen at site. | Ponerinae | Ponerinae |
| 8 | 39 | TCH | 10 Mar 08 | Leguga East | 3º22.931’N  25º03.817’E | O | Probe | 3 | Chimpanzee nest site. | Unkown | Ponerinae |
| 9 | 42 | TCH | 20 Mar 08 | Leguga  West | 3º21’285’N  24º58.114’E | O | Probe | 1 | - | Unkown | Unknown |
| 10 | 45 | TCH | 15 Apr 08 | Bambesa (Bungide) | 3º20.905’N  25º50.254’E | F | Scoop | 1 | Chimpanzee footprint at site, feeding remains, ants at site. | Ponerinae | Ponerinae |
| 11 | 46 | TCH | 1 May 08 | Bambesa (Malembobi) | 3º26.305’N  25º48.095’E | R | Probe | 1 | Chimpanzee footprint, nest site. | Unkown | Ponerinae |
| 12 | 47 | TCH | 13 Aug 08 | Lebo (Mongongolo) | 3º27.610’N  25º13.347’E | R | Probe | 1 | Chimpanzee footprint, auditory. | Ponerinae | Ponerinae |
| 13 | 48 | TCH | 13 Aug 08 | Lebo (Mongongolo) | 3º27.663’N  25º13.468’E | R | Probe | 1 | - | Ponerinae | Ponerinae |
| 14 | 49 | TCH | 18 Sept 08 | Buta | 2º43.108’N  24º52.827’E | O | Probe | 1 | Chimpanzee nest site. | Ponerinae | Ponerinae |
| 15 | 50 | TCH | 19 Sept 08 | Buta | 2º42.749’N  24º53.248’E | R | Probe | 2 | Ant seen at site, collected. | Ponerinae | Ponerinae |
| 16 | 51 | TCH | 27 Sept 08 | Ngume | 2º45.811’N  25º19.713’E | O | Probe | 1 | - | Ponerinae | Ponerinae |
| 17 | 52 | TCH | 29 Sept 08 | Ngume | 2º43.172’N  25º22.014’E | R | Probe | 1 | - | Unkown | Ponerinae |
| 18 | 53 | SK | 30 Sept 08 | Ngume | 2º46.162’N  25º19.738’E | R | Probe | 3 | - | Unkown | Unknown |
| 19 | Gan3 | EM | 10 Aug 12 | Gangu  North | 4º20.231’N  24º42.046’E | O | Probe | 2 | - | Unkown | Ponerinae |
| 20 | Hem | EM | 5 Nov 12 | Gangu  North | 4º23.949’N  24º42.971’E | O | Probe | 6 | - | Unkown | Unknown |

Supplementary Materials 7C. Potential and assigned non-epigaeic driver ant (*Dorylus kohli*) sites found on recces and transects in the 19 main survey regions.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Site name | Found by | Date | Location | GPS | Age | Tool type | No. tools | Notes | Ant species | Final assignment |
| 1 | 2 | TCH | 22 Sep 04 | Camp Louis | 4º23.030’N  24º53.915’E | R | Skinny wand | 1 | - | Unknown | Unknown |
| 2 | 17 | TCH | 30 June 05 | Gangu South | 4º16.402’N  24º37.560’E | F | Skinny wand | 3 | Chimpanzees filmed dipping with wands, ants present, collected. | *Dorylus kohli*  (C. Schöning) | *D. kohli* |
| 3 | 32 | JS | 16 Dec 06 | Gbangadi | 4º44.036’N  24º46.440’E | O | Skinny wand | 5 | Snail pound possibly by chimpanzee nearby. | Unknown | *D. kohli* |
| 4 | Gan2 | EM, TCH | 10 Aug 12 | Gangu North | 4º19.501’N  24º42.160’ E | F | Skinny wand | 2 | Mud on vines above tools, probably footprints. | Unknown | *D. kohli* |
| 5 | Gan7 | EM, TCH | 26 Aug 12 | Gangu North | 4º21.741’N  24º37.390’E | R | Skinny wand | 2 | Mud on vines above tools, probably footprints. | Unknown | *D. kohli* |
| 6 | Dume1 | HS | 16 Aug 12 | Dume | 4º24.891’N  25º02.349’ E | R | Skinny wand | 3 | - | Unknown | Unknown |

Note: TH found *Dorylus kohli* specimens in a chimpanzee dung sample in the Akuma Forest on 16 June 2010, south of the Uele River (C. Schöning identified the samples).

