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Front cover : The holotype of ( *Polyrhachis mkomaziae* ) TAYLOR & MCGAVIN, 2020

# Ants found on acacia of the genus *Vachellia* and other savannah trees at Mkomazi Game Reserve, Tanzania with the description of a new species (Hymenoptera: Formicidae)

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## Abstract

Sampling of ten species of trees in the Mkomazi Game Reserve, Tanzania, by a pyrethrum knock-down technique yielded forty-six species of ants. The results are compared with findings on acacia *Vachellia* trees in Kenya and show a different pattern of occupation. In addition to dominant species of *Crematogaster*, we give an appendix with notes on all the ants. There are first reports for Tanzania of 25 species. A new species, *Polyrhachis mkomaziae*, is described. The species status is changed for: *Crematogaster rauana* Forel, 1907 and *Crematogaster tenuipilis* Santschi, 1937, which are given new status. *Nesomyrmex latinodis* (Mayr, 1895). *Camponotus mombassae* Forel, 1886, *Crematogaster tricolor* Gerstäcker, 1859 *Tetraponera bifoveolata* (Mayr, 1895) and, *Tetraponera erythraea* (Emery, 1895) are given revived status.

**Keywords:** Ants, Acacia, Tanzania, Mkomazi, new species

## Introduction

The primary background to this study is the investigation of acacia insect communities initiated at Mkomazi Game Reserve, north-east Tanzania, in late-1995 (KRÜGER & MCGAVIN, 1998a, 1998b). The investigation was broadened to include other tree species in subsequent years. The Mkomazi Ecological Research Programme was organised by the Royal Geographical Society (with the Institute of British Geographers), the Government of Tanzania Department of Wildlife and the University of Oxford. The main publication from the RGS study at Mkomazi is *Mkomazi. The Ecology, Biodiversity and Conservation of A Tanzanian Savanna* (1999) Malcolm COE, Nicholas MCWILLIAM, Graham Stone and Michael Packer (Eds.) Royal Geographical Society. This contains all results and reports of the many studies carried out during the course of the programme 1993-1997. Reporting on ants from Mkomazi and the surrounding areas of Gonja Forest Reserve, the riverine forest above Kisiwani and the South Parc and West Usambara Forests, ROBERTSON (1999) listed a total of 232 species. He noted, however, that only 78 species came from genera that had been revised to modern standards and that the proportion of undescribed species in the remaining genera was probably greater than 31%. Ants collected from trees in grassland/woodland came to about 23% of the total from that habitat and 29.9% of ants from hilltop forests were from on trees. On the Mkomazi Reserve as a whole, he noted that there was no lowland forest within its borders and the hilltop forests had a distinctive fauna, both on the trees and inhabiting leaf litter, that did not overlap all that closely with the others studied (above).

Otherwise in Tanzania, COCHARD & AGOSTI (2008) gave a short summary of an investigation of *Vachellia zanzibarica* (S.Moore) Kyal. & Boatwr., at Mkwaja ranch on the coast south-east of Mkomazi. The acacia species had become established between 1954 and 2000 under intensive

cattle grazing and in the virtual absence of browsing by wildlife. In 2002 a survey revealed *Crematogaster* (Cr.) *sjostedti* Mayr, 1907, occupied 99% of those trees found to have ant colonies.

The main reported findings on acacia ants outside Tanzania have come from the work of YOUNG *et al.* (1997), who intensively studied a relatively small area of wooded grassland at Laikipia, north-central Kenya, an area of “black cotton” vertisol soils. This grassland has a moderate tree cover, composed primarily of two species of swollen-thorn acacias, *Vachellia drepanolobium*, Harms ex Y.Sjöstedt, and *V. seyal* ssp. *seyal*, (Delile) P.J.H.Hurter. The former is by far the more abundant. They reported that seven species of ant were found on *V. drepanolobium*, with four species being common and mutually exclusive. Three were *Crematogaster* species: Cr. (Cr.) *mimosae* Santschi, 1914; Cr. (Cr.) *nigriceps* Emery, 1897; and, Cr. (Cr.) *sjostedti* Mayr. The fourth was a very different ant, *Tetraponera penzigi* (Mayr, 1907). In addition, a fourth mutually exclusive *Crematogaster*, of the subgenus *Orthocrema*, was found in the swollen thorns of one *V. drepanolobium* tree. The foregoing ants all appear to use the swollen thorns as nests to shelter workers and raise brood. Two Camponotine species, *Camponotus* (*Myrmisolepis*) *braunsi* Mayr, 1895, and *Camp.* (*Myrmosericus*) *rufoglaucus* (Jerdon, 1851) were found. The latter were regarded as generalists, not inhabiting the swollen thorns. *V. seyal* ssp *seyal* does not produce swollen thorns but the related variety *fistula* does. The swollen thorns of the latter were found to be inhabited by Cr. *sjostedti* and two other species; Cr. (Cr.) *castanea* F. Smith, 1858 (*sensu lato*), entirely honey-coloured, and *Lepisiota canescens* (Emery, 1897) (*sensu lato*), a tiny entirely black ant. From a series of manual examinations of 536 *A. drepanolobium* trees, a pattern of colonization was observed. In the youngest trees (< 0.5 m), Cr. *mimosae* was common, with *Tet. penzigi* and Cr. *sjostedti* at low frequency. In the next size class ca (0.5 m) the proportion of uninhabited trees was almost nil, with *Tet. penzigi* and Cr. *nigriceps* being more common. Curiously, from that size on Cr. *mimosae* and Cr. *sjostedti* became more common at the expense of *Tet. penzigi* and Cr. *nigriceps*.

STANTON *et al.* (1999) described how Cr. *mimosae* and Cr. *sjostedti* stream onto *V. drepanolobium* trees and attempt to dislodge workers and brood of Cr. *nigriceps* or *Tet. penzigi* from inside the swollen thorns. They noted how Cr. *nigriceps* was evicted from its host tree more than any other ant but *Tet. penzigi* successfully defended its host tree from attack 71% of the time. Cr. *nigriceps*, however, appeared to have evolved a defence strategy of pruning their host tree so that the canopy was isolated from contact with neighbouring trees, in effect creating a “moat” around their domain. Thus, competitor ants could only access the host trees via its trunk. YOUNG & STANTON (2002) added the knowledge that single *Crematogaster* colonies often occupy multiple trees whereas *Tet. penzigi* generally only control a single contiguous canopy. ISBELL & YOUNG (2007) examined the ant species living in ant domatia of *V. drepanolobium* and forming part of the staple diet of patas monkeys (*Erythrocebus patas*). The ants were those already mentioned with the exception of Cr. *sjostedti* which does not nest in the domatia. This study has also given rise to some sweeping statements. For instance, PALMER (2004) claimed - “across hundreds of thousands of hectares throughout East Africa, *V. drepanolobium* trees are used as nesting sites by four species of specialist-plant ants: Cr. *mimosae*, Cr. *nigriceps*, Cr. *sjostedti* and *Tet. penzigi*”. The entomological literature from the first description of *Tet. penzigi* contains only four records prior to YOUNG *et al.* (1997) and even that has findings only from one area of Kenya. The same applies to Cr. *mimosae* and there are seven records of Cr. *nigriceps*. Although there are many more reports of Cr. *sjostedti* most of those concern so-called subspecies and varieties from outside East Africa. A recent paper with references to the on-going studies in Kenya is that of PRIOR & PALMER (2018). The authors sought to examine the mutual benefits to the host trees and the hosted ants. *Crematogaster mimosae* is the ecologically dominant ant in the system and protects the trees from mega-herbivores. The trees provide housing and carbohydrate-rich nectar from extra-floral nectaries. It also appears that scale insects played a



role in providing honey-dew in dry period when the nectaries were producing little food for the ants.

The published taxonomic knowledge of ants from the sub-Saharan region ranges from excellent for a relatively small number of genera to poor for most genera. Although much has been done to review and elucidate African ants over the past 50 years, the great and many-membered genera *Camponotus*, *Crematogaster*, *Lepisiota* and *Pheidole*, which constitute perhaps the most influential groups in terms of their impact on the general and commercial ecosystems, remain almost completely untackled. The senior author has compiled an almost complete illustrated catalogue of all the named species, with subspecies, varieties and other subspecific forms (TAYLOR, 1998-ongoing). This can be found on-line at <http://www.antsofafrica.org/>. The site is funded until 2026 and is archived by the British Library web archive. An early career in vector ecology taught the senior author that precise species identification was crucial to understanding and, perhaps, influencing disease transmission. In that context, the concept of “morphospecies” that existed and still exists amongst, say, those seeking to identify particular ecosystems is insufficient. Thus, the key objective of the website is to move on from the use of code designations for genotypes or more recently “morphospecies” to a situation where, at least, literature-based names are allocated to specimens backed up with diagnostic illustrations of the specimens. Thus, even if subsequent revisionary studies reveal the identifications to be incorrect or new species recognized, there is a sound reference point for interpreting the ecological findings. To avoid a proliferation of references the early taxonomic literature is not cited here but is accessible on the website.

## Methods

### *Study site (Figs 1-2)*

The Mkomazi Game Reserve is located in north-east Tanzania and lies adjacent to the Kenyan border and the Tsavo (West) National Park. It covers an area of circa 3250 km<sup>2</sup> with geographical borderlines of 37°35'–38°45' E and 3°50'–4°25' S. The area is part of the East African high plateau, with an altitude varying between 240 and 1609 m a.s.l. The climate is semi-arid (CoE, 1995) with a pronounced dry season and high mean temperatures between 23.1 and 37.8 °C. Precipitation ranges from 300 mm in the eastern part to 900 mm in the central and western parts of the reserve and shows a bimodal distribution, with the long rainy season between March and mid-May and the short rainy season between late October and December. The habitat is wooded grassland on the plains and woodland on the top of most hills; the most common tree species belong to the genera *Vachellia* and *Commiphora*.



Fig. 1. Mkomazi location map.



Fig. 2. Location of ant sampling sites, Mkomazi.



### *Insect sampling and analysis*

Trees were sampled during visits by the second author in April 1995, December 1995-January 1996, March-April 1996, and January 1997. Samples were taken using a “Hurricane Minor” petrol-driven mist blower (Cooper-Pegler Ltd), with an ultra-low-volume delivery nozzle. A mist of undiluted Pybuthrin 216, a pyrethroid formulation synergised with piperonyl butoxide was sprayed into the canopy in still conditions with dry leaf surfaces. Only trees under 10m high were sprayed and spraying time was 30s, with three bursts from different directions around the target tree. After a standard drop-time of 1h, insects were collected in 1-m<sup>2</sup> funnel-shaped trays. Catches were brushed into collecting jars, separated from debris and plant material and stored in 70% alcohol. All trays put under one tree were lumped to form a sample. This paper concerns only species of ant. All the ant specimens will be deposited in the Oxford University Museum of Natural History.



Fig. 3. Insect sampling by pyrethrum knock-down spraying.

### *Ant identification*

The first author sorted all specimens from vials containing 70% alcohol as a storage medium. This was done under 6.4-40 X magnification and, apart from limiting the number of individuals of the abundant species, most specimens were mounted on card tips. Using a simple digital camera held to the eyepiece of a dissecting microscope, photographs were taken from as many angles and at magnifications up to 40X, plus the 3X mechanical zoom facility of the camera, as were felt necessary. Generally, these images were compiled as a photomontage, with an appropriate size scale, and used for diagnosis.

The appendix gives details and taxonomic notes on all the recognised ant species. The species determinations used a combination of published keys, keys developed by the first author as part of the <http://antsofafrica.org> project and direct comparison with type images made freely available by the Antweb project of the University of California. In the appendix the reference number of those images is given as, *e.g.*, CASENT0903067, FOCOL2576, etc. These can be accessed by entering, for example, <https://www.antweb.org/specimenImages.do?code=CASENT0903067> into the address bar box of any web browser, changing the component after the = sign as appropriate. That should open the page for the type (sometimes co-type, syntype, etc.).

Slight problems are that the standard three Antweb images (lateral, dorsal and full face view) do not always reveal essential diagnostic characters, e.g. scape length, and almost all the images appear to have an excessive and misleading magenta tint. Using, for example, the Pixelmator for Mac imaging software, a relatively simple layering technique enables one to overlay type images on specimen images. Reducing the opacity of the superimposed layer allows a direct comparison of size, morphology and surface sculpture, etc. This was described and illustrated by BRAET & TAYLOR (2018). Photographs of almost all the Mkomazi specimen can be sighted on the Ants of Africa website by page links from the species index, [http://antsofafrica.org/ant\\_species\\_2012/nameind1.htm](http://antsofafrica.org/ant_species_2012/nameind1.htm).

### *Tree species*

The following tree species were identified by Malcolm Coe, Raphael Abdallah and Emmanuel Mboya of the Mkomazi Ecological Research Programme. The general information is culled from on-line resources, e.g. *Flora Zambesiaca* <http://apps.kew.org/efloras/fz/intro.html>, and EPIC, electronic Plant Information Centre, <http://epic.kew.org/index.htm>. The taxonomic status of what were known as *Acacia* from Africa was revised by KYALANGALILWA *et al.* (2013). -*Vachellia drepanolobium* (syn. *Acacia drepanolobium* Harms ex Sjöstedt (Leguminosae, subfamily Mimosoideae).

Whistling thorn acacia, a gall-bearing species which grows up to six metres in height. WILLMER & STONE (1997) gave a succinct description of this and *V. zanzibarica* from their studies at Mkomazi. An illustration of the swollen thorns was given by STANTON *et al.* (1999). -*Vachellia nilotica* (L.) (syn. *Acacia nilotica* (L.) Hurter and Mabb. (Leguminosae, subfamily Mimosoideae).

One of about 135 thorny African *Acacia* species. Variation is considerable with nine subspecies presently recognized, three occurring in the Indian subcontinent and six throughout Africa (BRENAN 1983.) They are distinguished by the shape and pubescence of pods and the habit of the tree. In habit *V. nilotica* varies from a shrubby tree with wide spreading crowns in savanna habitats (ssp. *subalata*, *leiocarpa*, *adstringens*, *hemispherica* and *kraussiana*), to a 20-metre tree (ssp. *nilotica*, *tomentosa*, and *indica*) in riverine situations.

-*Vachellia zanzibarica* (Moore, 1877) (syn. *Acacia zanzibarica* Moore) Kyal. and Boatwr. Taubert (Leguminosae, subfamily Mimosoideae).

A gall-bearing species (WILLMER & STONE, 1997), growing 3-9 m.

-*Combretum molle* R.Br ex G (Leguminosae).

A small to medium-sized deciduous tree, growing up to 8 m, common throughout Tanzania but more so within the coastal belt, in riverine forests, in wooded grasslands and in bushland. It is found on rocky sites and stony soil.

-*Dichrostachys cinerea* (Linnaeus) R. Wight and Arnott (Leguminosae).

A shrub or small tree to 8 m tall that grows in a variety of habitats: dry forests, woodlands, shrublands, open grassland, river banks, rocky hillsides, and coastal plains. It penetrates clear cut areas far into the rainforest zone. It is common in grasslands and on river banks in Arusha, Dodoma and Singida.

