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The ant genus *Tetramorium* Mayr (Hymenoptera: Formicidae) in the Malagasy region—introduction, definition of species groups, and revision of the *T. bicarinatum*, *T. obesum*, *T. sericeiventre* and *T. tosii* species groups

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Table of contents

Abstract

The globally distributed ant genus *Tetramorium* Mayr is especially diverse in the Afrotropical, Oriental, and Indo-Australian regions, while the Malagasy fauna, by contrast, seemed to be comparatively species-poor. However, recent ant inventories in Madagascar and its surrounding island systems have generated an immense amount of new material. As a result, there is now a great need of an updated taxonomic revision for the genus *Tetramorium* in this region. The present study represents an introduction to the genus, and treats the species groups encountered in the Malagasy region. All former species groups were redefined, and several new groups were established, in order to accommodate the substantial amount of new material. We propose 14 species groups of *Tetramorium* for this region. Morphological boundaries between these groups and their biogeographic affinities are discussed, and an illustrated identification key to species groups is provided. Diagnoses of all species groups are presented, as well as images of typical group members. Additionally, the species level taxonomy of the *T. bicarinatum*, *T. obesum*, *T. sericeiventre* and *T. tosii* species groups is revised with descriptions and images of all species, and an identification key to the species of the *T. bicarinatum* group is provided. No nomenclatorial changes are documented from the *T. bicarinatum*, *T. obesum*, and *T. tosii* groups. However, within the *T. sericeiventre* species group, one new species, *T. mahafaly* sp. n., is described and *T. quadrispinosum* Emery, 1886 and all its former synonyms are proposed as junior synonyms of *T. sericeiventre* Emery, 1877. At present, there are still 39 valid species of *Tetramorium* for the Malagasy region, but this number is expected to increase significantly with upcoming taxonomic revisions of the species groups not revised in this study.

Key words: Malagasy region, taxonomic revision, taxonomy, Tetramoriini, Tetramorium, tramp species

Introduction

The genus *Tetramorium* Mayr, 1855 is one of the most species-rich ant genera, containing approximately 450 described species (Bolton, 1995, 2007, 2010). It is by far the largest genus within the Tetramoriini, which constitutes more than 90 percent of all species within the tribe (Bolton, 1976). The distribution of the genus is worldwide, although species richness varies greatly among zoogeographic regions. The New World possesses a limited fauna with 13 species, while the Afrotropical region holds by far the largest number, around 230 described species (Bolton, 1976, 1980, 1985; Hita Garcia *et al*. 2010a, 2010b; Hita Garcia *et al*. 2010c). The genus is well-represented in the Palaearctic, Oriental, Malagasy, and Indo-Australian regions, though species numbers are much lower than in the Afrotropical region. The taxonomy of the genus was revised for most regions by Bolton (1976, 1977, 1979, 1980, 1985) save for the Palaearctic. However, the taxonomy of the latter region has seen great improvements in recent years (Steiner *et al*., 2005; Schlick-Steiner *et al*., 2006a; Csösz *et al*., 2007; Csösz & Schulz, 2010; Steiner *et al*., 2010).

The *Tetramorium* fauna of the Malagasy region was monographed by Bolton (1979), who recognised 36 species belonging to 8 species groups. The synonymisation of *Triglyphothrix* Mayr, 1890 under *Tetramorium* (Bolton, 1985) added a species group containing one species, and recently two more tramp species from the *Tetramorium bicarinatum* species group were found to occur on Mauritius, Reunion, and the Seychelles (see AntWeb, http://www.antweb.org; Blard *et al*., 2003; Roberts & McGlynn, 2004). These findings bring the total count of described species to 39. Before Bolton's revision (1979) the *Tetramorium* fauna was only poorly known. What information did exist was culled from scattered publications describing species and infraspecific taxa, mostly outside any generic framework (e. g. Emery, 1895a, 1895b, 1899; Forel, 1887, 1891, 1892, 1895; Santschi 1911). Bolton's revision (1979) provided the first monograph of the genus for the Malagasy region on the basis of old type material and fresh collections from the 1960s and 1970s. No further taxonomic treatments on the genus have been published, despite the fact that the region was intensively sampled over the last two decades (Fisher, 1996, 1997, 1998, 1999a, 1999b, 2000a, 2000b, 2002, 2003, 2005a, 2005b). Fisher (2003, 2005a) pointed out that the total number of ant species in the Malagasy region might approximate 1000, though over 60 percent of the fauna remains undescribed. As a group, Malagasy ants display an incredibly high rate of endemism. Against this background, the 39 described species of *Tetramorium* in the Malagasy region seem to be relatively paltry compared to the approximately 230 species known from the Afrotropical region. Most of these 39 species were described or documented, however, decades before the large scale ant sampling project in Madagascar initiated by the California Academy of Sciences, San Francisco. A large number of undescribed *Tetramorium* species resulted from these recent inventories and are now located in the collection of the California Academy of Sciences. Initial examinations of this material indicate that the actual number of undescribed *Tetramorium* species for the whole Malagasy region likely ranges between 100 and 120. If so, these species would increase the diversity of the genus four- to fivefold. Consequently, the genus is in great need of an updated taxonomic treatment on the basis of the framework provided by Bolton (1979).

With this study we present an introduction to the genus in the Malagasy region, redefine existing species groups, present new species groups, and provide an illustrated identification key to the species groups. Furthermore, we treat the taxonomy of the *T. bicarinatum*, *T. obesum*, *T. sericeiventre*, and *T. tosii* species groups with new descriptions of all formerly known species, the description of one new species, and a species key for the *T. bicarinatum* species group. This publication is meant to be the first of a series aiming to revise the taxonomy of the whole genus *Tetramorium* in the Malagasy region.