Supplementary Materials 7D. Potential and assigned honey digging / tree probing sites found on recces and transects in the 19 main survey regions.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Site  name | Found  by | Date | Location | GPS | Age | Tool type | No. tools | Notes | Bee species | Final assignment |
| 1 | 3 | TCH | 5 Oct 04 | Camp Louis Forest | 4º23.040’N  24º52.526’E | R | Dig | 3 | - | - | Unknown |
| 2 | 7 | TCH | 6 Apr 05 | Camp Louis Forest | 4º22.041’N  24º54.035’E | R | Dig (possibly) | 10 | Chimpanzee food remains, dung, plus auditory.observation. | NA | Unknown |
| 3 | 9 | TCH | 9 Apr 05 | Gangu North | 4º21.947’N  24º44.228’E | O | Dig (probably) | 3 | - | - | Unknown |
| 4 | 15 | TCH | 29 June 05 | Gangu South | 4º17.179’N  24º39.294’E | R | Dig | 4 | Old chimpanzee nest. | - | Stingless bee  dig tools |
| 5 | 16 | TCH | 30 June 05 | Gangu South | 4º17.124’N  24º38.384’E | R | Dig | 1 | - | - | Unknown |
| 6 | 23 | TCH | 31 Aug 06 | Gangu North | 4º19.860’N  24º42.180’E | O | Dig (probably) | 1 | - | - | Stingless bee  dig tools |
| 7 | 26 | TCH,  Mbolibiee | 14 Sep 06 | Camp Louis savanna forest mosaic | 4º21.081’N  24º48.057’E | O | Tree probe | 4 | Bees present, collected. | *Meliponula furruginea*  (D. Roubik)  (D. Roubik) | *Meliponula furruginea*  tree probe |
| 8 | 27 | TCH | 10 Oct 06 | Gangu North | 4º19.435’N  24º41.939’E | O | Dig (probably) | 1 | - | - | Stingless bee  dig tools |
| 9 | 30 | TCH | 16 Oct 06 | Gangu North | 4º19.951’N  24º42.270’E | O | Dig (probably) | 4 | Recent chimpanzee feeding remains. | - | Unknown |
| 10 | 36 | TCH | 17 Jan 07 | Gangu North | 4º19.444’N  24º41.928’E | R | Dig | 2 | - | - | Stingless bee  dig tools |
| 11 | Gan6 | TCH | 23 Aug 12 | Gangu North | 4º21.847’N  24º41.792’E | O | Dig | 5 | Bee wax in hive. | *Meliponula* underground bee, probably *M. ferruginea*  (D. Roubik)¹ | Stingless bee  dig tools |
| 12 | Gan10 | TCH | 9 Sep 12 | Gangu North | 4º20.814’N  24º42.126’E | R | Dig | 2 | Honey smell. | *Meliponula* underground bee | Stingless bee  dig tools |
| 13 | Gan11 | TCH | 10 Sep 12 | Gangu North | 4º21.883’N  24º44.007’E | O | Dig (possibly) | 2 | - | - | Unknown |
| 14 | Gan12 | TCH | 18 Sep 12 | Camp Louis Forest | 4º23.188’N  25º01.405’E | R | Dig | 3 | - | *Meliponula* underground bee, probably *M. bocandei*  (D. Roubik)² | Stingless bee  dig tools |
| 15 | Aem | EM | 20 Oct 12 | Gangu North | 4º21.383’N  24º42.316’E | O & R | Dig | 3 | Chimpanzee footprint. | *Meliponula* underground bee | Stingless bee  dig tools |
| 16 | Bam2 | BB | 27 Oct 12 | Bambillo | 3º50.615’N  24º39.392’E | R | Dig (possibly) | 2 | Nest site, driver ant tool site. | - | Unknown |
| 17 | Bem | EM | 28 Oct 12 | Gangu North | 4º21.816’N  24º36.785’E | R | Dig | 2 | - | *Meliponula* underground bee | Stingless bee  dig tools |
| 18 | Cem | EM | 28 Oct 12 | Gangu North | 4º21.803’N  24º36.770’E | O | Dig | 8 | - | Probably *Meliponula* underground bee | Stingless bee  dig tools |
| 19 | Eem | EM | 31 Oct 12 | Gangu North | 4º23.094’N  24º40.874’E | O | Dig (probably) | 1 | - | - | Unknown |
| 20 | Fem | EM | 31 Oct 12 | Gangu North | 4º22.345’N  24º41.572’E | O | Dig (probably) | 6 | - | - | Unknown |
| 21 | Gem | EM | 5 Nov 12 | Gangu North | 4º23.369’N  24º42.793’E | O | Dig (probably) | 2 | - | - | Unknown |
| 22 | Htsg | GP & KD | 22 Feb 13 | Gangu North | 4º19.803’N  24º41.263’E | R | Tree probe | 5 | Bees present, collected. | *Meliponula bocandei*  (D. Roubik) | *Meliponula bocandei*  tree probe |
| 23 | Nbc1 | TCH | 4 March 16 | Gangu North | 4º19.012’N  24º41.978’E | R | Dig | 1 | Contact with chimpanzees, another honey site, ‘amumbulumba’ bees and honey present, collected. | *Meliplebeia lendliana*  (D. Roubik) | Stingless bee  dig tools |
| 24 | Nbc2 | TCH | 4 March 16 | Gangu North | 4º19.012’N  24º41.978’E | R | Dig | 1 | Contact with chimpanzees, another honey site, ‘amumbulumba’ bees and honey present, collected. | *Meliplebeia lendliana*  (D. Roubik) | Stingless bee  dig tools |

¹Tentative identification based on the small deep hole visible in the photograph.

²Tentative identification based on the wide, shallow hole at the second site as well as the hive structure.

Supplementary Material 7E. Unidentifiable tool sites and tool-like objects of uncertain status found on recces and transects in the 19 main survey regions.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Site name | Found by | Date | Location | GPS | Habitat type | Age | Tool type | No. tools | Length (cm) | Diameter  midpoint (cm) | Notes | Insect species |
| 1 | 18 | TCH | 12 July 06 | Bili South | 4º07.595’N  25º05.280’E | Medium stream-bed | F | Probe? | 1 | 28.2 | 0.45 | Contact with chimpanzees, feeding remains. | Unknown  (not used in analysis) |
| 2 | 21 | JS | 27 Aug 06 | Bili South | 3º59.088’N  25º18.060’E | Forest, not recorded | O | Probe? | 1 | 169 | Nr | - | Unknown. Termites? |
| 3 | 25 | TCH | 15 Sept 06 | Lebo | 3º24.088’N  25º18.060’E | Open *Gilbertio-dendron* | O | Probe | 2 | 60  39.3 | 0.80  1.12 | Chimpanzee nest site. | Unknown.  Termites? |
| 4 | 37 | TCH | 11 Jan 08 | Mbange East | 3º13.030’N  24º10.072’E | Medium  *Gilbertio-dendron* | O | Probe | 1 | 71.5 | 1.40 | Chimpanzee nest site. | Unknown  (not used in analysis) |
| 5 | 43 | TCH | 25 Mar 08 | Leguga East | 3º22.872’N  25º02.585’E | Medium mixed | R | Probe? | 2 | 43.2  54.5 | 1.50  1.59 | Chimpanzee nest site, tortoise smash. | Unknown |
| 6 | IEM | EM | 20 Nov 12 | Gangu North | 4º25.020’N  24º47.369’E | Open mixed | O | Probe? | 3 | 57  61  36 | 0.67  1.24  0.86 | - | Unknown |
| 7 | JEM | EM | 24 Nov 12 | Gangu North | 4º20.560’N  24º41.465’E | Medium mixed | O | Dig? | 2 | 53  49 | 1.18  1.27 | - | Unknown |
| 8 | Possible Tool Site | GP | 25 Oct 12 | Gangu North | 4º19.317’N  24º40.981’E | Medium mixed | R | Probe? | 1 | Nr | Nr | - | Unknown  (not used in analysis) |

Supplementary Material 8. Insect species identified at Rubi-Tele.