-*Heywoodia lucens* Sim (Euphorbiaceae).

Stink Ebony. A large evergreen tree up to 25 m tall, with grey bark, irregularly peeling in corky sheets or patches.

-*Lannea schweinfurthii* (Engl.) Engl. (Anacardiaceae), False marula.

A shrub or more frequently an irregularly branched tree 3–15 (18) m. high.

-*Grewia* sp. (Tiliaceae), e.g. *G. occidentalis*, are scrambling deciduous shrubs or small trees reaching up to 3m in height.

-*Ochna holstii* Engl. (Ochnaceae).

Red ironwood, a shrub or small understorey tree, up to 8 m tall.

-*Terminalia brownii* Fresen (Combretaceae).

Indian Almond family. An often straight boled tree with a roundish crown, growing up to 15 m, sometimes 25 m tall. It grows in sub-humid woodland and savanna; in drier areas as it is confined to the vicinity of rivers.

### Results from sampling the different tree species

The ants found by pyrethrum knock-down spraying are given in tables as follows. Table 1, on *Vachellia drepanolobium*. Table 2, on *Vachellia nilotica*. Table 3, on *Vachellia zanzibarica*. Table 4, on *Combretum molle*. Table 5, on *Dichrostachys cinerea*. Table 6, on *Grewia* species. Table 7, on *Heywoodia lucens*. Table 8, on *Lannea schweinfurthii*. Table 9, on *Ochna holstii*. Table 10, on *Terminalia brownii*.

Table 1. Ants found on *Vachellia drepanolobium*

Tree No	5/58	5/59	5/60	5/61
Date	12.i.1997	12.i.1997	12.i.1997	12.i.1997
Tree size height X canopy circ (m)	1 X 4	2 X 3	1.5 X 3.5	1.5 X 3
<i>Crematogaster nigriceps</i>	many	many	many	many
<i>Lepisiota depressa</i>	-	-	1	-

Table 2. Ants found on *Vachellia nilotica*

Tree No	5/55	5/56	5/57	5/63	5/64
Date	12.i.1997	12.i.1997	12.i.1997	12.i.1997	12.i.1997
Tree size height X canopy circ (m)	4.5 X 14	2 X 10	4 X 17	5 X 16	6 X 12
<i>Camponotus minusculus</i> ??	-	71	72	58	-
<i>Camponotus jeanneli</i>	43	-	-	-	58
<i>Crematogaster solenopsides</i>	4	49	10	-	-
<i>Camponotus braunsi</i>	-	-	-	-	17
<i>Tetraponera prelli</i>	11	-	-	-	-
<i>Tetraponera bifoveolata</i>	-	-	-	35	1
<i>Cataulacus intrudens</i>	4	-	-	1	-
<i>Crematogaster kneri</i>	2	-	-	-	-
<i>Monomorium pallidipes</i>	2	-	-	1	11
<i>Nesomyrmex latinodis</i>	1	3	2	4	1
<i>Tapinoma minimum</i>	1	-	-	4	-
<i>Tetramorium caldarium</i>	1	-	-	2	-
<i>Tapinoma modestum</i>	-	2	-	-	-
<i>Polyrhachis viscosa</i>	-	-	-	3	1
<i>Polyrhachis schistacea</i>	-	-	-	1	8
<i>Plagiolepis pictipes</i>	-	-	-	-	1



Table 3. Ants found on *Vachellia zanzibarica*

Tree No	5/16	5/17	5/26	5/27	5/28
Date	3.i.1997	4.i.1997	8.i.1997	8.i.1997	8.i.1997
Tree size height X canopy circ (m)	2 X 8	3 X 10	5 X 14	2 X 7	5 X 12
<i>Crematogaster mimosae</i>	many	many	many	many	many
<i>Camponotus flavomarginatus</i>	46	19	30	-	30
<i>Tetraponera bifoveolata</i>	-	24	3	-	7
<i>Cataulacus kenyensis</i>	-	30	6	-	many
<i>Camponotus olivieri moshianus</i>	-	4	-	1	-
<i>Plagiolepis alluaudi</i>	-	2	-	-	-
<i>Tapinoma schultzei</i>	-	3	-	-	-
<i>Polyrhachis schistacea</i>	-	-	-	-	10
<i>Tapinoma minimum</i>	-	-	-	-	1
<i>Technomyrmex pallipes</i>	-	-	-	-	2

Table 4. Ants found on *Combretum molle*

Tree No	2/18	2/25	2/26	2/27	2/31	3/64	3/65
Date	8.iv.1995	9.iv.1995	9.iv.1995	9.iv.1995	9.iv.1995	15.i.1996	15.i.1996
Tree size height X canopy circ (m)	5 X 3	5 X 6	6 X 12	5 X 9	4.5 X 7	5 X 10	4 X 12
<i>Crematogaster amita</i>	-	-	-	-	-	4	2
<i>Crematogaster kneri</i>	-	-	several	25	-	-	-
<i>Crematogaster foraminiceps</i>	2	-	-	-	-	-	-
<i>Crematogaster sjostedti</i>	-	several	-	-	62	-	-
<i>Crematogaster solenopsides</i>	-	-	-	-	-	-	1
<i>Nesomyrmex latinodis</i>	4	-	-	-	1	-	-
<i>Polyrhachis viscosa</i>	-	-	-	-	-	3	1
<i>Plagiolepis alluaudi</i>	-	-	-	-	-	-	1
<i>Tapinoma minimum</i>	3	-	-	-	1	-	-
<i>Tapinoma schultzei</i>	-	-	-	-	-	-	1
<i>Tetraponera bifoveolata</i>	-	-	-	-	-	-	1
<i>Tetraponera prelli</i>	-	1	-	-	-	2	-

Table 5. Ants found on *Dichrostachys cinerea*

Tree No	2/34	2/37
Date	10.iv.1995	10.iv.1995
Tree size height X canopy circ (m)	1.5 X 3	1.5 X 3
<i>Camponotus sericeus</i>	1	-
<i>Tapinoma demissum</i>	1	-
<i>Technomyrmex pallipes</i>	-	1

Table 6. Ants found on *Grewia* sp

Tree No	2/15
Date	7.iv.1995
Tree size height X canopy circ (m)	3 x 23
<i>Crematogaster tricolor</i>	25
<i>Camponotus flavomarginatus</i>	1
<i>Cataulacus intrudens</i>	3
<i>Monomorium pallidipes</i>	1
<i>Plagiolepis pictipes</i>	1

Table 7. Ants found on *Heywoodia lucens*

Tree No	3/50	3/51
Date	10.i.1996	10.i.1996
Tree size height X canopy circ (m)	10 X 23	3 X 9
<i>Plagiolepis alluaudi</i>	many	12
<i>Camponotus kollbrunneri</i>	4	-
<i>Cataulacus huberi</i>	1	-
<i>Crematogaster acaciae</i>	2	-
<i>Crematogaster tenuipilis</i>	1	1
<i>Monomorium speluncarum</i>	4	-
<i>Tetramorium caldarium</i>	1	-
<i>Tetramorium candidum</i>	1	-
<i>Camponotus erinaceus</i>	-	3
<i>Crematogaster rauana</i>	-	1

Table 8. Ants found on *Lannea schweinfurthii*

Tree No	3/66	3/67
Date	16.i.1996	16.i.1996
Tree size height X canopy circ (m)	5 X 20	7 X 36
<i>Crematogaster tricolor</i>	many	-
<i>Crematogaster foraminiceps</i>	-	many
<i>Cataulacus intrudens</i>	1	several
<i>Nesomyrmex latinodis</i>	7	4
<i>Tapinoma danitschi</i>	7	-
<i>Tapinoma modestum</i>	many	23
<i>Technomyrmex vapidus</i>	4	-
<i>Tetraponera parops</i>	14	19
<i>Tetraponera prelli</i>	1	20
<i>Polyrhachis viscosa</i>	-	1

Table 9. Ants found on *Ochna holstii*

Tree No	3/56
Date	12.i.1996
Tree size height X canopy circ (m)	5 X 10
<i>Camponotus mombassae</i>	3
<i>Camponotus ilgii</i> (queen)	1
<i>Crematogaster mimosae</i>	2
<i>Plagiolepis alluaudi</i>	1

Table 10. Ants found on *Terminalia brownii*

Tree No	3/68
Date	16.i.1996
Tree size height X canopy circ (m)	10 X 25
<i>Crematogaster sjostedti</i>	many
<i>Tetraponera erythraea</i>	many
<i>Camponotus flavomarginatus</i>	6
<i>Camponotus olivieri moshianus</i>	1
<i>Nesomyrmex latinodis</i>	1
<i>Polyrhachis cubaensis</i>	3
<i>Polyrhachis viscosa</i>	5
<i>Tapinoma schultzei</i>	1

### Taxonomic Notes

In his first major ant work, “Les Fourmis de la Suisse”, FOREL (1874) expressed his admiration for the works of Mayr and related how he adopted Mayr’s methods for the analytical tables. In a curious move, Forel noted how it was contrary to reproach Mayr for “la trop grande multiplication des genres”. In his short biography of Forel’s hyperproductive protégé, Felix Santschi, WEHNER (1990) noted how all eminent myrmecologists before FOREL (1874) had strictly used binomials. Forel introduced the deliberate splitting of species into subspecies and variations, although he used the term “race” and Santschi used “stirps” for these lower levels. Forel himself said that he used “races” for species that were badly determined or showed transitions between them, one could also call them “sub-species”. Seemingly he felt this would be helpful for dealing with intermediate or aberrant forms. The difficulties this system imposed were summed up by ANDRÉ (1881): “with the ants the separation of species presents great difficulties, and nothing is harder than to decide where the species ends and the variety commences”. This muddled and muddling thinking prevailed for the next 80 years. Its legacy still makes it difficult for anyone trying to sort out field collections and to evaluate variations in behaviour, etc. Many of Forel’s taxonomic descriptions were quite brief, often based on comparisons with other species (thus assuming the reader had access to the earlier publications) and very rarely had illustrations. He did not produce any comparative works or keys. Santschi clearly followed Forel’s thinking to the letter and his many publications included unqualified and cursorily detailed synonymies. For instance, SANTSCHI (1930) on *Crematogaster gerstaeckeri* Dalla Torre, 1892, wrote (our translation): “According to the examples received (from) and determined by M. Menozzi, *Cr. gerstaeckeri* is very close to the race *pulla* Sants. (*Crematogaster gallicola* For. stirps *Sjostedti* var. *pulla* nov. Santschi, 1914). It follows that the races and varieties related to this species can be disposed as follows”.

Santschi, 1930: 69

Le *Cr. gerstaeckeri* D. T. (— *Cr. cephalotes* Gerst.) est, selon des exemplaires reçus déterminés par M. MENOZZI très voisin de la race *pulla* Sants. Il découle de cela que les races et variétés se rattachant à cette espèce doivent être disposées comme suit:

<i>Cr. gerstaeckeri</i> D. T.	<i>st. godefroyi</i> For.
v. <i>pulla</i> Sants.	<i>st. oraclum</i> For.
v. <i>pudica</i> Sants.	<i>st. bulawayensis</i> For.
<i>st. sjostedti</i> Mayr	v. <i>zulu</i> Sants.
v. <i>inquieta</i> Sants.	v. <i>rufescens</i> Sants.
v. <i>infaceta</i> Sants.	v. <i>kohliella</i> For.

ROBERTSON (1999) listed a total of 232 species from Mkomazi. Many were unidentified beyond genus level. This included all Dolichoderines, 25 *Camponotus*, seven *Lepisiota*, five *Plagiolepis*, 24 *Crematogaster*, six *Monomorium*, eleven *Pheidole*, 13 *Tetramorium* (including the later identified *T. humbloti* Forel, 1903); *T. mkomazi* Hita Garcia, Fischer & Peters, 2010; *T. robertsoni* Hita Garcia, Fischer & Peters, 2010; *T. weitzeckeri* Emery, 1895; and, *T. zonacaciae* (Weber, 1943) and four *Tetraponera*.

The following paragraphs deal with what we consider to be valid taxonomic changes or new findings of species previously known only from the type collections.

-*Camponotus (Myrmosaga) mombassae* Forel, 1886, stat. rev.

A medium sized ant, major (?) TL 5.6 mm. First report from Tanzania; previously known only from holotype worker from Mombassa, Kenya. There are no type images on Antweb but Forel's description as a new species has the propodeum as very narrow, very inclined, feebly concave from front to back, much longer than the declivity from which it is separated by a very obtuse, rounded angle. One finding of 3 minor workers on *O. holstii* (Tree 3/56). With the specimens from Tanzania, it is quite clear that *mombassae* is a genuine species and that the synonymy under *Camponotus (Tanaemyrmex) acvapimensis*, attributed to WHEELER (1922: 948) by BOLTON (1995) was wrong. Wheeler gave no reason for his synonymy nor was there any indication that he had seen specimens of *mombassae*. The *C. acvapimensis* minor worker (CASENT0249859) has an evenly arcuate propodeal profile. In his description of *Camponotus (Myrmosaga) jeanneli*, SANTSCHI (1914) noted it was related also to *C. mombassae* "of which this may be a race". There are clear differences, however, between *jeanneli* and *mombassae*. The latter clearly is not a member of the subgenus *Tanaemyrmex*. BOLTON (1995) also cites EMERY (1896d: 372) as having *mombassae* as a subspecies of *Camponotus (Tanaemyrmex) kersteni*, that too was a synonymic list without reasons for the status change. There is a similarity between this and *Camponotus klugii* Emery, 1895, which shares the concave profile to the propodeum but appears to lack the striations on the lateral propodeum and the erect hairs on the mesonotum and the propodeum (see CASENT0905451).

-*Crematogaster (Cr.) nigriceps* Emery, 1897, type location Somalia (CASENT0904510). New synonymies: *Crematogaster prelli* (*Crematogaster nigriceps* Emery, subsp. *prelli* n. subsp., Forel, 1911, worker) from Tanzania, Kahe steppe, Prell, in spines of *Acacia cornigera* (CASENT0908545); listed as *prelli* by ROBERTSON (1999), this matches the specimens we report from Mkomazi, with a darker head and alitrunk than the type form.

*diversa* (*Crematogaster*) *Acrocoelia nigriceps* E., stirps *prelli* For. v. *diversa* n. var., Santschi, 1928, worker (CASENT0912706) probable j. syn. but undetermined as no images available.

*saganensis* (Menozzi & Consani, 1952: 65, illustrated, worker) from Ethiopia - no images on Antweb.

-*Crematogaster (Cr.) rauana* Forel, 1907, stat. nov.

*Crematogaster gallicola* Forel var *rauana* n. var., Forel, 1907: 22, worker. Type location Tanzania; near Moshi (CASENT0908528). Sole prior report. A small ant, TL 2.7-3.0 mm. Single specimen found on *H. lucens* (Tree 3/51). This is identical in all ways to the type but at the lowest end of the size range given by Forel, 2.7-3.0 mm. *Cr. gallicola* Forel, 1894, is smaller, much less sculptured and has a more rectangular head in full face view (CASENT0908527).

-*Crematogaster (Cr.) sjostedti* Mayr, 1907, stat. rev.