Abbreviations of depositories

The collection abbreviations follow Bolton (1980) and Evenhuis (2009). The material upon which this study is based is located and/or was examined at the following institutions:

BMNH	The Natural History Museum (British Museum, Natural History), London, U.K.
CASC	California Academy of Sciences, San Francisco, California, U.S.A.
MCZ	Museum of Comparative Zoology, Cambridge, Massachusetts, U.S.A.
MHNG	Muséum d'Histoire Naturelle de la Ville de Genève, Geneva, Switzerland

MNHN	Muséum National d'Histoire Naturelle, Paris, France
MNHU	Museum für Naturkunde, Berlin, Germany
MSNG	Museo Civico di Storia Naturale Giacomo Doria, Genoa, Italy
NHMB	Naturhistorisches Museum, Basel, Switzerland
NMW	Naturhistorisches Museum Wien, Vienna, Austria
OUMNH	University Museum of Natural History, Oxford, U.K.
RMCA	Royal Museum for Central Africa, Tervuren, Belgium
ZSM	Zoologische Staatssammlung München, Munich, Germany

Material and methods

The material examined in this study is based on ant inventories carried out in the Malagasy region from 1992 to 2008 and included more than 6,000 leaf litter samples, 4,000 pitfall traps, and 9,000 additional hand collecting events (see Fisher, 2005a for additional details).

Type material for the new species and all imaged specimens can be uniquely identified with specimen-level codes affixed to each pin (e.g. CASENT0078328). Digital colour images were created using a JVC KY-F75 digital camera and Syncroscopy Auto-Montage (version 5.0) software. All images presented herein are available online and can be seen on AntWeb (http://www.antweb.org). All measurements were taken with a Leica MZ 12.5 equipped with an orthogonal pair of micrometers at a magnification of 100x. Measurements and indices are presented as minimum and maximum values with arithmetic means in parentheses. In addition, all measurements are expressed in mm to three decimal places. The following measurements and indices, in parts adapted from Bolton (1980) and Güsten *et al*. (2006), were used:

Head length (HL):	maximum distance from the mid-point of the anterior clypeal margin to the mid-point of the posterior margin of head, measured in full-face view (Fig. 1C). Impressions on anterior clypeal margin and posterior head margin reduce head length.
Head width (HW):	width of head directly behind the eyes measured in full-face view (Fig. 1C).
Scape length (SL):	maximum scape length excluding basal condyle and neck (Fig. 1C).
Eye length (EL):	maximum diameter of compound eye measured in oblique lateral view (Fig. 1A).
Pronotal width (PW):	maximum width of pronotum measured in dorsal view (Fig. 1B).
Weber's length (WL):	diagonal length of mesosoma in lateral view from the postero-ventral margin of propodeal lobe to the anterior-most point of pronotal slope, excluding the neck (Fig. 1A).
Propodeal spine length (PSL):	the tip of the measured spine, its base, and the centre of the propodeal concavity between the spines must all be in focus. Using a dual-axis micrometer the spine length is measured from the tip of the spine to a virtual point at its base where the spine axis meets orthogonally with a line leading to the median point of the concavity (Fig. 1D).
Petiolar node height (PTH):	maximum height of petiolar node measured in lateral view from the highest (median) point of the node to the ventral outline. The measuring line is placed at an orthogonal angle to the ventral outline of the node (Fig. 1A).
Petiolar node length (PTL):	maximum length of the dorsal face of the petiolar node from the anterodorsal to the posterodorsal angle, measured in dorsal view excluding the peduncle (Fig. 1B).
Petiolar node width (PTW):	maximum width of dorsal face of petiolar node measured in dorsal view (Fig. 1B).
Postpetiole height (PPH):	maximum height of the postpetiole measured in lateral view from the highest (median) point of the node to the ventral outline. The measuring line is placed at an orthogonal angle to the ventral outline of the node (Fig. 1A).
Postpetiole length (PPL):	maximum length of postpetiole measured in dorsal view (Fig. 1B).
Postpetiole width (PPW):	maximum width of postpetiole measured in dorsal view (Fig. 1B).