Researchers: R = Rumen, E = Emmanuel, M = Mbangi

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample | | Researcher | Name assigned  in field | | Identification  (C. Schöning) |
| 1 | R | | | NA | *Paltothyreus tarsatus* |
| 2 | R | | | NA | *Dorylus rubellus* |
| 3 | R | | | NA | *Camponotus* sp. |
| 4 | R | | | Red ants | *Dorylus opacus* |
| 5 | R | | | ‘zanza’ | *Tetraponera aethiops* |
| 6 | E | | | Epigaeic ants | *Dorylus rubellus* |
| 7 | E | | | Army ants | *Dorylus wilverthii* |
| 8 | E | | | Black ants | *Paltothyreus tarsatus* |
| 9 | E | | | Black ants | *Megaponera analis* |
| 10 | E | | | Army ants | *Dorylus wilverthii* |
| 11 | E | | | Black ants | *Polyrachis* sp. |
| 12 | E | | | Red ants | *Camponotus* sp. |
| 13 | M | | | Black ants | *Paltothyreus tarsatus* |
| 14 | M | | | NA | *Cataulacus erinaceus* |
| 15 | M | | | Epigaeic ants | *Dorylus wilverthii* |
| 16 | M | | | Army ants | *Dorylus wilverthii* |
| 17 | M | | | Army ants \* | *Camponotus* sp. |

\*This sample was misidentified in the field as an ‘army ant’ (epigaeic *Dor*y*lus*).

Supplementary Material 9. Standard deviations and factor loadings for a principle component analysis of all tool characteristics.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Standard deviation | PC1 | PC2 | PC3 | PC4 | PC5 | PC6 | PC7 | PC8 | PC9 | PC10 | PC11 |
| Tool length | 1.596 | 0.516 | -0.174 | 0.204 | -0.020 | 0.043 | -0.062 | 0.066 | 0.055 | 0.135 | -0.794 | 0.000 |
| Tool diameter | 1.444 | 0.268 | -0.335 | -0.341 | 0.240 | -0.054 | 0.123 | 0.261 | 0.651 | -0.330 | 0.153 | 0.000 |
| Dirty | 1.208 | -0.226 | -0.340 | 0.417 | 0.214 | 0.183 | -0.026 | -0.336 | 0.439 | 0.507 | 0.129 | 0.000 |
| Blunted | 1.157 | -0.312 | -0.400 | 0.086 | 0.031 | 0.289 | 0.330 | -0.336 | -0.184 | -0.580 | -0.243 | 0.000 |
| Brushed | 0.935 | -0.212 | -0.388 | 0.033 | -0.266 | 0.054 | 0.424 | 0.647 | -0.181 | 0.312 | 0.027 | 0.000 |
| Modification | 0.915 | -0.037 | -0.346 | -0.205 | 0.111 | 0.464 | -0.711 | 0.199 | -0.241 | -0.010 | 0.075 | 0.000 |
| Epigaeic *Dorylus* | 0.795 | 0.522 | -0.252 | 0.168 | -0.122 | -0.010 | 0.099 | -0.185 | -0.257 | -0.015 | 0.397 | -0.593 |
| Honey (terrestrial) | 0.733 | -0.379 | -0.247 | -0.285 | -0.201 | -0.530 | -0.251 | -0.123 | 0.099 | 0.063 | -0.262 | -0.482 |
| Honey (arboreal) | 0.636 | 0.014 | 0.223 | -0.590 | -0.074 | 0.521 | 0.280 | -0.209 | 0.093 | 0.316 | -0.141 | -0.274 |
| Ponerine sp. | 0.535 | -0.181 | 0.245 | 0.178 | 0.705 | 0.033 | 0.077 | 0.315 | -0.095 | -0.043 | -0.135 | -0.492 |
| *Dorylus kohli* | 0.000 | -0.136 | 0.277 | 0.357 | -0.503 | 0.327 | -0.167 | 0.226 | 0.402 | -0.278 | -0.014 | -0.313 |

Supplementary Material 10. Results of Hartigan’s dip tests of unimodality for tool length and diameter of tools used for all identified resource types. We found no significant multimodality, thus providing no support for the hypothesis that the resource was harvested using a tool set.

|  |  |  |  |
| --- | --- | --- | --- |
| Resource | Tool characteristic | D | P |
|  | Length |  |  |
| Epigaeic *Dorylus* |  | 0.033 | 0.851 |
| Ponerine ants |  | 0.036 | 0.991 |
| Honey (terrestial) |  | 0.045 | 0.903 |
| Honey (aboreal) |  | 0.107 | 0.435 |
| *Dorylus kohli* |  | 0.081 | 0.738 |
|  | Diameter |  |  |
| Epigaeic *Dorylus* |  | 0.042 | 0.479 |
| Ponerine ants |  | 0.054 | 0.624 |
| Honey (terrestial) |  | 0.046 | 0.898 |
| Honey (aboreal) |  | 0.111 | 0.331 |
| *Dorylus kohli* |  | 0.083 | 0.688 |

Supplementary Material 11. A comparison of midpoint diameters of the different tool-types (N=166 tools for which diameter was measured).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Resource type | No. tools | Avg. midpoint  diameter | SD | No. tools ≤0.65 cm diameter | % | No. tools ≤ 0.75 cm diameter | % |
| Honey ground | 33 | 1.2 | 0.3 | 0 | 0 | 3 | 9 |
| Honey tree | 8 | 1.2 | 0.4 | 0 | 0 | 1 | 13 |
| Epig. *Dorylus* | 72 | 1.3 | 0.3 | 1 | 1 | 2 | 3 |
| Ponerinae | 41 | 1.1 | 0.3 | 2 | 5 | 3 | 7 |
| *D. kohli* ants at site subset | 3 | 0.6 | 0.1 | 2 | 67 | 3 | 100 |
| *D. kohli* subset | 7 | 0.6 | 0.1 | 5 | 71 | 7 | 100 |
| *D. kohli* full set¹ | 12 | 0.6 | 0.1 | 10 | 83 | 12 | 100 |

¹ For 5 of these tools, we did not measure exact diameters, but estimated them to be, from a film of the tools in JS’s hand, about 2 cm in circumference, or 0.64 cm in diameter.

Supplementary Material 12.