*Crematogaster Sjostedti*, Mayr, 1907: 17, worker; type location Tanzania, Usambara (syntype CASENT0902105). Listed as a stirps of *Cr. gerstaeckeri* Dalla Torre, 1892, by SANTSCHI (1930) but without any explanation. In the Kenya papers (see earlier), *Cr. sjostedti* was used and COCHARD & AGOSTI (2008) cited *Cr. sjostedti* as common on *Vachellia zanzibarica* (as *Acacia*). A fairly small ant, TL 3.0-5.5 mm. Dalla Torre gave *gerstaeckeri* as piceous, TL 3.75 mm – 4 mm, from his drawing it also has moderately long propodeal spines rather than the short narrowly triangular spines of *sjostedti*. Widespread in Eastern Africa, from Somalia south to South Africa. Three findings, probably as the dominant ant on all three trees; twice on *C. molle* (Trees 2/25 & 2/31); once on *T. brownii* (Tree 3/68).

-*Crematogaster* (*Cr.*) *tenuipilis* Santschi, 1937, stat. nov.

*Crematogaster* (*Acrocoelia*) *mimosae* Sants. v. *tenuipilis* n.v., Santschi, 1937a: 55, worker; CASENT0912705; type location Kenya, sole finding. A small ant, TL 3-5.5 mm. First report from Tanzania. Two findings on *H. lucens* (Trees 3/50 & 3/51); one specimen on each. Close to *Cr. mimosae* Santschi, 1914, in size and form but with distinctive bicoloured appearance being yellow-brown with a brown to black gaster. *Cr. mimosae* is dusky, dark red with the gaster similar but darker, and is known only from acacia species.

-*Monomorium pallidipes* FOREL, 1910, worker; CASENT0908719; type location Eritrea. BOLTON (1987) raised this to species, having examined the type collection of three specimens. He gave the colour as uniform medium to dark brown. The Antweb shows a yellow brown specimen with slightly paler legs, as in FOREL (1910). All those from Mkomazi are a uniform dark brown but match the diagnostic characters, size and form in Bolton's full description.

-*Monomorium speluncarum* Santschi, 1914, worker; CASENT0913855; type location Kenya. BOLTON (1987) raised this to species, having examined the type collection of three specimens. This is the first record other than the type collection.

-*Nesomyrmex latinodis* (Mayr, 1895), stat. rev.

*Leptothorax latinodis* nov. spec., Mayr, 1895: 130, worker; CASENT0914925; type location Mozambique.

Junior synonym *concolor* (*Leptothorax angulatus* var. *concolor* nov., Santschi, 1914b: 107, illustrated, worker) from Kenya, Mombasa, 3.x.1912, Alluaud & Jeannel, CASENT0908991, new synonymy.

A small ant, TL 3.1-3.8 mm. A widespread sub-Saharan form that appears to have been wrongly lumped with the Egypt/North Africa type *Nesomyrmex angulatus* (Mayr, 1862, CASENT0914922) by BOLTON (1982). *N. latinodis* has a wider postpetiole and slightly longer scapes; it also has more sharply angled anterior pronotal corners. *N. angulatus* specimens appear to have consistently distinctive dark apical segments to the funiculi. Ten findings of 1-7 specimens; five on *V. nilotica* (Trees 5/55, 5/56, 5/57, 5/63 & 5/64), two on *C. molle* (Trees 2/18 & 2/31); two on *L. schweinfurthii* (Trees 3/66 & 3/67); and, one on *T. brownii* (Tree 3/68). All our specimens match the form and structure of *latinodis*.

-*Plagiolepis alluaudi* Emery, 1894, type location Seychelles, CASENT0101699. Presumably a tramp species, but found well inland at Arusha in Tanzania, so, possibly of East African origin. On *H. lucens*, in moderate to high numbers; also, on *C. molle*, tree 5/65; and, *V. zanzibarica*, tree 5/17.

-*Plagiolepis pictipes* Santschi, 1914, worker, type location Kenya; CASENT0912411. First records outside Kenya and the type collection. Two collections: on *Grewia* species, tree 2/15; and, on *V. nilotica*, tree 5/64.

-*Tetraponera bifoveolata* (Mayr, 1895), stat. rev.

*Sima bifoveolata* nov. spec., Mayr, 1895: 146, worker; CASENT0902814 (damaged), minor worker. Type location Mozambique but known otherwise only from Tanzania and the Horn of Africa. Revived from the synonymy under *Tetraponera ambigua* Emery, 1895 (CASENT0904033), of WARD (2006). From among the specimens reported by ROBERTSON (1999) from Mkomazi woodland, in the inclusive list of WARD (2006). A fairly small ant, minor TL 3.8-4.2 mm, major TL 4.5-5.0 mm. The minor exactly matches the alitrunk and gaster of the type.



This appears to be the first finding of a major worker and Ward gave no indication of a major for *T. ambigua*. Six findings; two on *V. nilotica* (Trees 5/63 & 5/64), many specimens & one queen; three on *V. zanzibarica* (Trees 5/17, 5/26 & 5/28), 24, 3 & 7 specimens; plus, a single specimen on *C. molle* (Tree 3/65).

-*Tetraponera erythraea* (Emery, 1895), stat. rev.

*Sima ambigua* sous-esp. *erythraea* n. subsp., Emery, 1895: 23, worker (CASENT0904034). Type location Yemen. A fairly small ant, TL 4.5 mm. First report from Tanzania. Single finding of many specimens on *T. brownii* (Tree 3/68). Revived from the synonymy under *Tetraponera ambigua* Emery, 1895 (CASENT0904033), of WARD (2006). *T. erythraea* has the alitrunk profile in three shallow convexities, with quite abundant erect hairs, whereas the alitrunk on the *T. ambigua* type is near flat and there are few, very short, erect hairs. The junior synonym of *T. ambigua*, *rhodesiana* (*Sima ambigua* Em. r. *Rhodesiana* n. stirps, Forel, 1913), is identical. In his comments on *T. ambigua*, Ward had “the worker of this species is characterized by its intermediate size, relatively small eyes, relatively flat profile of the mesosoma (alitrunk) dorsum, and abundant standing pilosity. There is some variability in the configuration of the median clypeal lobe, shape of the petiole and details of sculpture – as might be expected in a widespread species but the variation appears to be continuous and is consistent with the hypothesis of a single polytypic species. Of course, a more detailed genetic and phenotype analysis might reverse this judgement”. We note that the types of *T. ambigua* and *rhodesiana* do not show abundant standing pilosity.

***Polyrhachis mkomaziae* sp.nov.**

Figs 4-5

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**ETHYMOLOGY:**

The name of the new species is derived from the type location within the Mkomazi National Park in northeastern Tanzania. Established as a game reserve in 1951, Mkomazi was upgraded to a national park in 2006.

**TYPE MATERIAL:**

Holotype. TANZANIA: Mkomazi, 16.i.1996 (G McGavin); single finding of three specimens on *Terminalia brownii* (Tree 3/68).

Paratype worker. HL 1.55, HW 1.40, CI 90 (HW/HL X 100), SL 1.65, SI 118 (SL/HW X 100), FW 0.50, FI 36, PW 1.20 (1.30 across spine apices). Matching the holotype but slightly smaller. Possibly, the *P. cubaensis* Mayr listed by Robertson (1999).

**DIAGNOSIS:**

The *Polyrhachis* worker key of BOLTON (1973) leads to the following separation: Head with arcuate anterior margin to clypeus. Pronotum marginate throughout its entire length. Metanotal groove represented by a line, not all impressed. Antennal scapes without erect hairs, other at the apices. Sculpture of alitrunk a reticulate puncturation. Propodeum with a transverse raised ridge between the spines and raised medially into a distinct tooth. Gaster with fine sculpture but not striate. At couplet 23 the separation is: *P. viscosa* with the scape apex suddenly broadened and flat eyes; and, scape apex not suddenly broadened and convex eyes. The latter separated into *P. spinicola*, without a propodeal median tooth or tubercle, propodeal spines outcurved posterolaterally; and, *P. cubaensis*, with a median propodeal tooth, the propodeal spines directed upwards and upcurved. Without sight and no illustration of *P. cubaensis* Mayr, 1982, which he listed as “holotype worker, South Africa, Natal”, nor sight of any others, Bolton synonymized *P. gerstaeckeri* Forel, 1886, Tanzania, Zanzibar, *P. cubaensis* var. *striolato-rugosa* Mayr, 1893 (mis-spelt by Bolton, *striatorugulosa*), and *P. wilmsi* Forel, 1910. He did examine four workers from “Zululand, collector G. Arnold”.

RIGATO (2016) reviewed more recent findings and examined type specimens unsighted by Bolton, leading to the description of ten new species. Of the above, *P. gerstaeckeri* and *P. wilmsi* were restored to species and elevated respectively, with *P. cubaensis* var. *striolatorugosa*, as a junior synonym of *P. gerstaeckeri*. The *P. viscosa* group was separated as having the mesonotal suture not impressed and alitrunk (mesosoma) distinctly laterally marginate, with reduced pilosity (few erect hairs).

**In Rigato's key to workers, from couplet 27, the progression is:**

27. Petiole bearing a pair of lateral spines and a pair of median teeth ..... 28  
 -- Petiole bearing a pair of lateral and a pair of, often longer dorsal spines ..... 30
28. Apex of antennal scape strongly broadened and hood-like in dorsal view, concealing the base of the first funicular joint, which is proximally dorsoventrally flattened, eyes flat ... *P. viscosa*  
 -- Apex of antennal scape not strongly broadened and hood-like, not concealing the base of the first funicular joint ..... 29
29. Propodeal dorsum posterolaterally bearing a pair of relatively well-developed raised spines. Dorsum of propodeum curving evenly into the declivity, eyes flat ..... *P. nigrita*  
 -- Propodeal dorsum posteriorly bearing a median lobe and posterolaterally a pair of upturned small teeth. Dorsum of propodeum often separated from the declivity by a thin ridge, eyes convex ..... *P. omissa*
30. First gastral tergite finely longitudinally striate, eyes weakly convex ..... *P. arnoldi*  
 -- First gastral tergite finely reticulate-punctate, eyes convex ..... 31
31. Propodeum without a transverse raised ridge running between the spines or teeth and separating the dorsum from the declivity, the dorsum passing through an angle or curving directly into the declivity, median tooth or tubercle absent ..... *P. durbanensis*  
 -- Propodeum with a transverse raised ridge running between the spines or teeth and separating the dorsum from the declivity, the ridge often raised into a tooth or tubercle medially ..... 32
32. Head in full face view trapezoidal, with distinct, rounded posterior corners. Head and mesosoma regularly longitudinally rugulose ..... *P. gibbula*  
 -- . Head in full face view more or less oval, without distinct posterior corners. Head and mesosoma mostly reticulate-punctate, superimposed longitudinal rugulation usually weak and often more or less effaced ..... 33
33. Posterior propodeal corners with small, upturned teeth, which are much smaller than the pronotal teeth ..... *P. gerstaeckeri*  
 -- Posterior propodeal corners with well developed, more or less upturned spines, which are similar in size to pronotal teeth ..... 34
34. Propodeum with a sharp transverse ridge and a pronounced medial spine; frons and vertex without standing hairs ..... *P. mkomaziae*  
 -- Propodeum with a weak transverse ridge and no more than a low triangular median process ..... 35
35. Frons and vertex bearing some pairs of standing hairs ..... *P. wilmsi*  
 -- Frons and vertex without standing hairs ..... *P. spinicola*

## DESCRIPTION

A species in the *viscosa*-group well characterised by its trapezoidal head with weakly bulging eyes, dorsum of head and alitrunk with weak longitudinal rugulosity, and strongly transversely arched propodeum with a pronounced median spine. Keys out at the Rigato couplet 33/34. Holotype worker. HL 1.70, HW 1.60, CI 94 (HW/HL X 100), SL 1.70, SI 106 (SL/HW X 100), FW 0.48, FI 30, PW 1.25 (1.35 across spine apices).

FW (Frontal Width): the maximum distance between frontal carinae in full face view; FI = FW/HW X 100.

Clypeus with distinct median carina and an evenly convex anterior margin. Head in full face view ovoid, widest at the front of the eyes. Eyes placed posteriorly and convex. Scapes moderately long, widening weakly from base to apex. Alitrunk longer than wide; in dorsal view pronotum and mesonotum wider than long. In profile alitrunk shallowly convex. Pronotal spines moderate triangular. Alitrunk distinctly marginate along its sides, the margins forming a distinct but narrow horizontal flange. Promesonotal and metanotal sutures distinct but not impressed. Propodeal dorsum and declivity separated by a sharp margin. Propodeal teeth moderate, upturned and sharp, plus a well-developed median triangular tooth. Petiole with four equisized spines, the dorsal pair angled 45° upward and; in frontal (or posterior) view the space between the dorsal spines concave. First gastral tergite anteriorly concave.

Whole of head, alitrunk and petiole with imbricate sculpture but weakly shiny, gaster more finely sculptured; legs and antennae distinctly but even more finely so. Dorsum of head and mesosoma with superimposed fine and dense longitudinal rugulation. Almost without erect hairs, a few on the vertex and clypeus. Scape without hairs apart from very short apical hairs. Pubescence absent except for a very fine covering on the gaster. Colour almost entirely black, tarsi and apex of funiculus orange-yellow.

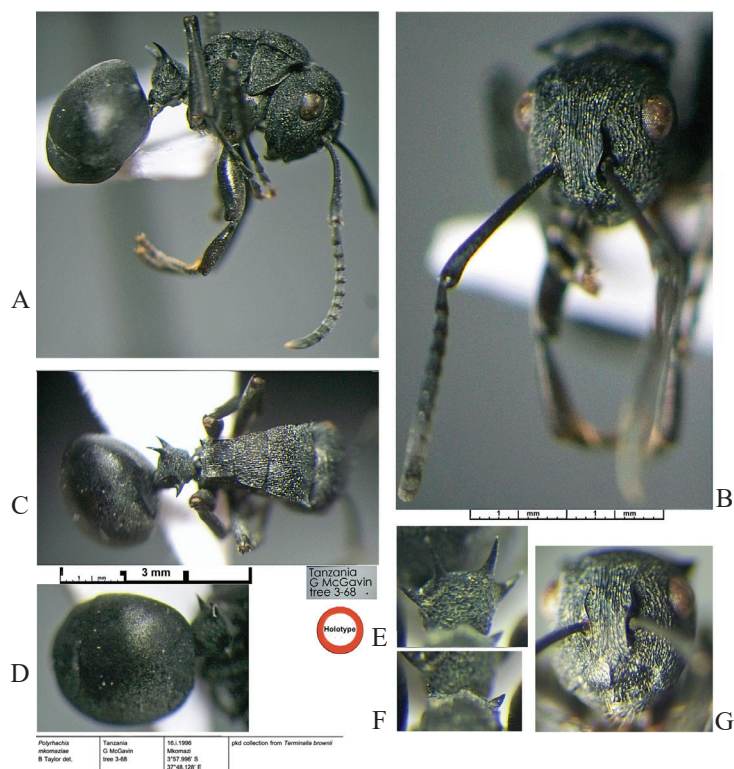


Fig. 4. Holotype of *Polyrhachis mkomaziae* sp. nov. A. Lateral view. B. Frontal view of head. C. Dorsal view. D. Gaster. E. Anterior of petiole. F. Anterior oblique view of propodeum margin. G. Enlarged view of the clypeus.