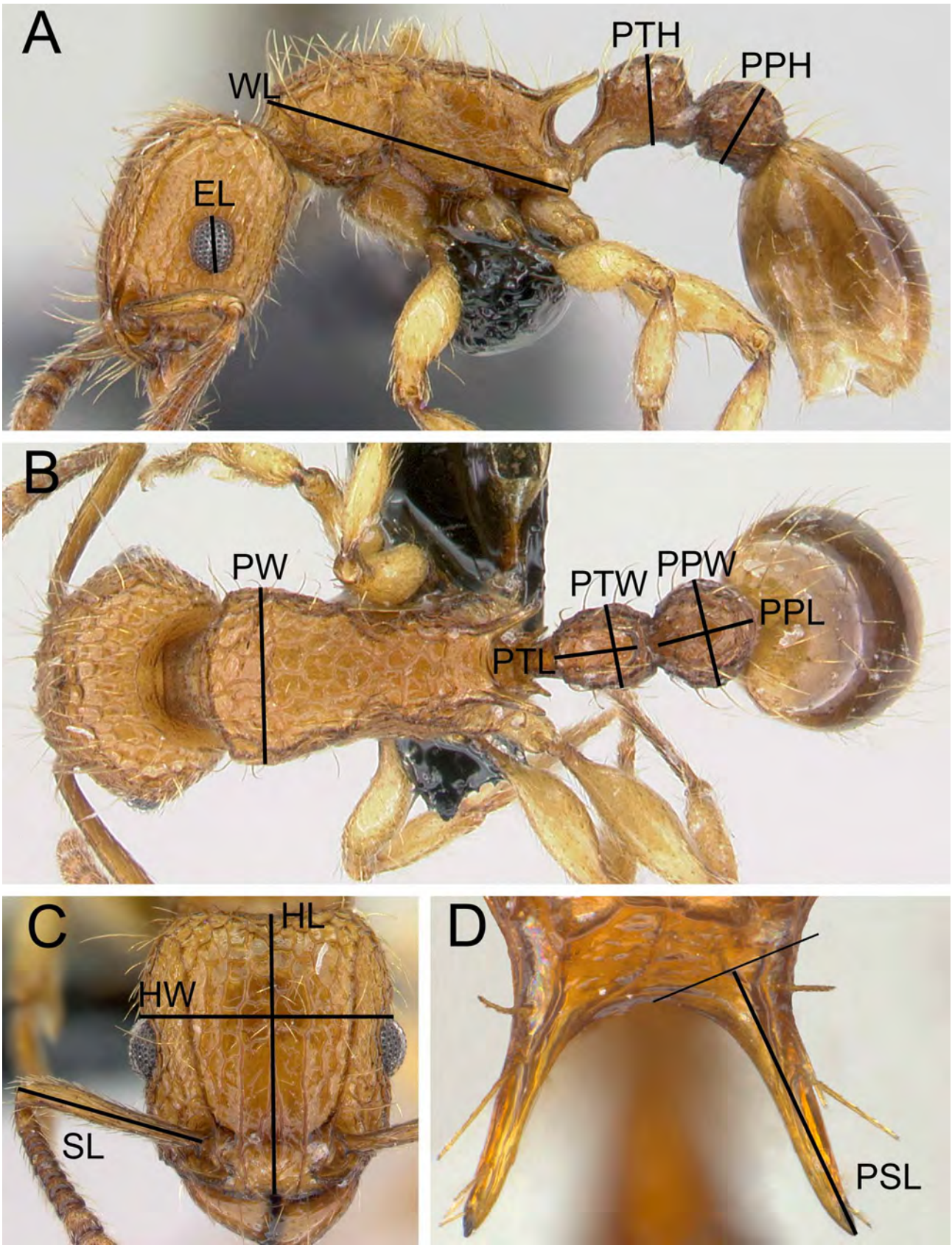


FIGURE 1. Images of *Tetramorium insolens* (Smith, F., 1861) illustrating the used measurements. A. body in lateral view with measuring lines for EL, PPH, PTH, and WL. B. body in dorsal view with measuring lines for PPL, PPW, PTL, PTW, and PW. C. head in full-face view with measuring lines for HL, HW, and SL. D. dorsocaudal view of the propodeum with measuring line for PSL and an orthogonal (thinner) helping line going to the median point where the mesosomal dorsum meets the declivity.

[Note that the petiole and postpetiole were measured differently. For the petiole, only the petiolar node was measured, excluding the peduncle, as the node has proved to be of high diagnostic value (Hita Garcia *et al*., 2010b). Measurements of the whole petiole, peduncle plus node, would mask these important differences between species. In contrast, we measured the whole postpetiole because it was rounded in most species without a distinct peduncle-like structure. As a consequence, some information can be lost in the few species with a weakly anteroposteriorly compressed postpetiole. However, taking all species into account, the postpetiole measurements as defined allowed better comparisons for most species.]

Ocular index (OI):	EL / HW * 100
Cephalic index(CI):	HW / HL * 100
Scape index (SI):	SL / HW * 100
Propodeal spine index (PSLI):	PSL / HL * 100
Petiolar node index (PeNI):	PTW / PW * 100
Lateral petiole index (LPeI):	PTL / PTH * 100
Dorsal petiole index (DPeI):	PTW / PTL * 100
Postpetiolar node index (PpNI):	PTW / PW * 100
Lateral postpetiole index (LPpI):	PPL / PPH * 100
Dorsal postpetiole index (DPpI):	PPW / PPL * 100
Postpetiole index (PPI):	PPW / PTW * 100

Species groups of the Malagasy zoogeographical region

Prior to this study, 9 species groups were known from the Malagasy region. These were created to accommodate between 35 to 40 species (Bolton, 1976, 1979). Though the actual number of species is likely 4 to 5 times greater, most of these groups still work relatively well. However, the large amount of new material made it necessary to modify several existing species groups and establish several new groups, leading to a total of 14 species groups for the region.

The first major change to Bolton's (1979) classification is the treatment of the *T. weitzeckeri* group as previously defined for the Malagasy region. At present, we consider only the species *Tetramorium humbloti* Forel, 1891 (Fig. 25) a true member of the primarily Afrotropical *T. weitzeckeri* group; the other former members have been placed in other groups. The *T. weitzeckeri* group was recently revised for the Afrotropical region (Hita Garcia *et al*., 2010b), and the Malagasy species formerly considered to belong to this species group show enough morphological differences to justify placement in their own groups.

The species *Tetramorium bessonii* Forel, 1891 (Fig. 26) and a number of related undescribed species (e. g. Fig. 27) show strong differences in petiolar node shape and gastral pilosity compared to the Afrotropical *T. weitzeckeri* group members. Consequently, these ants have been placed in their own species group. The primary reason for this shift is the shape of the petiolar node, which is always squamiform or high nodiform in the *T. weitzeckeri* group, but vary from strongly anteroposteriorly compressed and squamiform to rectangular nodiform without sharp angles in the *T. bessonii* group. The latter condition strongly contradicts the definition for the *T. weitzeckeri* species group. Furthermore, the first gastral tergite in the *T. bessonii* group can possess very short to relatively long, sparse to dense pubescence, and is generally devoid of any pilosity. The latter condition of reduced pilosity can also be found in some Afrotropical species of the *T. weitzeckeri* group, but such ants always have very short and scarce pubescence in contrast to the *T. bessonii* group members.

Two more newly created species groups are based on the former Malagasy *T. weitzeckeri* group: the *T. marginatum* group, as well as a "New species group 1" (Figs. 28, 29, 30). Both possess11-segmented antennae, unsculptured waist segments, and a typically strongly anteroposteriorly compressed and squamiform petiolar node that rendered them members of the *T. weitzeckeri* group in the past. However, the shape of the node differs distinctly from the one observed in the Afrotropical species of the *T. weitzeckeri* group. The squamiform petiolar node of the latter group is much higher than long, regularly anteroposteriorly compressed leading to roughly parallel anterior and posterior faces with the dorsal face as a plateau, and the anterodorsal angle is never higher than the posterodor-

sal angle (see Hita Garcia *et al*., 2010b). The petiolar node of both Malagasy species groups is usually only dorsally anteroposteriorly compressed, which often gives the node a triangular or even cuneiform appearance, and the anterodorsal angle is often situated much higher than the posterodorsal angle, if the latter is defined at all. The shape of the petiolar node in some members of the Afrotropical *T. squaminode* species group (see Bolton, 1980) does resemble the one described for the *T. marginatum* group and the "New species group 1", although the former possesses an antennal count of 12 in contrast to 11 found in the two Malagasy groups.