Observation of tool use in the Gangu South Forest: 30 June 2005:

We (TH and team) had been following a noisy group of chimpanzees through the Gangu South Forest, observing their feeding remains at a fruit tree and listening to them fight over the carcass of a tree pangolin (*Phataginus tricuspis*). We arrived at a clearing and observed a group of about five chimpanzees foraging on the ground (N 4 16.402’, E 24 37.560’). An adult male and an adult female (with an infant on her belly) were crouched over a *Dorylus kohli* burrow using tools to dip for ants. The adult male held a tool in one hand and brought ants into his mouth, then chewed vigorously. A juvenile individual sitting in front of him leaned in closer to peer at what he was doing, causing the adult male to barkat the juvenile, who screamed and ran off. The adult male then returned to the hole and adjusted his ant dip wand. He continued dipping and we could clearly see that the adult female next to him was dipping as well. About a minute later, the chimpanzees noticed TH filming and fled silently. We moved forward and investigated the tool site. We collected three short stick tools, which were covered in *Dorylus kohli* ants and had been plucked from nearby saplings and stripped of their leaves. We collected a sample of the ants.This observation provided us with evidence that the Gangu chimpanzees use the ‘mouth-off’ technique to harvest these less aggressive ants, using short skinny tools.

Footage of the incident can be viewed here:

<https://www.youtube.com/watch?v=Ofy5qoumHVY>

Supplementary Material 13.

Observations of chimpanzee tool use via camera trap, 2012:

On 4 November 2012, at 14:52, four chimpanzees triggered a camera trap in the Gangu Forest (N 4º19.605’, E 24 º41.807’). An adult male passed by the camera first. Behind him, an adult female with an infant clinging to her belly arrived out of dense forest carrying a medium-length, thin wand in her mouth. She walked into the clearing and began using one hand to dip the wand into what were preseumably small insects swarming in several spots on the ground surface. She brought the wand one-handed into her mouth several times, picking off the insects with her lips. Behind her, a juvenile or subadult individual (probably a female) moved through the dense forest behind the clearing and tore off a tool from the vegetation. The adult female moved off. In the next clip, at 14:54, the young individual followed in the older female’s footprints, dipping the wand into the insects with one hand and plucking them off with the mouth. The individual appeared at one point to brush insects off its hair and then followed the adult female off-camera. It is unlikely that the insects in this clip were epigaeic driver ants, given that they were spread out over the clearing (i.e., not in a travel stream), yet the chimpanzees appeared to walk through them with very little irrititation. It is unlikely as well that chimpanzees could fish for surface-swarming *Macrotermes* in this way, and anyway, there was no other evidence of *Macrotermes* consumption at this site. The insects are most likely to be *Dorylus kohli*, a relatively unaggressive non-epiageic species, for which the chimpanzees have been previously filmed using wands to dip for while sitting right in the center of the swarm. These clips are available at:

<https://www.youtube.com/watch?v=lH6TqJbG5tw>

<https://www.youtube.com/watch?v=9QP4v056q6E>

Supplementary Material 14. Depths of insect holes for epigaeic driver ants and other insect species at tool sites (a), and length to which these tools were found thrust into the different kinds of insect holes (b). The median is indicated by the horizontal line; the box depicts the quartiles and the whiskers the quantiles (encompassing 2.5 and 97.5%). The raw datapoints are plotted in partially-transparent grey, resulting in darker colours when points overlap.