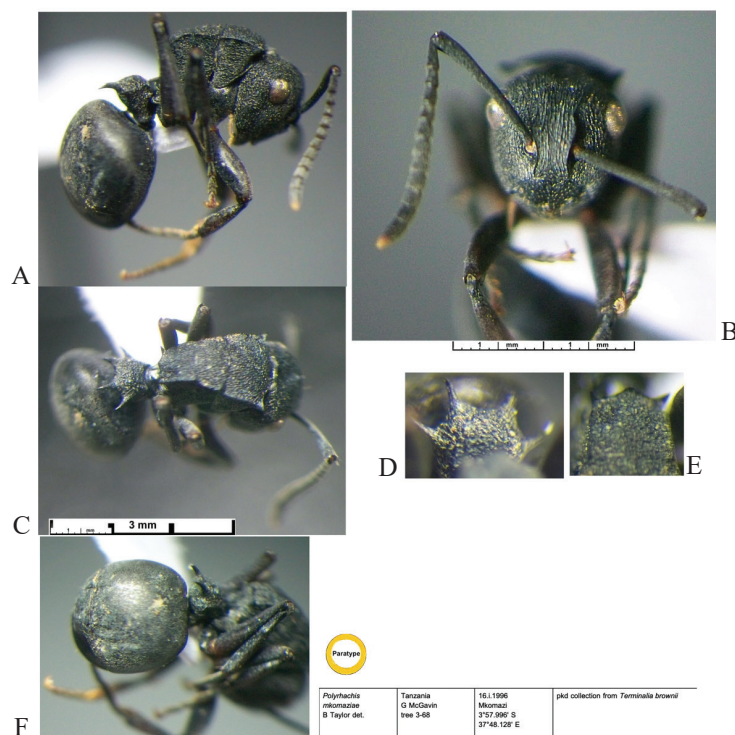


Fig. 5. Paratype of *Polyrhachis mkomaziae* sp. nov. A. Lateral view. B. Frontal view of head. C. Dorsal view. D. Anterior of petiole. E. Anterior oblique view of propodeum margin. F. Gaster.



## Discussion

### Gall-bearing acacias

Our results for the two swollen-thorn acacias, *V. drepanolobium* and *V. zanzibarica*, are in marked contrast to the observations at Mpala, Kenya (STANTON, *et al.* , 2005, and earlier). There, the acacia system on the black-cotton soil is a near monopoly by *V. drepanolobium* and two dominant *Crematogaster* ant species, *Cr. mimosae* and *Cr. nigriceps*, compete for the same host tree. At Mkomazi, our limited results show these two *Crematogaster* species do not compete but simply occupy different acacia species. *Cr. nigriceps* inhabits *V. drepanolobium* and *Cr. mimosae* inhabits *V. zanzibarica*. STAPLEY (1998) studied the protective effect of ants inhabiting *V. drepanolobium* and gives *Cr. nigriceps* as the ant involved.

A further contrast is in the other ants reported from *V. drepanolobium* at Mpala. These were *Cr. sjostedti*, *Tetrap. penzigi*, a *Crematogaster* of the subgenus *Orthocrema*, and two Camponotine species, *Camp. braunsi* and *Camp. rufoglaucus*. At Mkomazi, with the exception of a single specimen of *Lepisiota depressa*, the only ant on this acacia was *Cr. nigriceps*. *Tetrap. penzigi* was not found, neither was *Camp. rufoglaucus*, and there were no *Cr.* (*Orthocrema*) species. *Cr. sjostedti* was not found on *V. drepanolobium* but was found inhabiting and perhaps dominating two other tree species (see below).

The occupancy of *V. zanzibarica* by *Cr. mimosae* at Mkomazi showed that, although it obviously was the dominant species, it did not exclude other ant species. On two of the five trees the numbers of *Cataulacus kenyensis* indicate the presence of colonies of this arboreal species. Another colonizing ant observed was *Tetrap. bifoveolata*. On four of the trees, *Camp. flavomarginatus*, a ground-nesting species found across most of sub-Saharan Africa, appears to have been able to forage in quite large numbers. Seven other species of ant were found in very small numbers. The Mkomazi findings from *V. zanzibarica* in a wildlife reserve contrast with the situation reported from Mkwaja Ranch on the coast (COCHARD and AGOSTI, 2008) where 99% of the trees were occupied by *Cr. sjostedti*. At Mkomazi the very small sample of five trees had no *Cr. sjostedti*.

### Other pinnate-leaved trees

Two other species of pinnate-leaved trees were sampled. On all five trees of *V. nilotica*, the most abundant ants were *Camponotus*, *Camp. braunsi* and *Camp. jeanneli*. A very small *Crematogaster*, *Cr. solenopsides*, was in sufficient numbers to suggest it was nesting on at least one of the trees. The same applies to two *Tetraponera* species, *Tetrap. prelli* and *Tetrap. bifoveolata*. Twelve other ant species were found on these trees indicating that the more abundant species do not exercise any exclusion activity.

Two trees of *Dichrostachys cinerea* were sampled and were almost devoid of ants.

### Broad-leaved trees

Seven *Combretum molle* trees were sampled. Again a range of ant species was found. Of these two *Crematogaster* species, *Cr. kneri* and *Cr. sjostedti* were present in sufficient numbers to imply colonization. Both are known to nest on trees but it is interesting that the latter was among the apparently aggressive dominants of the Kenyan *V. drepanolobium*.

*Grewia* species, a single tree was sampled and appeared to be inhabited by a small colony of *Cr. tricolor*. Single-fig. numbers of four other ant species also were found.

On two trees of *Heywoodia lucens*, one ant species, *Plag. alluaudi* was present in moderate to high numbers. However, it is a minute ant and would not be expected to exclude any other species. Eleven other ants were found in very small numbers.

Two trees of *Lannea schweinfurthii* were sampled. One was numerically dominated by *Cr. tricolor*, apparently co-habiting with the minute *Tap. modestum* and *Tetrap. parops*. The other was numerically dominated by *Cr. gallicola*, apparently also co-habiting with *Tap. modestum*

and *Tetrap. parops*; but with *Tetrap. prelli* and *Cat. intrudens* (a Tanzania variant) also present in modest numbers.

On a single tree of *Ochna holstii*, four species of ants were found but in single-fig. numbers. A single tree of the relatively large *Terminalia brownii* had two numerically dominant species, *Cr. sjostedti* and *Tetrap. erythraea*. The apparent co-existence contrasts with the reported aggressive exclusion activity of *Cr. sjostedti* in Kenya. Six other ants were found in single-fig. numbers.

### Ant species

A total of forty-five ant species were found in the sampling of arboreal ants at Mkomazi. In the context of sub-Saharan arboreal ant populations, this is a fairly impoverished environment. Within the rain-forest zones of West Africa and the Congo Basin numbers of species would exceed one hundred.

The dominance, either in terms of aggressive competition or simply numerical abundance, by *Crematogaster* species is similar, although by wholly different species. Of the species found on cocoa in western Nigeria (by BT) only three, *Camp. flavomarginatus*, *Cr. kneri* and *N. angulatus* were found at Mkomazi. The first is a quite large soil-nesting species, widespread right across the continent and known to ascend trees in order to tend Homoptera. Like its relatives, *Cr. kneri* is arboreal and tends homoptera. The last also is known from across the continent, if not beyond, but has never been reported in other than small numbers, apparently being arboreal but with unknown habits.

Twenty-two of the species have not been reported from Tanzania before, some being known previously only from the holotype or a single collection. These are: *Tapinoma danitschi*, *Tap. demissum*, *Tap. modestum*, *Tech. pallipes*, *Camp. (Myrmopelta) kollbrunneri*, *Camp. (Myrmosaga) jeanneli*, *Camp. (Myrmosaga) mombassae*, *Camp. (Myrmosericus) flavomarginatus*, *L. depressa*, *Plag. pictipes*, *Cat. huberi*, *Cat. kenyensis*, *Cr. (Cr.) acaciae*, *Cr. (Cr.) foraminiceps*, *Cr. (Cr.) mimosae*, *Cr. (Cr.) tenuipilis*, *Cr. (Sphaerocrema) amita*, *Cr. (Sph.) kneri*, *M. speluncarum*, *Tetram. caldarium*, *Tetram. candidum* and *Tetrap. erythraea*.

Of the others, three are from the area of sub-coastal East Africa including the Usambara Mountains that are quite well-known for their high level of endemism. These are *Camp. (Myrmisolepis) erinaceus*, type location Arusha; *Cr. (Cr.) rauana*, type location near Moshi; and, *Cr. (Cr.) sjostedti*, type location Usambara.

Somewhat unexpectedly, there were no findings of members of the genus *Pheidole* which is commonly ubiquitous in most parts of sub-Saharan Africa. Although most are ground-nesting, *Pheidole* species usually forage readily on trees, often tending Homoptera. Similarly, the species *Oecophylla longinoda sensu lato* is regularly found on broad-leaved trees but was not found in this sampling.

### Disclosure statement

There is no conflict of interest.

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### Subfamily Dolichoderinae

*Tapinoma danitschi* Forel, 1915. A minute soft-bodied ant, TL 1.5 mm. First report from Tanzania; type location Kenya, Fundu Island. From on *L. schweinfurthii* (Tree 3/66). Exact morphological match for the type CASENT0903067, although perhaps darker in general colour, although Forel gave the type colour as black, legs and antennae dark brown, other appendages lighter to reddish-yellow. ARNOLD (1926) who collected other specimens wrote “Varying from dark brown to sepia”.



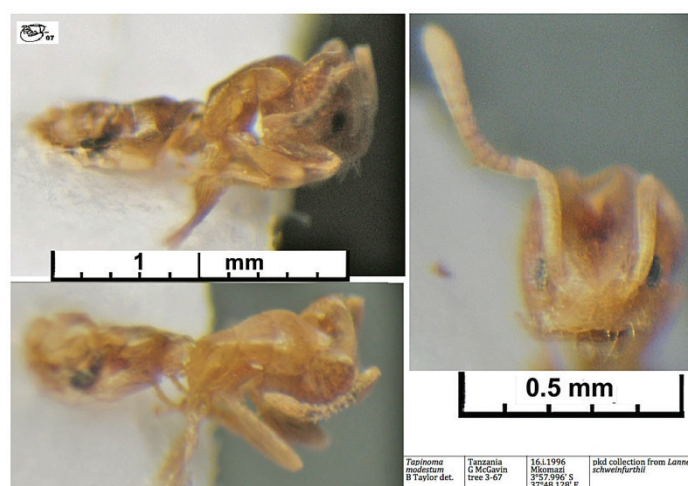
*Tapinoma demissum* Forel, 1913; syntype CASENT0903071; type location Zimbabwe; first report from Tanzania, elsewhere reported from Senegal (DIAMÉ *et al.*, 2017). Nests in soil. A single finding of one specimen on *D. cinerea* (Tree 2/34).



*Tapinoma minimum* Mayr 1895. A minute soft-bodied ant, TL 1.2-1.4 mm. Type location Tanzania, Tanga; CASENT0909777. Also known from South Africa (SANTSCHI, 1914, ARNOLD, 1926) and Somalia (MENOZZI, 1930). Four findings, two on *V. nilotica* (Trees 5/55/ & 5/63), 1 & 4 specimens; one on *V. zanzibarica* (Tree 5/28), 1 specimen; and, two on *C. molle* (Trees 2/18 & 2/31) single specimens.

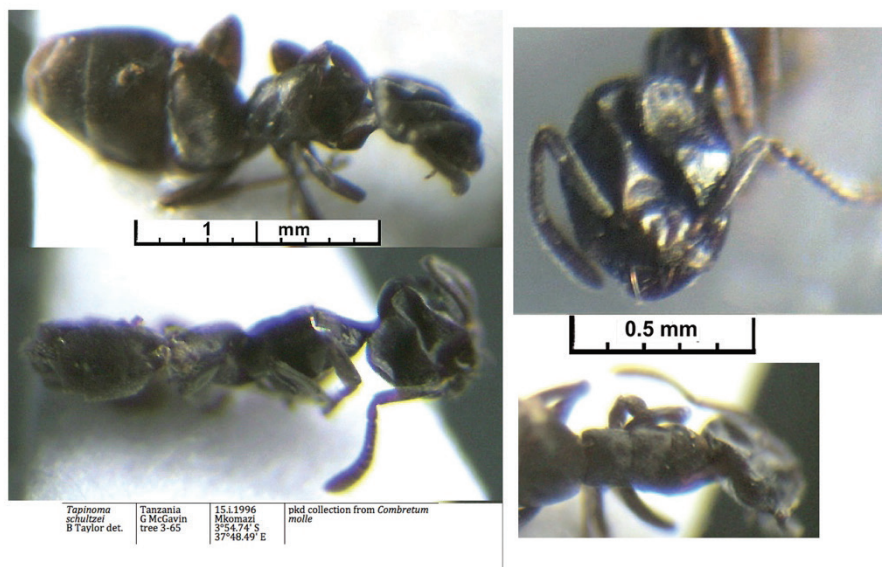


*Tapinoma modestum* Santschi, 1932; CASENT0911574. A minute soft-bodied ant, TL 1.4-1.5 mm. First report from Tanzania; type location Zimbabwe. Three findings; one on *V. nilotica* (Tree 5/56), 2 specimens; two on *L. schweinfurthii* (Trees 3/66 & 3/67) many & 23 specimens.

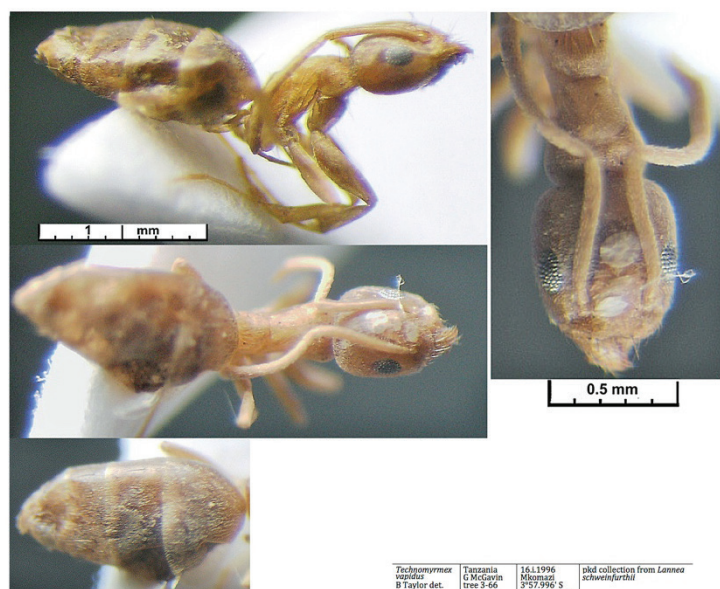




*Tapinoma schultzei* (Forel, 1910); CASENT0909809, type location Botswana, with several other reports from Southern Africa. A very small soft-bodied ant, TL 2.0 mm. Known from Tanzania but the following appear to be darker than the type. ARNOLD (1915), however gave the colour as “black or brownish.” Like all *Tapinoma* the specimens crushed as they dried out. Three findings; one on *V. zanzibarica* (Tree 5/17), 3 specimens; one on *C. molle* (Tree 3/65), 1 specimen; and one on *T. brownii* (Tree 3/68).