Another species group consisting of *Tetramorium dysalum* Bolton, 1979 (Fig. 34), *Tetramorium steinheili* Forel, 1892 (Fig. 35), and more than 15 additional, potentially undescribed species was newly established: the *T. dysalum* group. This group has a petiolar node that is generally sculptured, although often only weakly so, and variable in shape from relatively anteroposteriorly compressed and squamiform to high nodiform; if the latter condition is present, then the anterodorsal angle is higher than the posterodorsal, causing the dorsum to taper distinctly backwards. The node is always much higher than long. This petiolar node shape resembles the one observable in most members of the African *T. edouardi* species complex of the *T. weitzeckeri* group. Bolton (1979) pointed out that *T. steinheili* resembles members of the *T. tortuosum* group in overall appearance with the exception of the petiolar shape. We fully agree with his opinion, and consider the whole *T. dysalum* group morphologically closer to the *T. tortuosum* group than to the *T. weitzeckeri* group. The very strong, longitudinal rugulation on the head and mesosoma, the often strongly marginated mesosoma, the sculptured waist segments, and the often long and dense pilosity all argue for the placement of the *T. dysalum* group near the *T. tortuosum* group, while the only reason to add them to the *T. weitzeckeri* group is the anteroposteriorly compressed petiolar node. Nevertheless, *T. dysalum*, *T. steinheili*, and allies are not considered to belong to the *T. tortuosum* group because of the shape of the petiolar node. The *T. tortuosum* group is present in the New World, Afrotropical, Oriental, and Indo-Australian regions, and the shape of the petiolar node is always rectangular nodiform with more or less sharp angles, usually longer than high or as long as high. The petiolar node shape of the *T. dysalum* group, as noted above, is markedly different, supporting the establishment of a new species group.

The *T. schaufussii* species group as defined by Bolton (1979) (Figs. 31, 32) still works relatively well. The main characters considered diagnostic for this group are the rounded high nodiform petiolar node, relatively small body size with a compact appearance, and very short to medium-sized propodeal spines. This combination of characters separates it from all other Malagasy species groups. Nonetheless, the species *Tetramorium severini* Emery, 1895b (Fig. 33) was excluded from the *T. schaufussii* group for several reasons. First, its overall appearance does not resemble any other member of the *T. schaufussii* group since *T. severini* is a very large species with very long and spinose propodeal spines, a more slender constructed mesosoma, and very dark brown to black colouration. Also, early data from mtDNA analyses indicates (FHG & BLF, unpublished data) that *T. severini* is not a member of the *T. schaufussii* group. Interestingly, Emery (1895b) was of the opinion that *T. severini* could be related to members of the *T. tortuosum* group, e. g. *Tetramorium andrei* Forel, 1891 and *Tetramorium latreillei* Forel, 1895. Bolton (1979) pointed out that the unsculptured mandibles and waist segments and the rounded high nodiform petiolar node of *T. severini* place this species within the *T. schaufussii* group. We agree that these characters are distinctly different from all known species of the *T. tortuosum* group. At present, we cannot say with certainty whether *T. severini* is an aberrant *T. schaufussii* species, a very unusual member of the *T. tortuosum* group, or a separate development lacking any relation to the other two groups. Therefore, we place it in its own species group until more evidence becomes available.

The two remaining species groups with 11-segmented antennae, the *T. ranarum* (Figs. 38, 39) and *T. tortuosum* (Figs. 36, 37) groups, remain mostly unchanged in their definitions since Bolton's (1979) revision; ways to differentiate between these two are presented in the key below. Also, all 12-segmented species groups, the *T. bicarinatum* (Figs. 15, 16, 17), *T. obesum* (Fig. 18), *T. sericeiventre* (Figs. 19, 20, 21, 22), *T. simillimum* (Figs. 40, 41), and *T. tosii* (Figs. 23, 24) groups, do not need any significant redefinitions or modifications, and can be used as defined by Bolton (1976, 1979).

In this publication we revise the taxonomy of the *T. bicarinatum*, *T. obesum*, *T. sericeiventre*, and *T. tosii* groups; all other groups will be treated in future publications. The total count of described species remains 39, although it will increase significantly in the next taxonomic treatments.

Biogeographic notes on the species groups

The zoogeographic affinities of the species groups have changed considerably since Bolton (1979). At present, eight species groups are considered endemic to the Malagasy region: the *T. bessonii*, *T. dysalum*, *T. marginatum*, *T. ranarum*, *T. schaufussii*, *T. severini*, *T. tosii* groups, and the "New species group 1", in contrast to the three groups restricted to this region noted in Bolton (1979): the *T. ranarum*, *T. schaufussii*, and *T. tosii* groups. However, it should be noted that the *T. tosii* group shows strong morphological affinities to some members of the Afrotropical *T. setigerum* group, which is discussed in the *T. tosii* species group section of this study. In addition, two comparatively species-poor groups, the *T. sericeiventre* and *T. weitzeckeri* groups, are of primarily Afrotropical distribution, although the *T. sericeiventre* group also occurs to a minor degree in the Southern Palaearctic. All representatives of these two groups except one appear to originate in the Afrotropical region, since they are widely distributed in Africa. The *T. tortuosum* group is widely distributed in the Afrotropical, Oriental, Indo-Australian regions and the New World; its greatest centres of diversity are the Oriental and Indo-Australian regions. The remaining three species group, the *T. bicarinatum*, *T. obesum*, and *T. simillimum* groups, contain mostly or entirely well-known pan-global tramp species; almost none of the species within these groups are considered native to the Malagasy region.