**A.**

****

**B.**

****

Supplementary Material 15. Plant sources used to construct the different kind of tools in northern DRC. Scientific names: italics; family names: \*; local Kizande language names: normal font. Unidentified plants, including almost all South Uele tools, were not included in the totals.%s are rounded, thus do not always total 100.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Plant name | *D.kohli* | Epigaeic  *Dorylus* | Honey ground | Honey  tree | Ponerine ant sp. | Unknown | Total |
| *Aidia micrantha* | 0 | 1 **2%** | 0 | 0 | 1 **5%** | 0 | 2 **1%** |
| *Aulacocalyx jasminiflora* | 0 | 4 **7%** | 2 **10%** | 0 | 3 **14%** | 0 | 9 **7%** |
| Bakilamama | 0 | 0 | 0 | 0 | 0 | 1 **4%** | 1 **1%** |
| Basanbangwa | 0 | 0 | 0 | 0 | 1 **5%** | 0 | 1 **1%** |
| Begbe | 0 | 1 **2%** | 0 | 0 | 0 | 0 | 1 **1%** |
| *Belenophora coffeoides* | 2 **22%** | 0 | 2 **10%** | 0 | 5 **23%** | 0 | 9 **7%** |
| Bese | 0 | 0 | 0 | 0 | 0 | 2 **7%** | 2 **2%** |
| *Blighia welwitschia* | 0 | 1 **2%** | 0 | 0 | 0 | 0 | 1 **1%** |
| Bugilo | 0 | 1 **2%** | 0 | 0 | 0 | 0 | 1 **1%** |
| *Caloncoba glauca* | 0 | 1 **2%** | 0 | 0 | 0 | 0 | 1 **1%** |
| *Carapa* sp. | 0 | 3 **6%** | 0 | 0 | 0 | 0 | 3 **2%** |
| *Celtis philipensis* | 0 | 1 **2%** | 3 **14%** | 0 | 0 | 0 | 4 **3%** |
| *Clerodendron schweinfurthii* | 0 | 0 | 0 | 0 | 0 | 3 **11%** | 3 **2%** |
| *Coffea canophera* | 0 | 0 | 0 | 0 | 1 **5%** | 0 | 1 **1%** |
| *Cola urceolata* | 0 | 5 **9%** | 0 | 0 | 0 | 0 | 5 **3%** |
| *Combretum mucronatum* | 0 | 2 **4%** | 0 | 0 | 0 | 0 | 2 **2%** |
| *Diospyros canaliculata* | 0 | 0 | 5 **24%** | 1 **25%** | 1 **5%** | 6 **21%** | 13 **9%** |
| *Diospyros iturensis* | 0 | 1 **2%** | 0 | 0 | 0 | 0 | 1 **1%** |
| *Dracoena camerooniana* | 0 | 0 | 1 **5%** | 0 | 0 | 0 | 1 **1%** |
| Duambo | 0 | 0 | 0 | 0 | 1 **5%** | 0 | 1 **1%** |
| *Garcinia ovalifolia* | 0 | 0 | 0 | 0 | 0 | 1 **4%** | 1 **1%** |
| Kbuh | 1 **11%** | 0 | 0 | 0 | 0 | 0 | 1 **1%** |
| Kobanzuwa | 0 | 2 **4%** | 0 | 0 | 0 | 2 **7%** | 4 **3%** |
| Kpembala | 0 | 1 **2%** | 0 | 0 | 0 | 0 | 1 **1%** |
| Kpopongo | 0 | 0 | 0 | 0 | 1 **5%** | 0 | 1 **1%** |
| Kulegboli | 0 | 1 **2%** | 0 | 0 | 0 | 0 | 1 **1%** |
| *Leptonychia* sp. | 0 | 1 **2%** | 3 **14%** | 3 **75%** | 2 **9%** | 1 **34%** | 10 **7%** |
| Lige | 0 | 1 **2%** | 1 **5%** | 0 | 0 | 0 | 2 **2%** |
| Marantaceae \* | 0 | 1 **2%** | 0 | 0 | 0 | 1 **4%** | 2 **2%** |
| Mbaso | 0 | 0 | 0 | 0 | 0 | 1 **4%** | 1 **1%** |
| *Megaphrynium* sp. | 0 | 0 | 0 | 0 | 2 **9%** | 0 | 2 **2%** |
| *Memecylon myrianthum* | 0 | 0 | 0 | 0 | 0 | 2 **7%** | 2 **2%** |
| Munungbu | 0 | 2 **4%** | 0 | 0 | 0 | 0 | 2 **2%** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Plant name | *D.kohli* | Epigaiec  *Dorylus* | | Honey ground | Honey.tree | Ponerine ant sp. | Un-known | Total |
| *Ochtocosmus africana* | 0 | 1 **2%** | 0 | | 0 | 0 | 0 | 1 **1%** |
| *Paramacrolobium coeruleum* | 0 | 2 **4%** | 0 | | 0 | 0 | 0 | 2 **2%** |
| Povulugo | 0 | 2 **4%** | 0 | | 0 | 0 | 0 | 2 **2%** |
| *Rauvolfia mannii* | 0 | 2 **4%** | 0 | | 0 | 0 | 0 | 2 **2%** |
| *Rinorea claessensii* | 0 | 6 **11%** | 0 | | 0 | 0 | 0 | 6 **4%** |
| *Rinorea* sp. | 0 | 1 **2%** | 0 | | 0 | 0 | 0 | 1 **1%** |
| *Rothmannia urcelliformis* | 0 | 2 **4%** | 0 | | 0 | 0 | 0 | 2 **2%** |
| *Rothmannia whitefieldii* | 2 **22%** | 2 **4%** | 0 | | 0 | 0 | 3 **11%** | 7 **5%** |
| Sambilo | 1 **11%** | 0 | 0 | | 0 | 0 | 0 | 1 **1%** |
| *Scottellia klaineana* | 0 | 1 **2%** | 0 | | 0 | 0 | 0 | 1 **1%** |
| *Strychnos camptoneura* | 2 **22%** | 0 | 0 | | 0 | 0 | 0 | 2 **2%** |
| *Strychnos* sp. | 1 **11%** | 0 | 1  **5%** | | 0 | 1 **5%** | 0 | 3 **2%** |
| Sutulo | 0 | 0 | 0 | | 0 | 0 | 1 **4%** | 1 **1%** |
| *Tabernaemontana* sp. | 0 | 3 **6%** | 0 | | 0 | 1 **5%** | 0 | 4 **3%** |
| *Trichilia rubescens* | 0 | 2 **4%** | 0 | | 0 | 0 | 3 **11%** | 5 **3%** |
| Zawa | 0 | 0 | 0 | | 0 | 2 **9%** | 0 | 2 **2%** |
| Zelengembembe | 0 | 0 | 0 | | 0 | 0 | 1 **4%** | 1 **1%** |
| Zezingama | 0 | 0 | 3 **14%** | | 0 | 0 | 0 | 3 **2%** |
| TOTALS | 9 | 54 | 21 | | 4 | 22 | 28 | 138 |

Supplementary Material 16. Numbers of percussive artifacts per survey region, along with weaver ant crush sites and soil dig sites (Table 9). We omit termite mound sites without a substrate and snail pounding sites lacking cracked shells < 10 m of a bruised tree or root.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Time period | Km walked per region | No. termite mound pounding sites | No. pounded termite mounds | No. snail pounding sites | No. pounded snails | No. pounded tortoises | No. fruit pounding sites | No. pounded fruits | No. soil dig sites | No. weaver ant*.* nest-crush sites |
| Camp Louis | Aug 04-  Mar 13 | 1430.6 | 13 | 16 | 3 | 5 | 1 | 1 | 5 | 1 | 0 |
| Dume | Aug-Sept 12 | 93.6 | 0 | 0 | 8 | 26 | 0 | 0 | 0 | 0 | 0 |
| Gangu N | Mar 05-Mar 13 | 813.5 | 19 | 22 | 26 | 45 | 0 | 26 | 120 | 1 | 1 |
| Gangu S | June 05-Nov 13 | 135.9 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Bili S | Jul 06–Nov 06 | 205.2 | 8 | 12 | 6 | 13 | 0 | 0 | 0 | 6 | 0 |
| Zapay | Dec 06 | 49.9 | 0 | 0 | 3 | 6 | 0 | 0 | 0 | 1 | 0 |
| Bambillo | Oct-Nov 12 | 76.2 | 0 | 0 | 6 | 17 | 0 | 0 | 0 | 0 | 0 |
| Gbangadi | Dec 06 | 31.7 | 5 | 6 | 2 | 4 | 0 | 1 | 4 | 0 | 0 |
| Nawege-Zaza | Sept 06, Aug 08 | 21.7 | 1 | 1 | 2 | 8 | 0 | 0 | 0 | 0 | 0 |
| Lebo | Sept 06, Aug 08 | 41.3 | 1 | 1 | 7 | 17 | 0 | 0 | 0 | 1 | 0 |
| Bambesa | Apr– May 08 | 64.9 | 1 | 1 | 25 | 44 | 0 | 0 | 0 | 2 | 0 |
| Leguga | Mar 08 | 48.5 | 3 | 9 | 35 | 66 | 1 | 0 | 0 | 1 | 0 |
| Buta | Sept– Oct 08 | 25.6 | 0 | 0 | 2 | 11 | 0 | 0 | 0 | 0 | 0 |
| Ngume | Oct 08 | 37.5 | 4 | 6 | 11 | 16 | 0 | 0 | 0 | 0 | 0 |
| Akuma-Yoko | Jun 08-Nov08 | 22.4 | 5 | 6 | 6 | 11 | 0 | 0 | 0 | 2 | 0 |
| Mbange East | Jan 08 | 80.9 | 6 | 9 | 5 | 11 | 0  0 | 0  0 | 0  0 | 1 | 0  0 |
| Mbange West | Jan 08-Feb 08 | 45.5 | 2 | 3 | 6 | 14 | 0 | 0 | 0 | 0 | 0 |
| Lingo | Nov 08 | 38.5 | 2 | 4 | 8 | 27 | 0 | 0 | 0 | 0 | 0 |
| Zongia | Nov 08 | 35.7 | 2 | 2 | 7 | 20 | 0 | 0 | 0 | 0 | 0 |
| N of Uele Total | Aug 04-Mar 13 | 2858.2 | 46 | 57 | 57 | 125 | 1 | 28 | 129 | 9 | 1 |
| S of Uele | Sept 06, Nov 07-Feb 09 | 440.9 | 26 | 41 | 112 | 237 | 1 | 0 | 0 | 7 | 0 |
| Total | Aug 04-Mar 13 | 3299 | 72 | 98 | 169 | 362 | 2 | 28 | 129 | 16 | 1 |
| Rubi-Tele | 2014-2016 | 1066 | 12 | 22 | 10 | 11 | 0 | 0 | 0 | 0 | 0 |