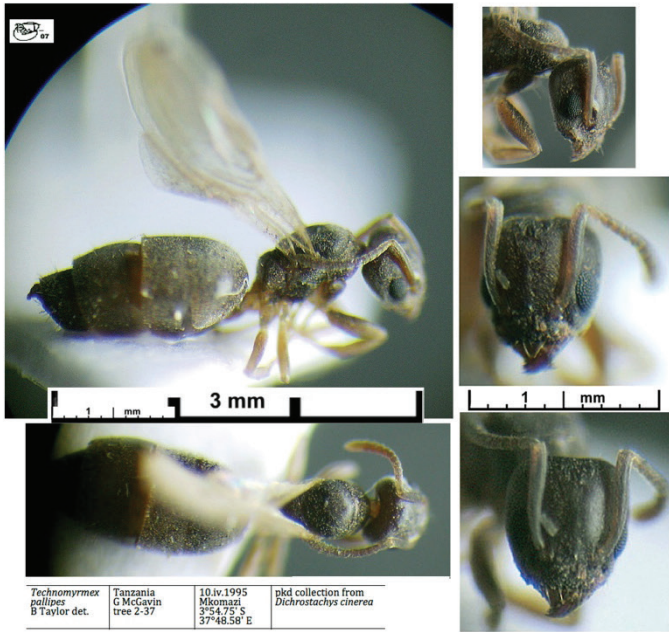
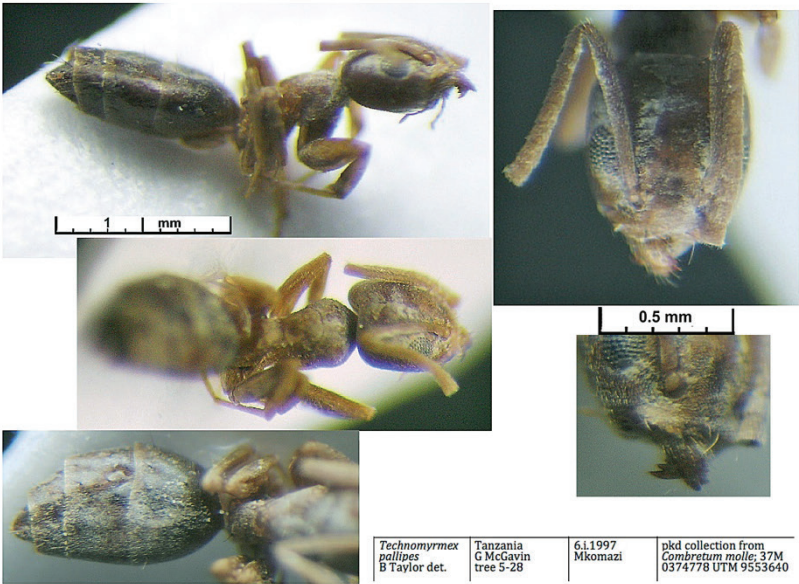


*Technomyrmex vapidus* (Bolton, 2007); type CASENT0903060. A small ant, TL 2.4-2.5 mm. Type location Kenya; on *L. schweinfurthii* (Tree 3/66) 4 specimens.



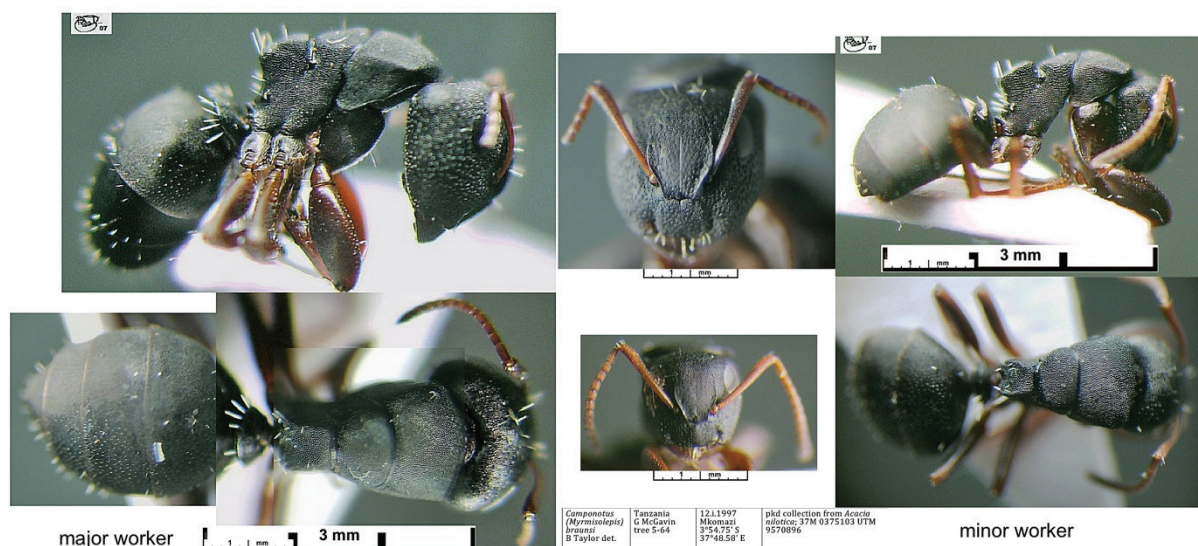


*Technomyrmex pallipes* (Smith, 1876); syntype CASENT0102320. A small ant, TL 2.4-2.5 mm. Type location Mauritius; reported from Kenya; first report from Tanzania; on *L. schweinfurthii* (Tree 3/66); on *C. molle* (Tree 5/28); and, a single dealate queen on *D. cinerea* (Tree 2/37).



## Subfamily Formicinae

*Camponotus (Myrmisolepis) braunsi* Mayr, 1895; no type images; subspecies *candidus* Santschi, 1926 (*Camponotus (Myrmisolepis) braunsi* Mayr var. *candidus* n. var., Santschi, 1926: 618, worker), type location Uganda, CASENT0911716. Note: the various subspecies shown on Antweb appear identical but without the type form images cannot be reliably synonymised. A medium sized ant, minor TL 4.5 mm, major TL 8 mm. Wide ranging in East Africa, Mozambique to Somalia. ROBERTSON (1999) reported it from Mkomazi woodland, nesting in dead branches on trees. One finding of 17 specimens on *V. nilotica* (Tree 5/64); major and minor workers.



*Camponotus (Myrmisolepis) erinaceus* Gerstäcker, 1871; CASENT0905434, major worker. A medium sized ant, minor TL 6.7 mm. Type location Arusha, Tanzania. One finding of 3 specimens on *H. lucens* (Tree 3/51); major and minor workers.





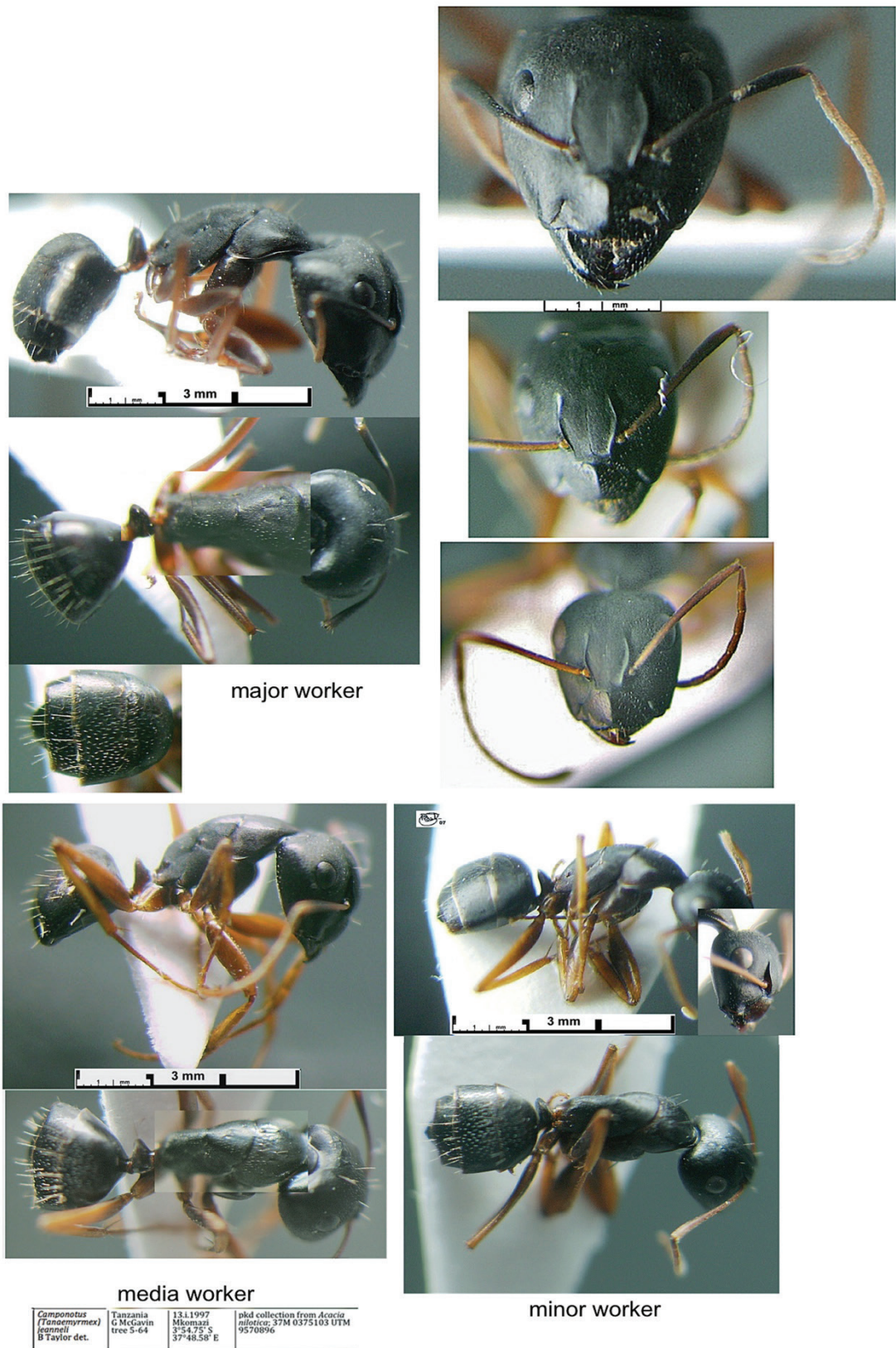
*Camponotus (Myrmopelta) kollbrunneri* Forel, 1910; CASENT0910461, super major. A medium sized ant, the minor has not been not described, major TL 8.0 mm. First report from Tanzania; type location Ethiopia. One finding on *H. lucens* (Tree 3/50), 4 specimens, major worker illustrated, with a normal sized head for the genus.



*Camponotus (Myrmosericus) flavomarginatus* Mayr, 1862, CASENT0915599, major worker. A large ant, minor TL ca 6 mm, major TL 9 mm. First report from Tanzania; widespread across sub-Saharan Africa. Known as a quite common ground-nesting species that forages on trees. Five findings - 3 on *V. zanzibarica* (Trees 5/16, 5/17 & 5/28), 19-46 specimens; 1 on *Grewia* sp (Tree 2/15), 1 specimen; 1 on *T. brownii* (Tree 3/68), 6 minor workers.

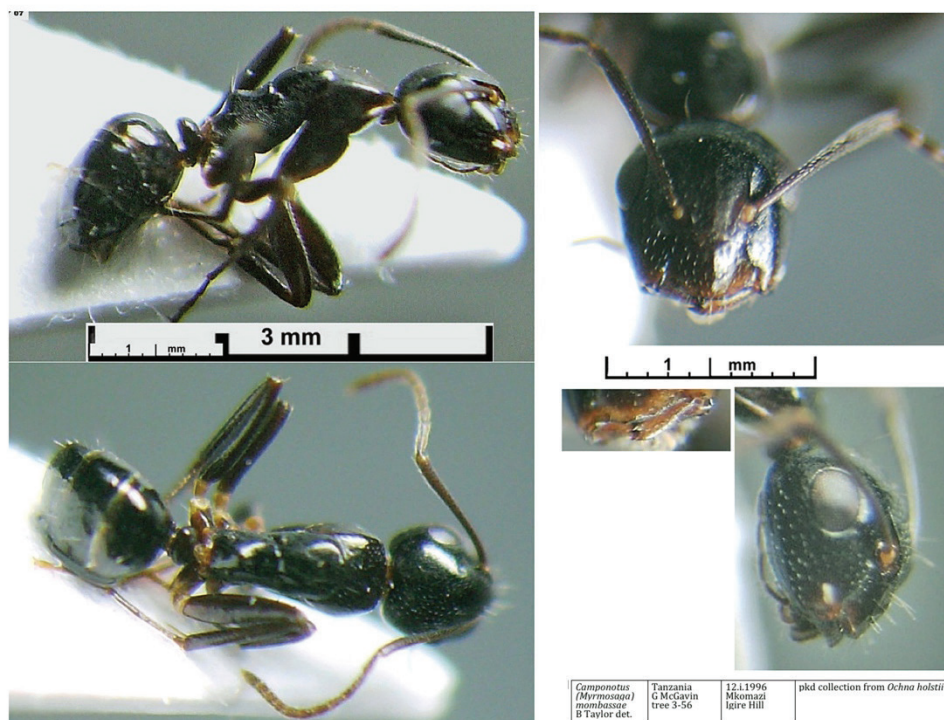


*Camponotus (Myrmosaga) jeanneli* Santschi, 1914, CASENT0911648, major, CASENT 0911649, minor worker. Type location Kenya, no other reports. Two findings both on *V. nilotica* (Trees 5/55, 2 specimens, & 5/64, 5 specimens); range of worker sizes.





*Camponotus (Myrmosaga) mombassae* Forel, 1886, **revived status**; no images on Antweb. A medium sized ant, major (?) TL 5.6 mm. First report from Tanzania; previously known only from holotype worker from Mombasa, Kenya, later inexplicably synonymized with *C. acvapimensis* from which it is very distinct. Forel's description has the propodeum as very narrow, very inclined, feebly concave from front to back, much longer than the declivity from which it is separated by a very obtuse, rounded angle. One finding of 3 workers on *O. holstii* (Tree 3/56) which match the Forel description.