In conclusion, the vast majority of groups and species are endemic for the Malagasy region, two groups have very few species of Afrotropical origin, one larger group is predominantly Oriental and Indo-Australian, while three species-poor groups are global in distribution and those representatives present in the Malagasy region are mostly tramp species. This data presents additional evidence that the ant fauna of Madagascar, and to a lesser degree its surrounding island systems, is to a great extent unique, even though it shows affinities with the Afrotropical, Oriental, and Indo-Australian regions.

Synopsis of species of the Malagasy region examined in this study

***Tetramorium bicarinatum* species group**

Tetramorium bicarinatum (Nylander, 1846)
- = *Myrmica cariniceps* Guérin-Méneville, 1852
- = *Myrmica kollari* Mayr, 1853
- = *Myrmica modesta* Smith, F. 1860
- = *Myrmica reticulata* Smith, F. 1862

Tetramorium insolens (Smith, F., 1861)
- = *Tetramorium guineense* var. *macra* Emery, 1914
- = *Tetramorium pacificum* var. *wilsoni* Mann, 1921
- = *Tetramorium melanogyna* var. *pallidiventre* Wheeler, W.M., 1934

Tetramorium pacificum Mayr, 1870
- = *Tetramorium pacificum* var. *subscabrum* Emery, 1893

***Tetramorium obesum* species group**

Tetramorium lanuginosum Mayr, 1870
- = *Tetramorium obesum* r. *striatidens* Emery, 1889
- = *Triglyphothrix striatidens* var. *laevidens* Forel, 1900
- = *Triglyphothrix striatidens* r. *australis* Forel, 1902a
- = *Triglyphothrix striatidens* r. *orissana* Forel, 1902b
- = *Triglyphothrix ceramensis* Stitz, 1912
- = *Triglyphothrix striatidens* var. *felix* Forel, 1912
- = *Triglyphothrix striatidens* var. *flavescens* Wheeler, W.M., 1929
- = *Triglyphothrix mauricei* Donisthorpe, 1946
- = *Triglyphothrix tricolor* Donisthorpe 1948

***Tetramorium sericeiventre* species group**

Tetramorium mahafaly Hita Garcia & Fisher **sp. n.**

Tetramorium sericeiventre Emery, 1877
= *Tetramorium quadrispinosum* Emery, 1886 **syn. n.**
= *Tetramorium blochmannii* Forel, 1887
= *Tetramorium blochmanni* var. *montanum* Forel, 1891 **syn. n.**
= *Tetramorium sericeiventre* var. *debile* Forel, 1894
= *Tetramorium sericeiventre* subsp. *femoratum* Emery, 1895a
= *Tetramorium neuvillei* Forel, 1907
= *Tetramorium blochmanni* subsp. *continentis* Forel, 1910
= *Tetramorium sericeiventre* var. *inversa* Santschi, 1910
= *Tetramorium blochmanni* var. *nigriventre* Stitz, 1910
= *Tetramorium blochmanni* st. *continentis* var. *eudoxia* Forel, 1914 **unavailable name**
= *Tetramorium sericeiventre* var. *arenarium* Santschi, 1918
= *Tetramorium sericeiventre* var. *bipartita* Santschi, 1918
= *Tetramorium sericeiventre* st. *cinnamomeum* Santschi, 1918
= *Tetramorium sericeiventre* st. *femoratum* var. *colluta* Santschi, 1918 **unavailable name**
= *Tetramorium sericeiventre* st. *inversa* var. *defricta* Santschi, 1918 **unavailable name**
= *Tetramorium quadrispinosum* st. *elegans* Santschi, 1918 **syn. n.**
= *Tetramorium sericeiventre* var. *gamaii* Santschi, 1918
= *Tetramorium sericeiventre* st. *continentis* var. *georgei* Santschi, 1918 **unavailable name**
= *Tetramorium sericeiventre* var. *hori* Santschi, 1918
= *Tetramorium sericeiventre* var. *jasonis* Santschi, 1918
= *Tetramorium sericeiventre* var. *munda* Santschi, 1918
= *Tetramorium sericeiventre* st. *continentis* var. *platonis* Santschi, 1918 **unavailable name**
= *Tetramorium sericeiventre* st. *femoratum* var. *transversa* Santschi, 1918
= *Tetramorium sericeiventre* var. *vascoi* Santschi, 1918
= *Tetramorium blochmanni* var. *calvum* Stitz, 1923 **syn. n.**
= *Tetramorium quadrispinosum* r. *beirae* Arnold, 1926 **syn. n.**
= *Tetramorium quadrispinosum* r. *otaviensis* Arnold, 1926 **syn. n.**
= *Tetramorium sericeiventre* var. *repertum* Santschi, 1926 **syn. n.**
= *Tetramorium sericeiventre* var. *vividum* Santschi, 1926
= *Tetramorium sericeiventre* st. *inversum* var. *evidens* Santschi, 1928 **unavailable name**
= *Tetramorium sericeiventre* st. *continentis* var. *gladiator* Santschi, 1928 **unavailable name**
= *Tetramorium quadrispinosum* st. *angolense* Santschi, 1930 **syn. n.**
= *Tetramorium sericeiventre* st. *femoratum* var. *kenyense* Santschi, 1933 **unavailable name**
= *Tetramorium quadrispinosum* st. *elegans* var. *benguelense* Santschi, 1937 **unavailable name**
= *Atopula hortensis* Bernard, 1948

***Tetramorium tosii* species group**
Tetramorium tantillum Bolton, 1979
Tetramorium tosii Emery, 1899

Preliminary key to species groups of the Malagasy zoogeographical region (workers)

The following key was developed on the basis of existing species groups (Bolton, 1979), with significant additions and modifications made in order to incorporate a substantial amount of new material. However, it should be noted that this key is only of preliminary nature, and that the ongoing revision of all species groups might lead to further changes.