Supplementary Material 17.

*Two additional case studies of termite mound pounding*

*Case One*

On 21 April 2005, we (TH and team) encountered a noisy group of chimpanzees in a forest patch near Camp Louis, at N 4°20.564’, E 24°58.064’. We observed an adult male dangling from a branch and heard several more individuals vocalizing in the trees and on the ground. Directly under the tree in which the adult male was located, approximately 30 m to our south, we listened for 3.5 minutes to a steady thumping of a heavy object against a substrate. We agreed that what we were likely hearing was termite mound-pounding behaviour. Soon afterwards, the adult male descended and the chimpanzees moved away. We moved forward to search for the mound we had heard being pounded open, and found it immediately, a mushroom-shaped mound (most likely *Cubitermes*) which had just been pulverized against the root of a tree. On the bark of the tree was a patch of bruised bark. Tiny termites, some all white and some white with grey heads, wiggled around inside the broken mound; others were were scattered about on the ground. From that point, we traced the trail of the chimpanzee backward through dense forest: 7 paced metres northwest, we could see that it had struck the same mound against the side of another tree, leaving a bare, bark-less spot covered in termite mound dirt. Five meters west of this, the chimpanzee had struck the mound against a root, leaving an exposed bruise on the root, and a mass of wiggling white termites. We continued tracing the trail backwards 77 m from the pound site and found the original source from which the chimpanzee had detached the termite mound, with a chimpanzee print next to it. The evidence indicated that the chimpanzee had ripped off the mound, and walked to the tree buttresses through dense, low-visibility forest carrying a large chunk of termite mound in its hand, periodically stopping to strike it against substrates.

*Case Two*

25 April 2005 - As we approached a loud group of pant-hooting chimpanzees near the village of Baday, we heard several loud thumps of something being struck against a substrate. We saw a small chimpanzee descending a tree above the source of the thumping noise (N 4°22.673’, E 25°00.126’). Investigating the area, we found a root and two buttresses against which chunks of termite mounds (probably *Cubitermes* sp.) had just been pounded open. These substrates were bruised and covered in termite mound mud; termite remains, living termites, and crumbled dirt from the mound were scattered around them. We found chimpanzee prints around the smash sites. One of the termite mounds had been pulled down from the side of one of the substrate trees. Tracker Likongo explained to us why we were now seeing so much termite mound pounding: the rains, he said, had softened the mounds, making them easier to break open.

*Additional notes:*

We do not know exactly what the chimpanzees were feeding on in these pounded termite mounds. We found no termite remains in our 46 dung washes between October 2004 and July 2005 (during which time we had encountered numerous smashed termite mounds), although in two cases we found what may have been dirt from a termite mound. Several possibilities present themselves: the apes may have been feeding on dirt from the mound, eggs, larvae, or the termites themselves, or a combination of the above. If it were larvae or eggs, we would not expect these to be visible in the faeces. It is doubtful that adult termites would be visible either, as both *Thoracotermes* and *Cubitermes*, unlike *Macrotermes*, are tiny, soft-bodied insects. Because the mounds were broken open to reveal the wiggling insects, it appears likely that the chimpanzees were feeding on them and not just the dirt, as chimpanzees have been observed to do in the northern community of the Taï Forest (L. Luncz, pers. comm., 14 June, 2010).

Supplementary Material 18. Number of pounded termite mounds at the 19 main survey regions north and south of the Uele River (2004-2008; data from 2012 not included), substrate-types, and season when discovered.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Location | No. sites | No. mounds smashed | Substrate type of each smashed mound | % sites found in dry season (Dec – March) | Tree species substrates |
| N of Uele | 43 | 51 | 29 roots  7 tree bases  1 buttress  8 rocks  1 vine  1 stick  3 ground  1 not recorded | 16% | 1 *Blighia welwitschia*  2 *Carapa procera*  1 *Celtis tessmannii*  2 *Diospyros canaliculata*  1 *Erythrophleum suaveolens*  2 *Gilbertiodendron dewevrei*  1 *Myrianthus arboreus*  1 *Ricinodendron hendelowi*  1 *Strychnos camptoneura*  1 *Tabernae* sp.  1 *Trichilia rubescens* |
| S of Uele | 32 | 45 | 22 roots  8 buttresses  1 root + buttress 3 logs  10 ground  1 stick | 31% | 1 *Annonidium mannii*  1 bois rouge  2 *Gilbertiodendron dewevrei*  1 *Hallea stipulosa*  1 *Klainedoxa gabonensis* |
| All | 75 | 96 | 51 roots  7 tree bases  3 logs  1 root + buttress  9 buttresses  8 rocks  1 vine  2 sticks  13 ground  1 not recorded | 28% | 1 *Annonidium mannii*  1 bois rouge  1 *Blighia welwitschia*  2 *Carapa procera*  1 *Celtis tessmannii*  2 *Diospyros canaliculata*  1 *Erythrophleum suaveolens*  4 *Gilbertiodendron dewevrei*  1 *Hallea stipulosa*  1 *Klainedoxa gabonensis*  1 *Myrianthus arboreus*  1 *Ricinodendron hendelowi*  1 *Strychnos camptoneura*  1 *Tabernae* sp.  1 *Trichilia rubescens*  46 unknown tree species |