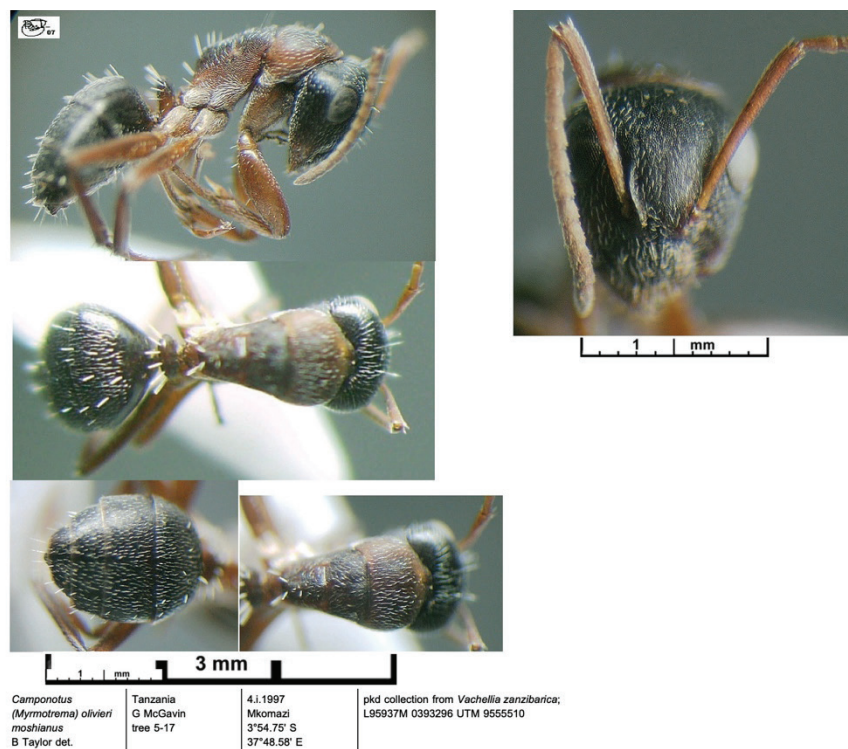


*Camponotus (Myrmotrema) ilgii* Forel, 1894, CASENT0910497, worker. A medium sized ant, major-media TL 4.2-4.7 mm. Single dealate queen only on *Ochna holstii* (Tree 3/56), not fully verifiable; first report from Tanzania; earlier reports from spines of *V. fistula* Schwf. and *V. bussei* Harms.

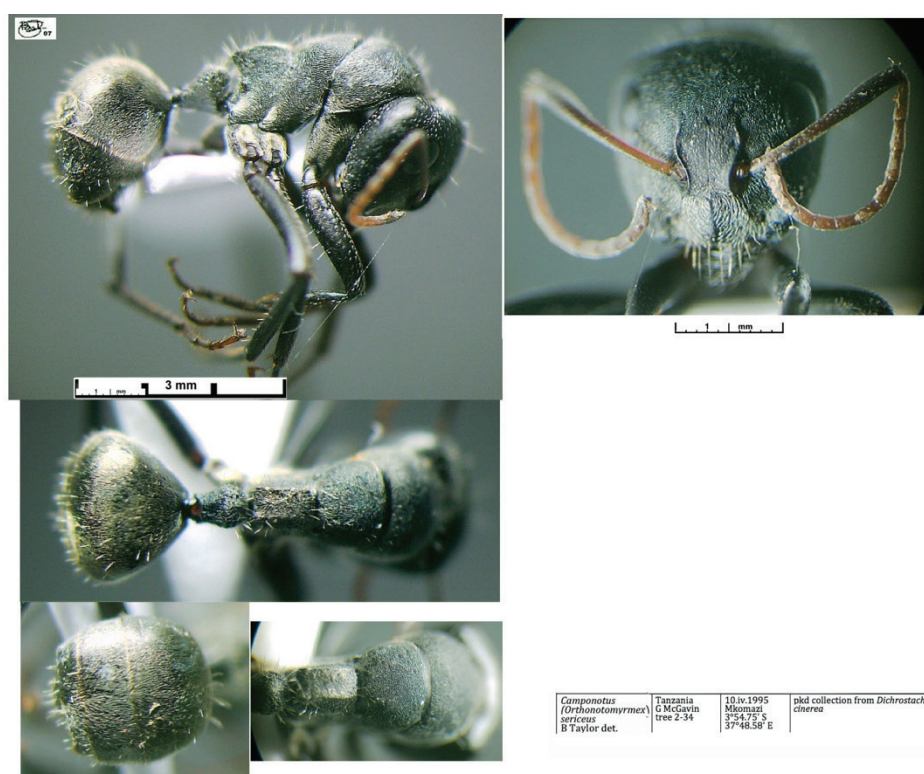




*Camponotus (Myrmotrema) olivieri* Emery, 1892, ssp. *lemma* Forel var. *moshiana* Forel, 1907) type location Tanzania, Moshi, CASENT09022408. A medium sized ant, major-media TL 4.0–5.8 mm. *C. olivieri* in many varieties is widespread in sub-Saharan Africa. Four findings; three on *V. zanzibarica*, 1–3 specimens (Trees 5/17, 5/27 & 5/28); one on *T. brownii* (Tree 3/68), 1 specimen; minor workers.



*Camponotus (Orthonotomymex) sericeus* (Fabricius, 1798); no type images but well known. A medium sized ant, minor TL 6–8.2 mm, major TL 8.0–10 mm. Common pan-African species; ground-nesting and foraging. ROBERTSON (1999) reported it from Mkomazi grassland and woodland. Single finding, one major worker on *D. cinerea* (Tree 2/34).



*Lepisiota depressa* (Santschi, 1914); CASENT0912376 (note – the location label is correct but the name label is wrong). A small ant, TL 2.2-2.3 mm. First report from Tanzania; type location Kenya (coastal area, River Ramisi). Single finding of one specimen on *V. dendropanolobium* (Tree 5/60).

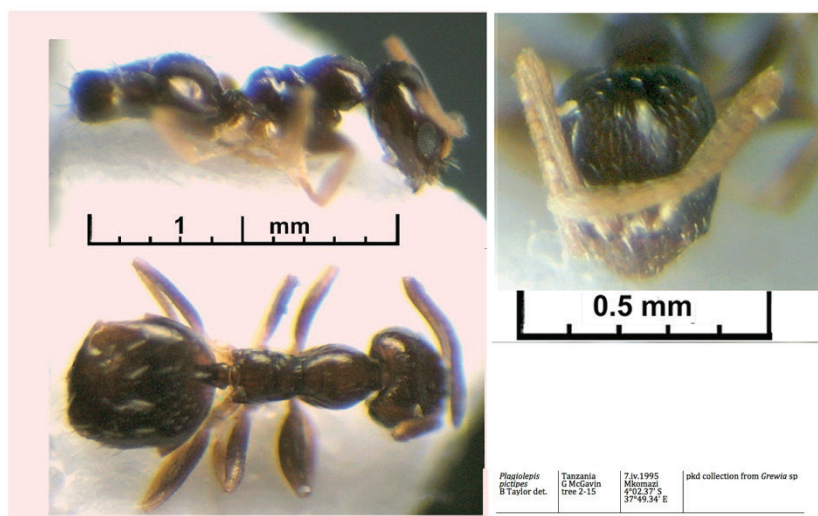


*Plagiolepis alluaudi* Emery, 1894; CASENT0101699. Type location Seychelles. A minute ant, TL 1.4-1.5 mm. Reported from Tanzania by Forel (1907), Arusha-Chini, close to Mkomazi. Five findings; one on *V. zanzibarica* (Tree 5/17), 2 specimens; one on *C. molle* (Tree 3/65), 1 specimen; two on *H. lucens* (Trees 3/50 & 3/51), many and 12 specimens; one on *O. holstii* (Tree 3/56), 3 specimens.



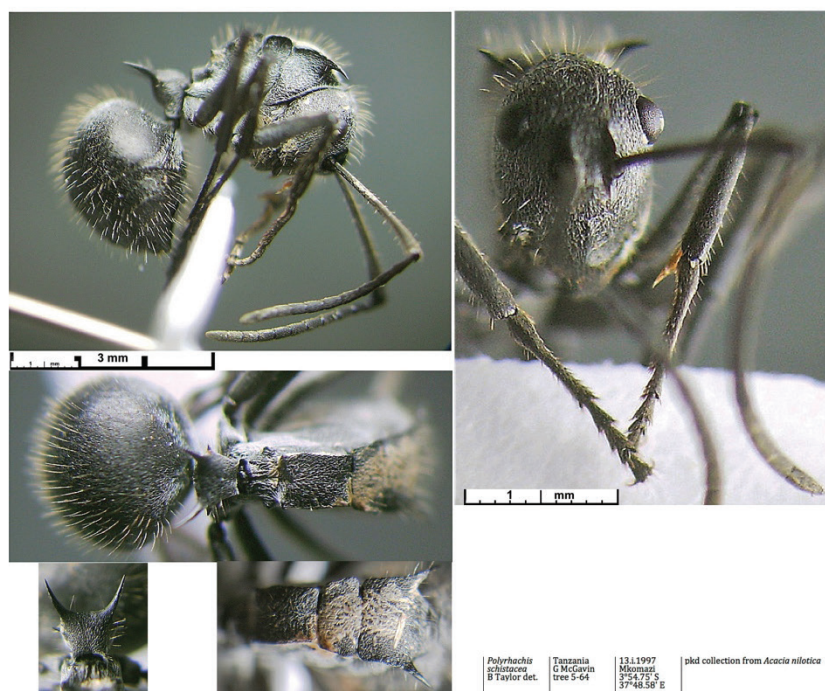


*Plagiolepis pictipes* Santschi, 1914; CASENT0912411. Type location Mbuyuni, Kenya, holotype specimen only. A minute ant, TL 1.4-1.5 mm. First report from Tanzania; two findings - one specimen on *V. nilotica* (Tree 5/64) and one specimen on *Grewia* sp.

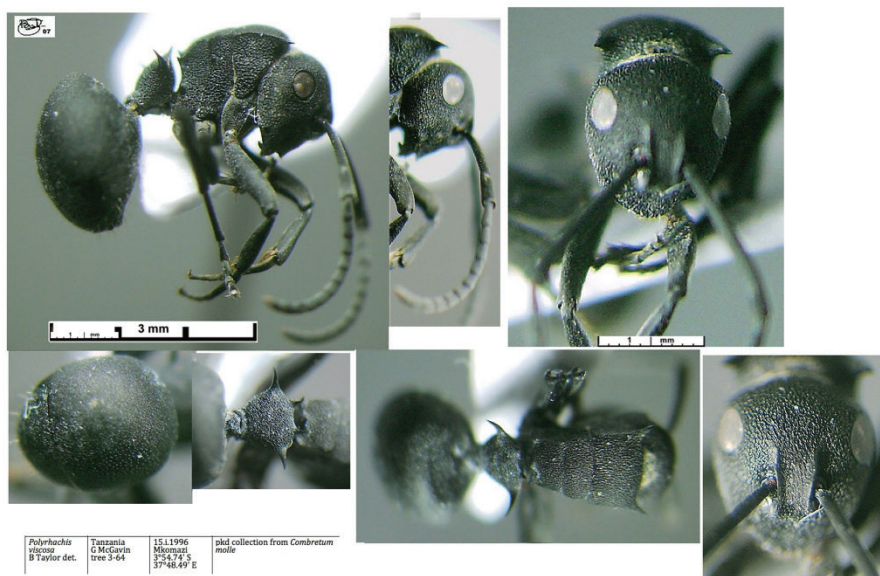


*Polyrhachis mkomzaiae* sp. nov. Single finding of two specimens on *T. brownii* (Tree 3/68). Possibly, the *P. cubaensis* Mayr listed by ROBERTSON (1999). See the species description (above).

*Polyrhachis schistacea* (Gerstäcker, 1859); FOCOL2576. A large ant, TL 9.3-13.7 mm. Common pan-African savannah species; ground nesting but known to forage on bushes and to tend homoptera (ROBERTSON, 1999) Two findings; one on *V. nilotica* (Tree 5/64), 8 specimens; one on *V. zanzibarica* (Tree 5/28), 10 specimens.

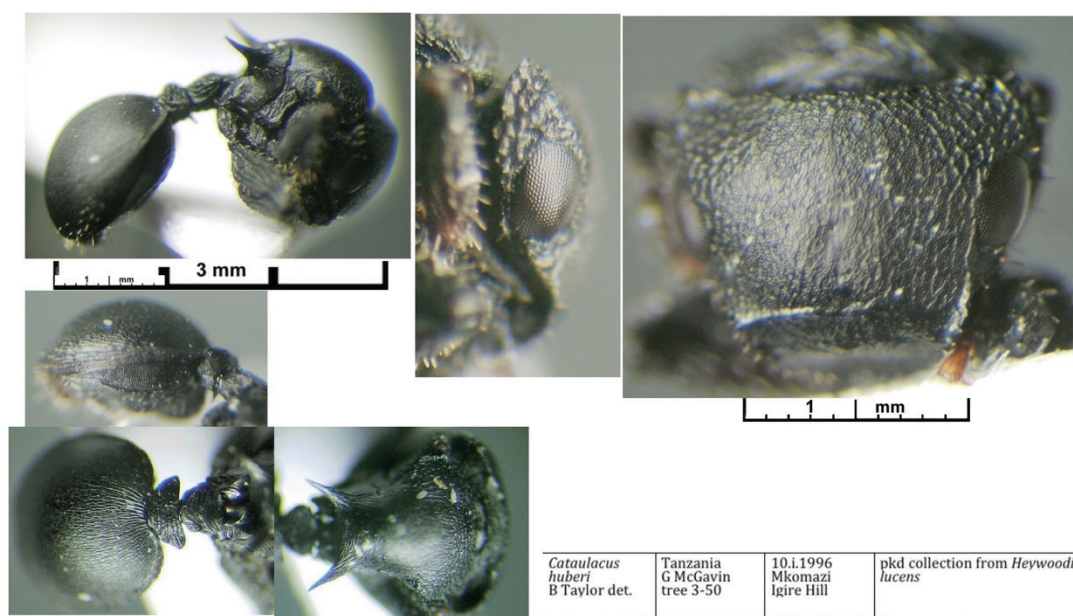


*Polyrhachis viscosa* F. Smith, 1858; CASENT0903462. A medium-sized ant, TL 5.9-7.6 mm. Common pan-African savannah species; ground-nesting but known to forage on trees and bushes. ROBERTSON (1999) reported it from Mkomazi woodland. Six findings all with single fig.s for specimens; two on *V. nilotica* (Trees 5/63 & 5/64); two on *C. molle* (Trees 3/64 & 3/65); one on *L. schweinfurthii* (Tree 3/67); and, two on *T. brownii* (Tree 3/68).