1. Species with distinctly branched hairs, usually a mixture of simple, bifid, and trifid hairs (Fig. 2.A). . . . . *T. obesum* group
- Species without branched hairs, hairs present neither bifid nor trifid, either with simple pilosity (Fig. 2.B), or with reduced pilosity but short appressed pubescence (Fig. 2.C). 2

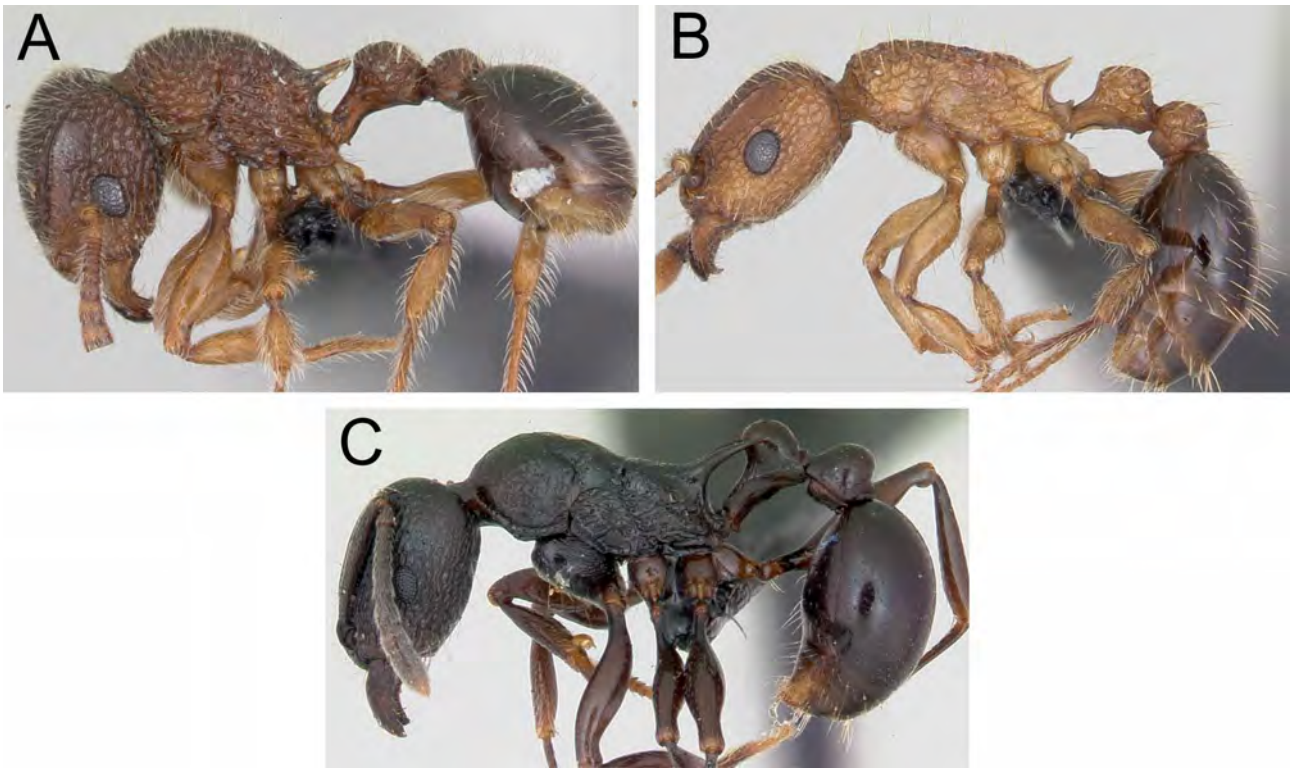


FIGURE 2. A. *Tetramorium lanuginosum* Mayr, 1870 in profile showing the mixture of simple, bifid, and trifid hairs—CASENT0060515 (April Nobile 2006). B. *Tetramorium bicarinatum* (Nylander, 1846) in profile with simple hairs only—CASENT0060334 (April Nobile 2006). C. *Tetramorium severini* (Emery, 1895) in profile as an example of strongly reduced pilosity, especially on the first gastral tergite and most of the mesosomal dorsum—CASENT0494149 (April Nobile 2007).

2. Antennae 11-segmented 3
- Antennae 12-segmented 12

3. Mesosoma anterodorsally with distinct protuberance or bulge (Fig. 3.A); sculpturation on posterior head and anterior mesosoma, especially pronotum, always strongly reticulate-rugose. . . . . "New species group 1" (in parts)
- Mesosoma anterodorsally without any protuberance or bulge (Fig. 3.B); sculpturation on posterior head and anterior mesosoma variable, but only rarely reticulate-rugose, usually with reduced sculpturation or longitudinal rugae/rugulae. 4

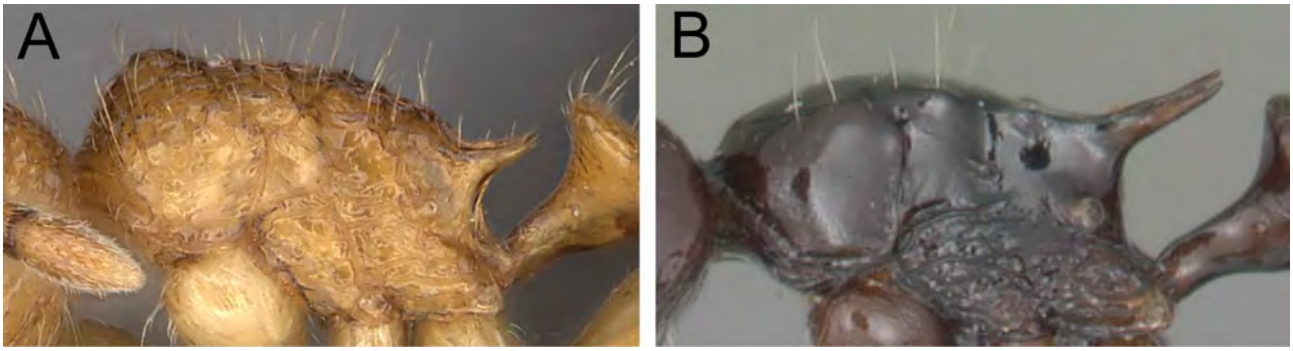


FIGURE 3. A. Mesosoma of *Tetramorium* MG017 in profile (undescribed morphospecies in "New species group 1") showing the distinct anterodorsal protuberance or bulge—CASENT0016867 (Shannon Hartman 2011). B. Mesosoma of *Tetramorium marginatum* Forel, 1895 in profile without any protuberance nor bulge on the anterior pronotum—CASENT0102398 (April Nobile 2006).