Supplementary Material 19A. Pounded termite mounds found in the main survey regions per km walked across the different months of the year. Here we include pounding sites without substrates (N=10). We highlight dry season months in bold print, although the first rains begin towards the end of March.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Month | Km walked per month | All termite mound pounding sites | Encounter rate per km (rounded) | Fresh termite mound pounding sites only | Encounter rate per km (rounded) |
| **January** | 315.9 | 10 | 0.032 | 2 | 0.006 |
| **February** | 120.5 | 0 | 0 | 0 | 0 |
| **March** | 184.0 | 5 | 0.027 | 3 | 0.016 |
| April | 210.2 | 7 | 0.033 | 4 | 0.019 |
| May | 137.2 | 7 | 0.051 | 2 | 0.015 |
| June | 130.5 | 10 | 0.077 | 4 | 0.031 |
| July | 163.1 | 5 | 0.031 | 1 | 0.006 |
| August | 441.5 | 17 | 0.039 | 2 | 0.005 |
| September | 473.7 | 3 | 0.006 | 1 | 0.002 |
| October | 563.0 | 6 | 0.011 | 3 | 0.005 |
| November | 391.0 | 5 | 0.013 | 1 | 0.003 |
| **December** | 168.3 | 7 | 0.042 | 2 | 0.012 |
| Totals | 3299 | 82 | 0.025 | 26 | 0.008 |

Supplementary Material 19B. Pounded termite mounds found in the main survey regions per km walked across the different months of the year. Here we exclude pounding sites without substrates (N=10). We highlight dry season months in bold print, although the first rains begin towards the end of March.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Month | Km walked per month | All termite mound pounding sites | Encounter rate per km (rounded) | Fresh termite mound pounding sites only | Encounter rate per km  (rounded) |
| **January** | 315.9 | 9 | 0.029 | 2 | 0.006 |
| **February** | 120.5 | 0 | 0 | 0 | 0 |
| **March** | 184.0 | 3 | 0.016 | 3 | 0.016 |
| April | 210.2 | 6 | 0.029 | 4 | 0.019 |
| May | 137.2 | 7 | 0.051 | 2 | 0.015 |
| June | 130.5 | 9 | 0.069 | 1 | 0.008 |
| July | 163.1 | 5 | 0.031 | 1 | 0.006 |
| August | 441.5 | 14 | 0.032 | 2 | 0.005 |
| September | 473.71 | 3 | 0.006 | 1 | 0.002 |
| October | 563.0 | 6 | 0.011 | 3 | 0.005 |
| November | 391.0 | 4 | 0.010 | 1 | 0.003 |
| **December** | 168.3 | 6 | 0.036 | 2 | 0.012 |
| Totals | 3299 | 72 | 0.022 | 22 | 0.007 |

Supplementary Material 20. Fruit-pounding sites, north of the Uele River, 2004-2013. Uk = Unknown.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Date | Location | No. fruits | No. revisits | Species | Sub-strate | Chimpanzee  evidence <50m? | |
| 1 | Apr 05 | Gangu N | 1 | 0 (fresh) | Buta (*Strychnos camptoneura*) | Log | | Nest site |
| 2 | Aug 06 | Gangu N | 1 | 0 (fresh) | Ndefu (*Saba comorensis)* | Root | |  |
| 3 | Aug 06 | Gangu N | 32 | Uk (old) | Buta (*S. camptoneura*) | 2 rocks | |  |
| 4 | Aug 06 | Gangu N | 3 | Uk (old) | Buta (*S.camptoneura*) | Rock | |  |
| 5 | Aug 06 | Gangu N | 8 | Uk (old) | Buta (*S. camptoneura*) | Rock | |  |
| 6 | Oct 06 | Gangu N | 4 | Uk (old) | Buta (*S. camptoneura*) | Rock | |  |
| 7 | Oct 06 | Gangu N | 3 | Uk (old) | Buta (*S. camptoneura*) | Rock | |  |
| 8 | Oct 06 | Gangu N | 1 | 0 (fresh) | Buta (*S. camptoneura*) | Rock | |  |
| 9 | Oct 06 | Gangu N | 1 | 0 (fresh) | Burlumanza (*Strychnos* sp.) | Root | |  |
| 10 | Dec 06 | Gbangadi | 4 | Uk (old) | Buta (*S. camptoneura*) | Vine | |  |
| 11 | Jan 07 | Gangu N | ≥ 4 | Uk (old) | Buta (*S. camptoneura*) | 2 roots | |  |
| 12 | Jan 07 | Gangu N | 1 | 0 (fresh) | Buta (*S. camptoneura*) | Root | | Feeding remains (*Afzelia africana*) |
| 13 | Jan 07 | Gangu N | 3 | 0 (fresh) | Buta (*S. camptoneura*) | Root | |  |
| 14 | Jan 07 | Gangu N | 3 | 2 (1 fresh, 1 recent, 1 old) | Buta (*S. camptoneura*) | Rock | |  |
| 15 | Jan 07 | Gangu N | ≥ 2 | 1 (today, yesterday) | Buta (*S. camptoneura*)) | 2 roots | | Nest site, prints |
| 16 | Jan 07 | Gangu N | 5 | 1 (3 fresh and 2 old) | Burlumanza (*Strychnos* sp.) | Root | |  |
| 17 | Jan 07 | Gangu N | 19 | 2 (1 of yesterday, 6 from 1 month,12 of 1 year) | Burlumanza (*Strychnos* sp*.*) | 4 roots | |  |
| 18 | Jan 07 | Gangu N | 1 | 0 (fresh) | Burlumanza (*Strychnos* sp.) | Rock | |  |
| 19 | Jan 07 | Gangu N | 1 | 0 (fresh) | Burlumanza (*Strychnos* sp.) | Rock | | Feeding remains (*Afzelia africana*) |
| 20 | Jan 07 | Gangu N | 6 | 0 (recent) | Burlumanza (*Strychnos* sp.) | Root | |  |
| 21 | Jan 07 | Gangu N | 2 | 1 (1 fresh and 1 old) | Burlumanza (*Strychnos* sp.) | Rock | | Feeding remains (*Klainedoxa gabonensis*) |
| 22 | Feb 07 | Camp Louis | 5 | 2 (1 yesterday, 1 recent, 3 old) | Buta (*S. camptoneura*) | 2 roots  1 vine | | Feeding remains  (*S. camptoneura*) |
| 23 | Aug 12 | Gangu N | 6 | 0 (old) | Buta (*S. camptoneura*) | Rock | |  |
| 24 | Aug 12 | Gangu N | 1 | 0 (fresh) | Tindu (*Strychnos* sp.) | Vine | |  |
| 25 | Aug 12 | Gangu N | 1 | 0 (old) | Kindu (*Caloncoba glauca*) | Vine | | Dirt-digging |
| 26 | Aug 12 | Gangu N | 1 | 0 (fresh) | Ndefu (*S. comorensis)* | Tree | | Knuckle print,  bite mark, nest |
| 27 | Sept 12 | Gangu N | 9 | 0 (old) | Buta (*Strychnos*) | Rock | |  |
| 28 | March 13 | Gangu N | 1 | 0 (recent) | Probably *Strychnos* | Rock | |  |