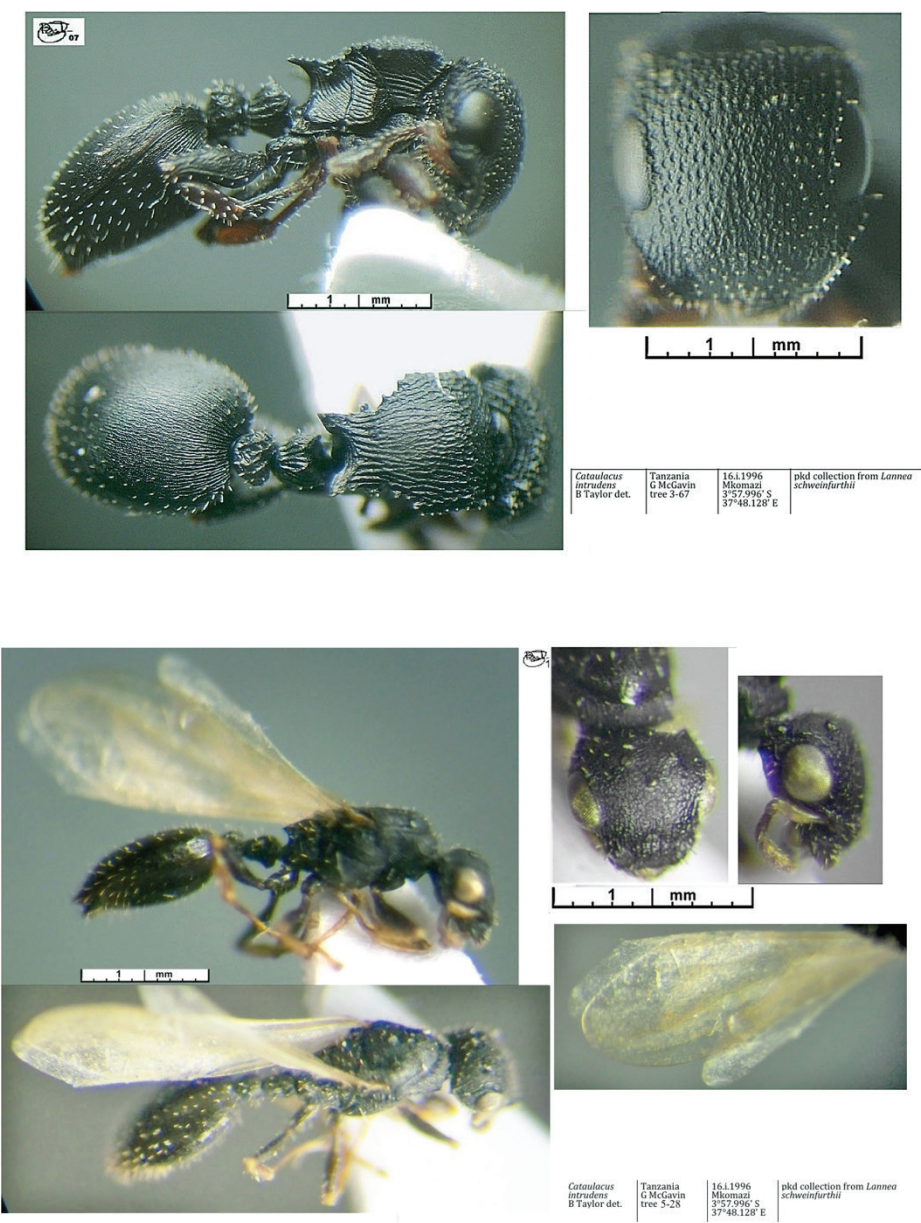
### Subfamily Myrmicinae

*Cataulacus huberi* André, 1890; CASENT0915358 (wrongly labelled "*C. mocquerysi*"). A medium-sized ant, TL 5.5-7.8 mm. First report from Tanzania; almost all prior reports are from West Africa and the Congo Basin, with one from Uganda. Single specimen found on *H. lucens* (Tree 3/50).





*Cataulacus intrudens* (F. Smith, 1876); type queen CASENT0919586; worker of junior synonym *baumi*, CASENT0904882. A medium-sized ant, TL 4.3–5.1 mm. Widespread in Eastern Africa, from Somalia south to South Africa; this appears to match a described Tanzania variant of a “very variable species”. Listed from Mkomazi by ROBERTSON (1999). Five findings; two on *L. schweinfurthi* (Trees 3/66 & 3/67); two on *V. nilotica* (Trees 5/55 & 5/63); and, one on *Grewia* sp (Tree 2/15); in low numbers.



*Cataulacus kenyensis* Santschi, 1935; CASENT0912560; type collection from Nairobi, Kenya. A small ant, TL 3.6 mm. First record from Tanzania, Four findings; three on *V. zanzibarica* (Trees 5/17, 5/26 & 5/28), one with many specimens; one on *V. nilotica* (Tree 5/63), single specimen; generally about 75% size of type but morphologically and proportionately identical. Specimens include a queen and a male, probably the first records of sexuals.



*Crematogaster (Cr.) acaciae* Forel, 1892; CASENT0908494. A small ant, TL 3-5 mm. Widespread but apparently uncommon in Eastern Africa, from Somalia south to South Africa; first report from Tanzania. Single finding, 2 specimens, on *H. lucens* (Tree 3/50).

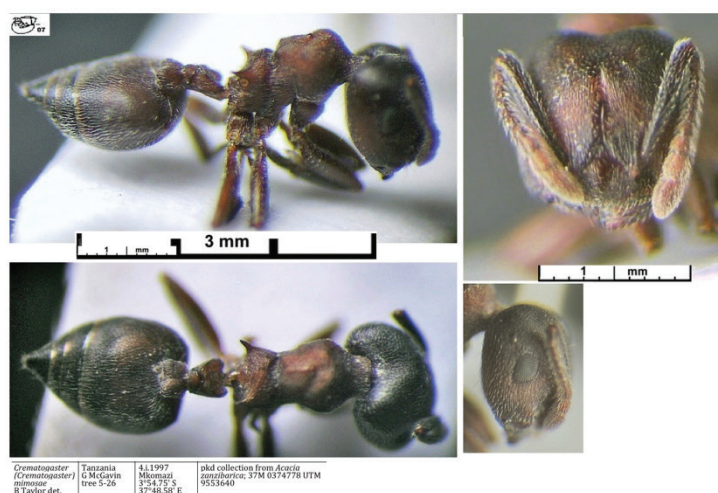




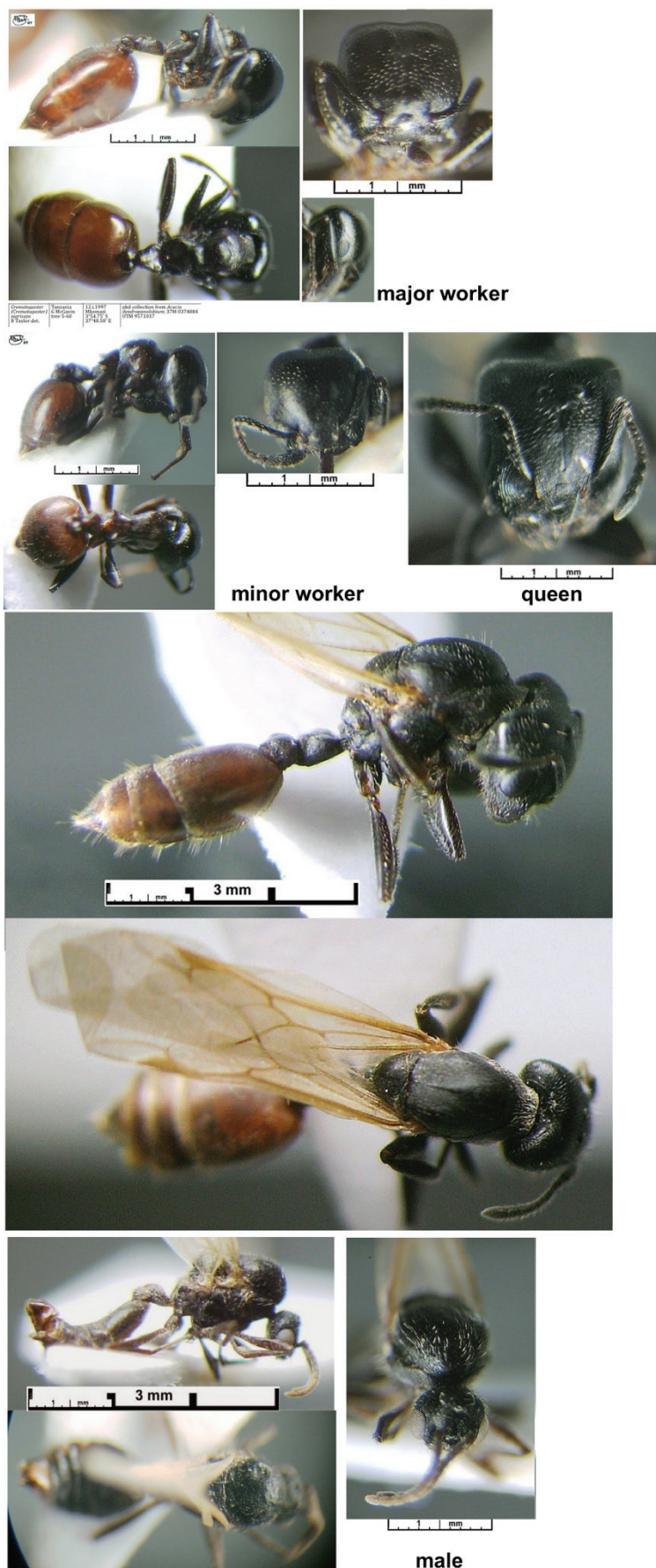
*Crematogaster (Cr.) foraminiceps* Santschi, 1913; CASENT0904515. Type location Kenya from where only reports. A small ant, TL 2.2–3 mm. First report from Tanzania. Two findings; one on *C. molle* (Tree 2/18), 2 specimens; one on *L. schweinfurthii* (Tree 3/67) numerous specimens.



*Crematogaster (Cr.) mimosae* Santschi, 1914; CASENT0904507. Type location Kenya, lower Mount Kenya in galls of *V. stenocarpa*. A fairly small ant, TL 3.5–4.5 mm. First report from Tanzania, also known from Somalia and Ethiopia. Six findings; five as a dominant on *V. zanzibarica* (Trees 5/16, 5/17, 5/26, 5/27 & 5/28); one of two specimens on *O. holstii* (Tree 3/56).

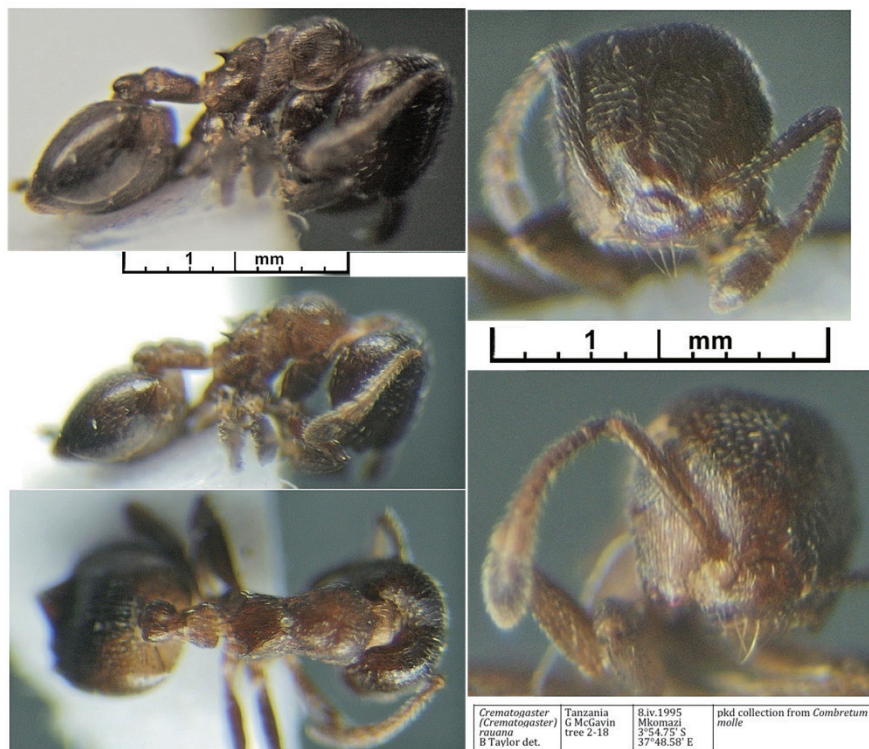


*Crematogaster* (*Cr.*) *nigriceps* Emery, 1897; CASENT0904510. Type location Somalia, from *V. spines*. A fairly small ant, TL 3-3.5 mm. Several reports from Tanzania north to Ethiopia. ROBERTSON (1999) reported it from Mkomazi woodland, as *Cr. prelli*. Four findings, all as a dominant on *V. drepanolobium* (Trees 5/58, 5/59, 5/60 & 5/61).





*Crematogaster* (*Cr.*) *rauana* Forel, 1907, **new status**; CASENT0908528. Type location Tanzania; near Moshi, sole prior report as a variety of *Cr. gallicola*. A small ant, TL 2.7–3.0 mm. Single specimen found on *H. lucens* (Tree 3/51). This is identical in all ways to the type but at the lowest end of the size range given by Forel, 2.7–3.0 mm. *Cr. gallicola* Forel, CASENT0908527, is smaller, much less sculptured and has a more rectangular head in full face view.



*Crematogaster* (*Cr.*) *sjostedti* Mayr, 1907; syntype CASENT0902105; type location Tanzania, Usambara. A fairly small ant, TL 3.0–5.5 mm. Widespread in Eastern Africa, from Somalia south to South Africa. Three findings, probably as a dominant; two on *C. molle* (Trees 2/25 & 2/31); one on *T. brownii* (Tree 3/68).



*Crematogaster* (*Cr.*) *tenuipilis* Santschi, 1937, **new status**; CASENT0912705; type location Kenya, sole finding. A small ant, TL 3-5.5 mm. First report from Tanzania. Two findings on *H. lucens* (Trees 3/50 & 3/51); one specimen on each. Close to *Cr. mimosae* in size and form but with distinctive bicloured appearance.



*Crematogaster* (*Cr.*) *tricolor* Gerstäcker, 1859, **revived status**; CASENT0104590; type location Mozambique. Readily separable from the unicoloured *Cr. castanea* F. Smith, 1858, from South Africa, CASENT0102953. A fairly small ant, TL 4.2-4.8 mm. Widespread in Eastern Africa, from Somalia south to Mozambique; Tanzanian forms include *bruta* (*Crematogaster* (*Acrocoelia*) *castanea* Sm. st. *bruta* Sants. var. *tanganikana* n. var., Santschi, 1926), CASENT0912649. Two findings; one as a possible dominant on *L. schweinfurthii* (Tree 3/66); one of 25 specimens on *Grewia* sp (Tree 2/15).



*Crematogaster* (*Decacrema*) *solenopsides* Emery, 1899; CASENT0904483. Type location Tanzania, subspecies *flavida* (*Crematogaster solenopsides* subsp. *flavida* Mayr, 1907) type location Usambara in acacia galls. A small ant, TL 2.25 mm. Four findings; three of 4–49 specimens on *V. nilotica* (Tree 5/55, 5/56 & 5/57); one of a single specimen on *C. molle* (Tree 3/65).



*Crematogaster* (*Sphaerocrema*) *amita* Forel, 1913; CASENT0902063. Type location Mozambique. A fairly small ant, TL 3.4–3.5 mm. First report from Tanzania. Two findings, both on *C. molle* (Trees 3/64 & 3/65), 4 & 2 specimens.