4. Both waist segments generally without any trace of rugose, rugulose, or reticulate sculpturation, generally unsculptured (Figs. 4.A, 4.B) 5
- One or both waist segments with conspicuous rugose, rugulose, or reticulate sculpturation (Figs. 4.C, 4.D). 10

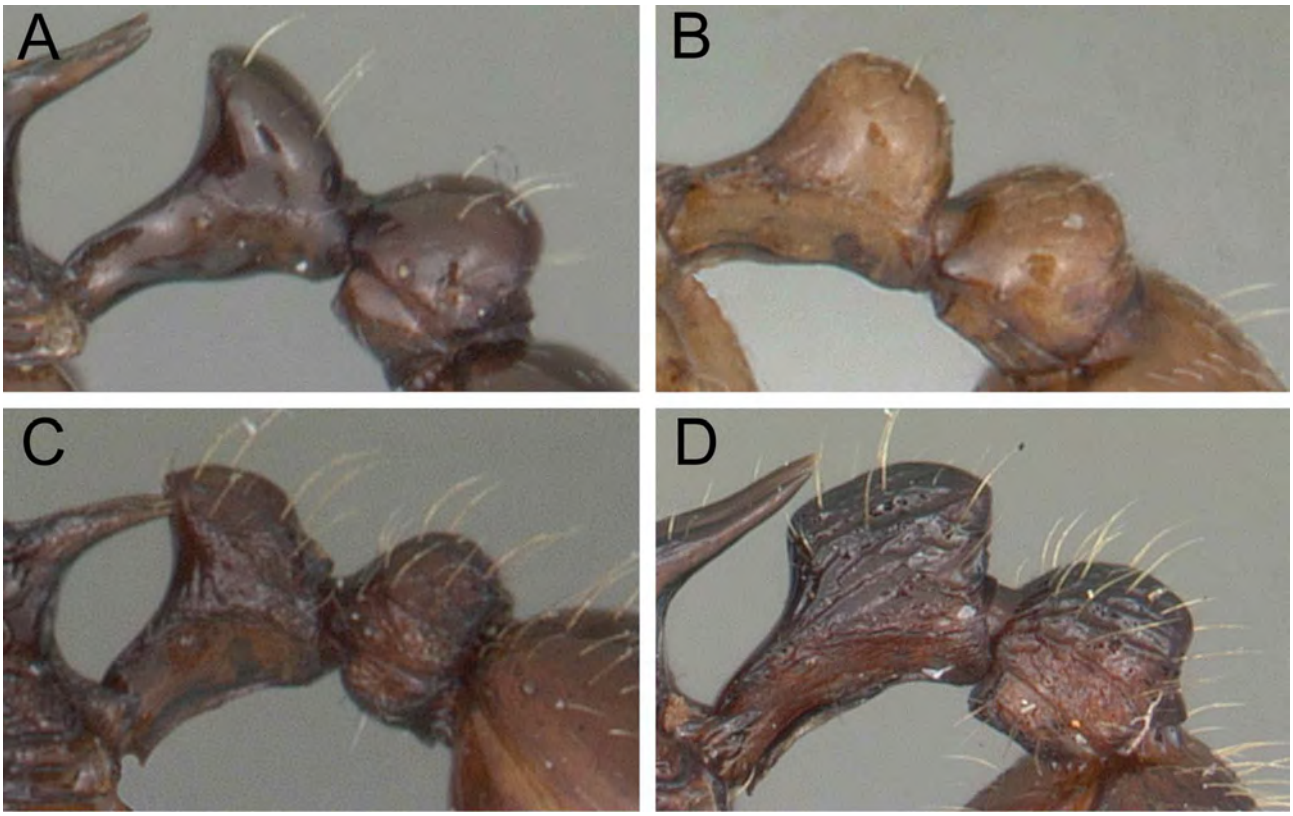


FIGURE 4. A. Unsculptured waist segments of *Tetramorium marginatum* Forel, 1895 in profile—CASENT0102398 (April Nobile 2006). B. Unsculptured waist segments of *Tetramorium xanthogaster* Santschi, 1911 in lateral view- CASENT0102400 (April Nobile 2005). C. Moderately to weakly sculptured waist segments of *Tetramorium dysalum* Bolton, 1979—CASENT0102349 (April Nobile 2005). D. Strongly sculptured waist segments of *Tetramorium robustior* Forel, 1892 in profile—CASENT0102983 (April Nobile 2005).

5. Both, petiolar node and postpetiole strongly squamiform and anteroposteriorly compressed (Fig. 5.A). . . . . *T. weitzeckeri* group
- Petiolar node variably shaped but postpetiole never strongly squamiform (Fig. 5.B) 6