Supplementary Material 21.

Lukuru Wildlife Foundation researcher Henri Silegowa made the following observation in the Dume Forest just east of Camp Louis at 11:52 on 17 August 2012 (N 4º 28.134’, E 25º02.560’). He first heard an adult chimpanzee pant hooting about 25 m ahead on the transect. As his team approached, they heard the sounds of the chimpanzee fleeing to the north. When they explored the site where the chimpanzee had been sitting 2 m north of the transect, they saw a freshly-smashed African giant snail (local name: *mbembe*). The *maji* tree substrate had a fresh bruise exuding sap with snail shell fragments projecting from it. The freshly smashed *mbembe* contained snail flesh, and snail eggs were scattered about on the ground. Soon after, they heard the chimpanzee vocalize (hoots or whimpers) from the direction it had fled, approx. 50 m N (Appendix 18C).

Supplementary Material 22. Additional information on non-tool artefacts shown in Table 11. Bold print beneath ground nests = % of total nests, whereas bold elsewhere represents encounter rates per km. Nr = not recorded.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Region | Km walked, nests | Ground nests / total nests | Km walked, other | Leaf cushions / km | Snail pounding sites (and individuals) / km | Snail pounding sites (and individuals) within 10 m of chimpanzee sign | | Snail pounding sites (and individuals) within 50 m of chimpanzee sign | |
| Gangu N | 508.5 | 48 / 622  **7.7%** | 813.5 | 3  **0.004** | 26 (45)  **0.03 (0.06)** | | 0 | | 0 |
| Gangu S | 93.6 | 1 / 86  **1.2%** | 135.9 | 0 | 1 (1)  **0.01 (0.01)** | | 0 | | 0 |
| Camp Louis | 1178.9.6 | 60 / 407  **14.7%** | 1430.6 | 2  **0.001** | 3 (5)  **0.002 (0.004)** | | 0 | | 0 |
| Zapay | 49.9 | 10 / 128  **7.8%** | 49.9 | 0 | 3 (6)  **0.06 (0.12)** | | 1 (3)  **0.02 (0.06)** | | 1 (3)  **0.02 (0.06)** |
| Gbangadi | 31.7 | 3 / 98  **3.1%** | 31.7 | 0 | 2 (4)  **0.06 (0.13)** | | 1 (1)  **0.03 (0.03)** | | 1 (1)  **0.03 (0.03)** |
| Dume | 66.6 | 1 / 15  **6.7%** | 93.6 | 0 | 8 (26)  **0.09 (0.28)** | | Nr | | Nr |
| Bambillo | 59.7 | 1 / 44  **2.3%** | 76.2 | 0 | 6 (17)  **0.08 (0.22)** | | Nr | | Nr |
| Bili South | 205 | 6 / 115  **5.2%** | 205 | 0 | 6 (13)  **0.03 (0.06)** | | 2 (3)  **0.01 (0.02)** | | 4 (7)  **0.02 (0.03)** |
| Nawege-Zaza | 13.8 | 0 / 32  **0** | 21.7 | 0 | 2 (8)  **0.09 (0.37)** | | 1 (1)  **0.05 (0.05)** | | 1 (1)  **0.05 (0.05)** |
| Lingo | 38.5 | 0 / 40  **0** | 38.5 | 0 | 8 (27)  **0.21 (0.70)** | | 0 | | 1 (5)  **0.03 (0.13)** |
| Zongia | 35.7 | 3 / 31  **9.7%** | 35.7 | 1  **0.03** | 7 (20**)**  **0.20 (0.56)** | | 2 (11)  **0.06 (0.31)** | | 3 (12)  **0.08 (0.34)** |
| Mbange East | 80.9 | 1 / 92  **1.1%** | 80.9 | 1  **0.01** | 5 (11)  **0.06 (0.14)** | | 0 | | 0 |
| Mbange West | 45.5 | 0 / 70  **0** | 45.5 | 0 | 6 (14)  **0.13 (0.31)** | | 1 (1)  **0.02 (0.02)** | | 3 (7)  **0.07 (0.15)** |
| Lebo | 39.3 | 4 / 163  **2.5%** | 41.3 | 3  **0.07** | 7 (17)  **0.17 (0.41)** | | 1 (1)  **0.02 (0.02)** | | 2 (2)  **0.05 (0.05)** |
| Leguga | 43.7 | 33 / 114  **29%** | 48.5 | 4  **0.08** | 35 (66)  **0.72 (1.36)** | | 2 (3)  **0.04 (0.06)** | | 3 (5)  **0.06 (0.10)** |
| Bambesa | 65 | 34 / 224  **15.2%** | 65 | 1  **0.02** | 25 (44)  **0.39 (0.68)** | | 5 (8)  **0.08 (0.12)** | | 8 (12)  **0.12 (0.19)** |
| Akuma-Yoko | 22.4 | 2 / 37  **5.4%** | 22.4 | 3  **0.13** | 6 (11)  **0.27 (0.49)** | | 1 (1)  **0.05 (0.05)** | | 2 (2)  **0.09 (0.09)** |
| Buta | 25.6 | 0 / 39  **0** | 25.6 | 0 | 2 (11)  **0.08 (0.43)** | | 0 | | 1 (5)  **0.04 (0.20)** |
| Ngume | 37.5 | 0 / 37.5  **0** | 37.5 | 0 | 11 (16)  **0.29 (0.43)** | | 0 | | 0 |