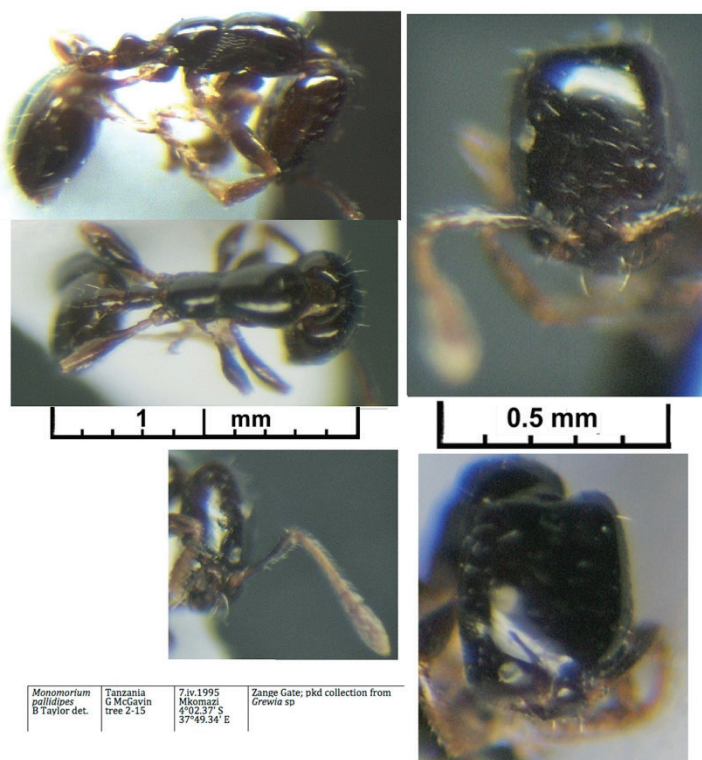




*Crematogaster* (*Sphaerocrema*) *kneri* Mayr, 1862; CASENT0919670. Type location Ghana, scattered reports from across sub-Saharan Africa. A fairly small ant, TL 4.2-4.8 mm. First report from Tanzania. Three findings; one on *V. nilotica* (Tree 5/55), 2 specimens; two on *C. molle* (Trees 2/26 & 2/27) ca 25 specimens on each.

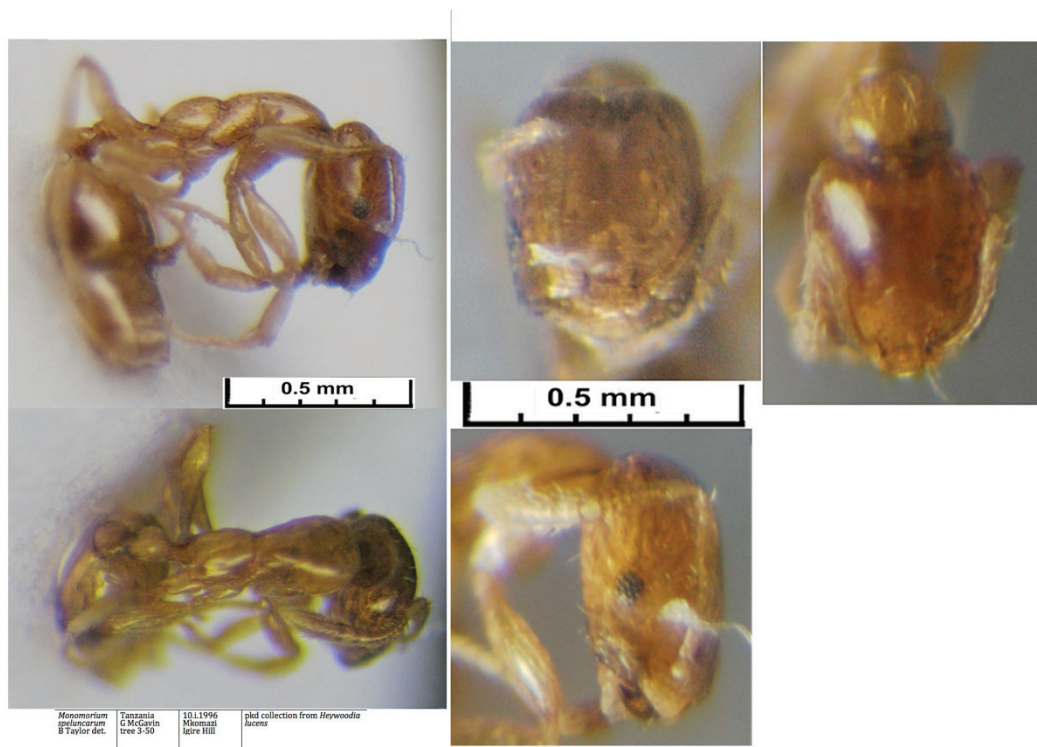


*Monomorium pallidipes* Forel, 1910; CASENT0908702. A minute ant, TL 1.5 mm. Type location Eritrea, other reports from Sudan, Kenya and Tanzania (Kilimanjaro, illustrated, Santschi, 1926). Four findings; three on *V. nilotica* (Trees 5/55, 5/63 & 5/64 - 11 specimens); one on *Grewia* sp (Tree 2/15); one specimen each. Note: the type specimen in the Antweb images is quite a pale yellow. BOLTON (1987) referring only to three specimens from the type collection, had the colour as “uniform medium to dark brown”. Our specimens all are a shiny, dark brown.





*Monomorium speluncarum* Santschi, 1914; CASENT0913855. Holotype & 2 other workers known only from a single site in Kenya. A minute ant, TL 1.5 mm. First record from Tanzania; single finding of four specimens on *H. lucens* (Tree 3/50).



*Tetramorium caldarium* (Roger, 1857); CASENT0102333; type location Germany. A small ant, TL 2.1-2.4 mm. First report from Tanzania; a tramp species with African records including Kenya. Three findings; two on *V. nilotica* (Trees 5/56 & 5/63); and one on *H. lucens* (Tree 3/50). These match the type form of a variable species.



*Nesomyrmex latinodis* (Mayr, 1895), **revived status**; CASENT0914925; type location Mozambique. A small ant, TL 3.1-3.8 mm. Widespread sub-Saharan form that seems to have been wrongly lumped with the Egypt/North Africa type *Nesomyrmex angulatus* (Mayr, 1862, CASENT0914922) by BOLTON (1982). *N. latinodis* has a wider postpetiole and slightly longer scapes; also, more sharply angled anterior pronotal corners. *N. angulatus* specimens appear to have consistently distinctive dark apical segments to the funiculi. Ten findings; five on *V. nilotica* (Trees 5/55, 5/56, 5/57, 5/63 & 5/64), two on *C. molle* (Trees 2/18 & 2/31); two on *L. schweinfurthii* (Trees 3/66 & 3/67); and, one on *T. brownii* (Tree 3/68).



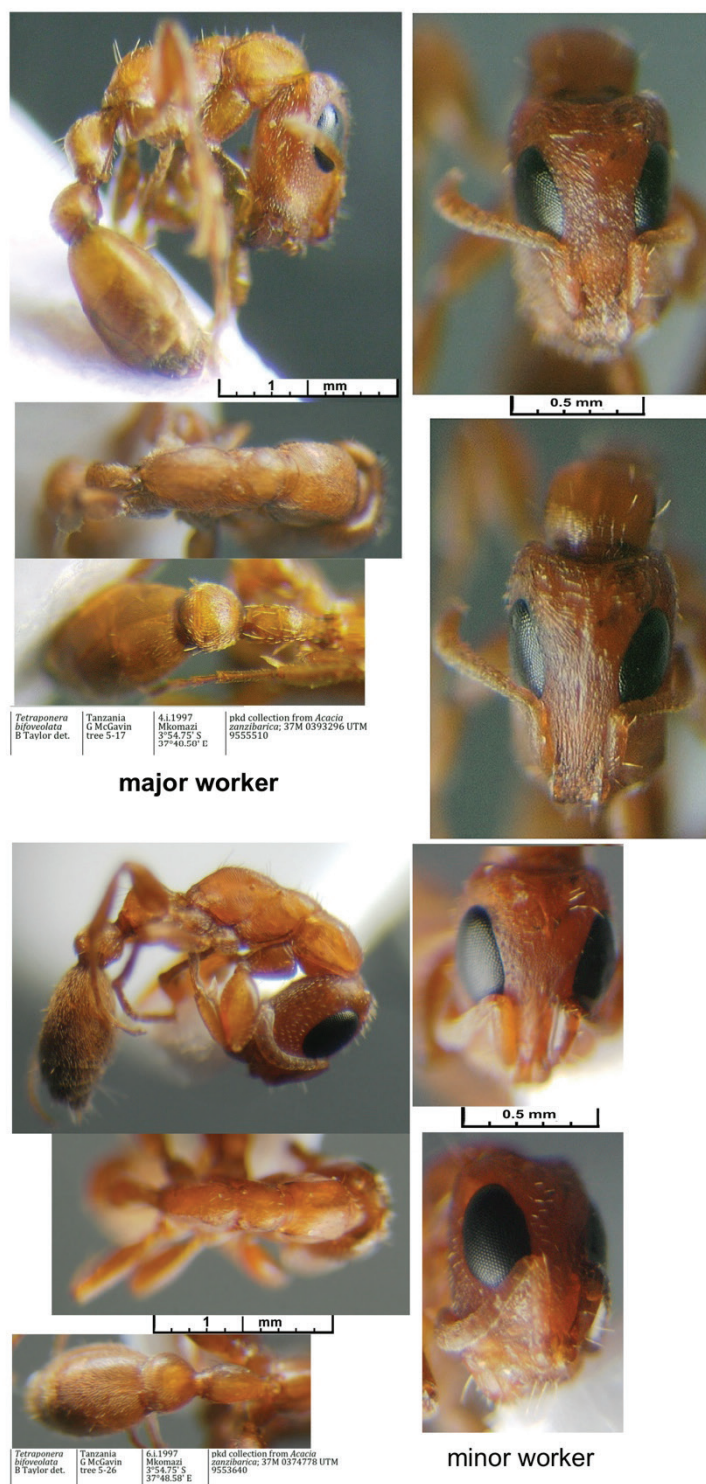
*Tetramorium candidum* Bolton. 1980; CASTYPE13387. Type location in eastern DR Congo, Bukavu; sole reported finding. A small ant, TL 3.1–3.3 mm. First report from Tanzania. Single finding of one specimen on *H. lucens* (Tree 3/50).



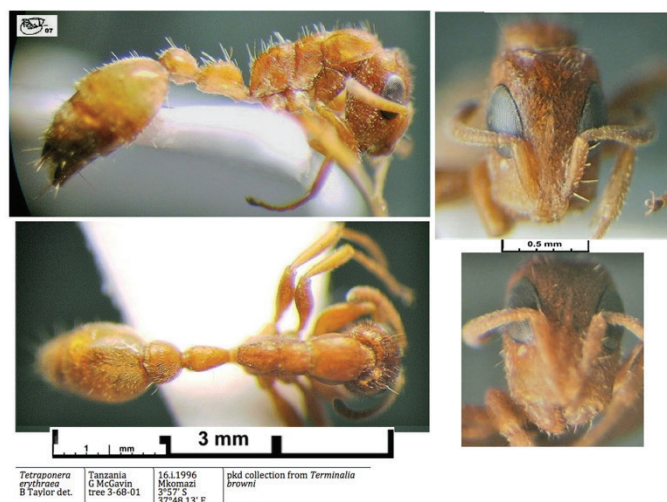


### Subfamily Pseudomyrmecinae

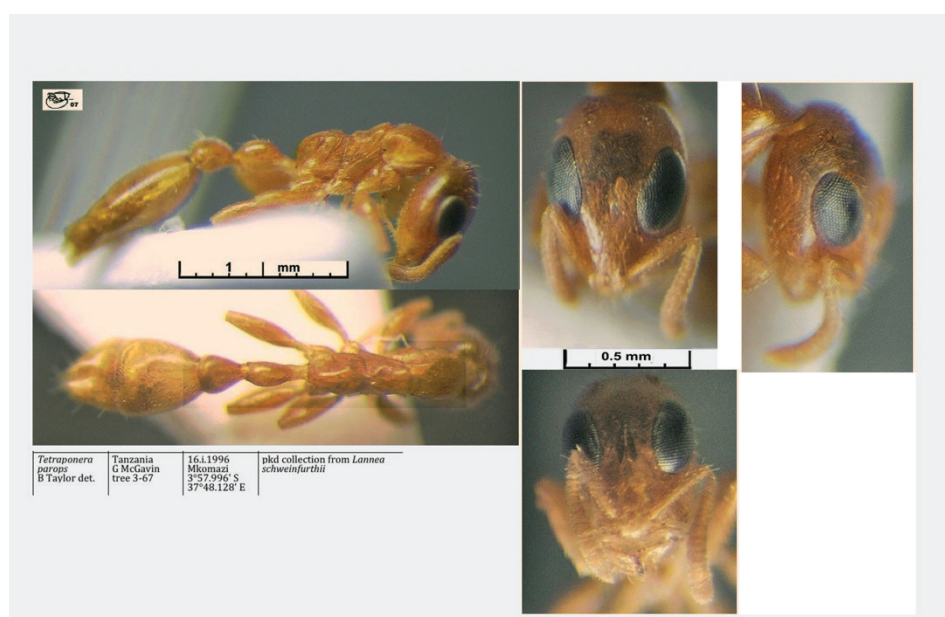
*Tetraponera bifoveolata* (Mayr, 1895); CASENT0902814, minor worker. Type location Mozambique but known otherwise only from Tanzania and the Horn of Africa. A fairly small ant, minor TL 3.8-4.2 mm, major TL 4.5-5.0 mm: This appears to be the first finding of a major worker; Six findings; two on *V. nilotica* (Trees 5/63 & 5/64), many specimens & one queen; three on *V. zanzibarica* (Trees 5/17, 5/26 & 5/28), 24, 3 & 7 specimens; plus a single specimen on *C. molle* (Tree 3/65).



*Tetraponera erythraea* (Emery, 1895), **revived status**, CASENT0904034. Type location Yemen. A fairly small ant, TL 4.5 mm. First report from Tanzania. Single finding of many specimens on *T. brownii* (Tree 3/68). Revived from the synonymy under *T. ambigua*, of WARD (2006). *T. erythraea* has the alitrunk profile in three shallow convexities, with quite abundant erect hairs, whereas the alitrunk on *T. ambigua* is near flat and there are few erect hairs.



*Tetraponera parops* Ward, 2006; CASENT0106133. Type location Kenya. A small ant TL ca 2.5 mm. Ward (2006) listed others from Tanzania (Arusha and Mkomazi, including among the ROBERSON, (1999), unidentified species) and Somalia, collected in dead twigs. Two findings of 14 and 19 specimens on *L. schweinfurthii* (Trees 3/66 & 3/67).



*Tetraponera prelli* (Forel, 1911); CASENT0907474. Type location Tanzania, Monga; also from Moshi and Usambara. A medium-sized ant, TL 5.6-7.5 mm. Five findings; two on *L. schweinfurthii* (Trees 3/66 & 3/67), 1 & 20 specimens; two on *C. molle* (Trees 2/25 & 3/64), 1 & 2 specimens; one on *V. nilotica* (Tree 5/55), 11 specimens.