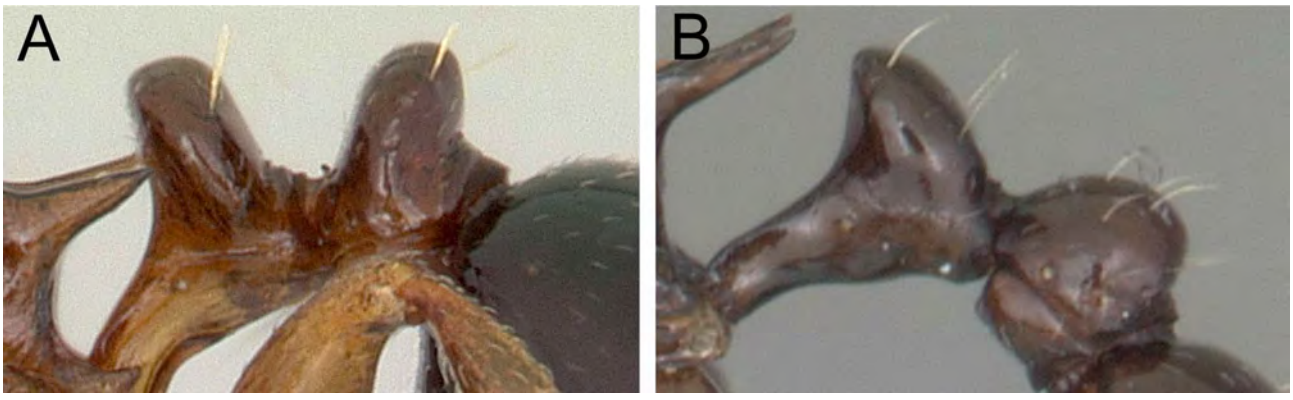


FIGURE 5. A. Strongly squamiform and anteroposteriorly compressed waist segments of *Tetramorium humbloti* Forel, 1891 in lateral view—CASENT0059691 (April Nobile 2006). B. Waist segments of *T. marginatum* Forel, 1895 with a dorsally anteroposteriorly compressed petiolar node and a roughly rounded postpetiole—CASENT0102398 (April Nobile 2006).

6. Petiolar node rounded high nodiform, rarely antero-posteriorly compressed; anterior and posterior faces of the node roughly parallel and all sides rounding smoothly onto the dorsal face; propodeal spines usually short to very short, very rarely otherwise (Fig. 6.A). 7
- Petiolar node variably shaped, usually distinctly higher and wider than long, anterior and posterior faces never parallel, in lateral view generally roughly to strongly triangular and strongly antero-posteriorly compressed dorsally, dorsum usually tapering strongly downwards posteriorly, in dorsal view strongly transverse; propodeal spines generally long and spinose (Fig. 6.B). 8

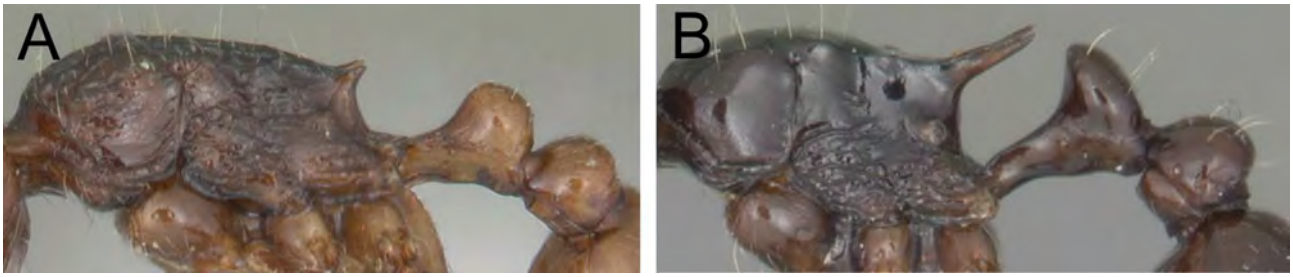


FIGURE 6. A. Mesosoma and waist segments of *Tetramorium xanthogaster* Santschi, 1911 in profile showing the high rounded nodiform petiolar node and the very short propodeal spines—CASENT0102400 (April Nobile 2005). B. Mesosoma and waist segments of *Tetramorium marginatum* Forel, 1895 in profile showing the roughly triangular shape which is strongly antero-posteriorly compressed dorsally and the long and spinose propodeal spines—CASENT0102398 (April Nobile 2006).

7. Large, elongate species with very long and spinose propodeal spines (Fig. 7.A); mesosomal sculpturation, especially on the dorsum, weak but still present. . . . . *T. severini* group
- Generally smaller, more compact species with very short to medium-sized propodeal spines or teeth (Fig. 7.B); mesosoma always distinctly sculptured, usually longitudinally rugose . . . . . *T. schaufussii* group

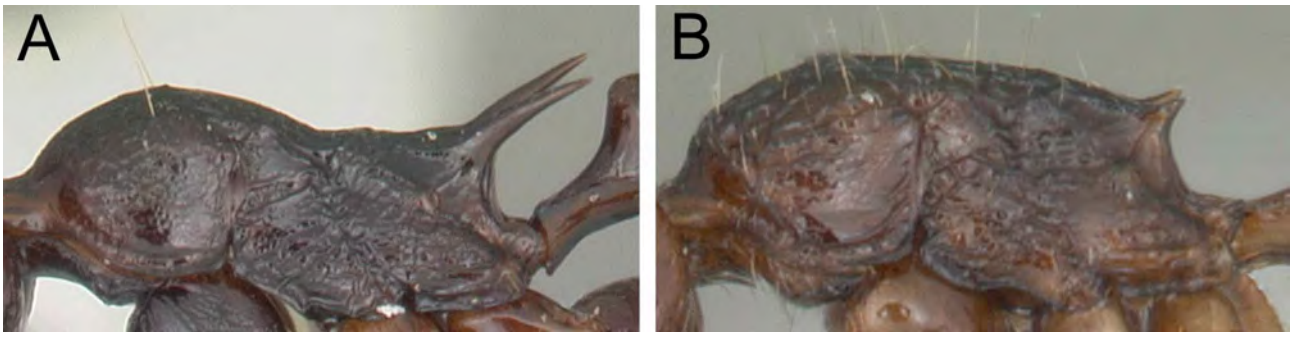


FIGURE 7. A. Mesosoma of *Tetramorium severini* (Emery, 1895) in profile illustrating the very long and spinose propodeal spines—CASENT0102397 (April Nobile 2007). B. Mesosoma of *Tetramorium xanthogaster* Santschi, 1911 in profile showing the very short and triangular propodeal spines/teeth—CASENT0102400 (April Nobile 2005).

8. First gastral tergite either without any standing hairs, only with short to relatively long, appressed to decumbent pubescence, or with medium-sized appressed to decumbent pubescence intermixed with relatively few erect hairs (Figs. 8.A, 8.B); sculpturation on head and mesosoma highly reduced. . . . . *T. bessonii* group
- First gastral tergite always with standing hairs, usually a mixture of mostly long, erect hairs with substantially fewer shorter, appressed to decumbent hairs (Figs. 8.C, 8.D); sculpturation on head and mesosoma variable. 9

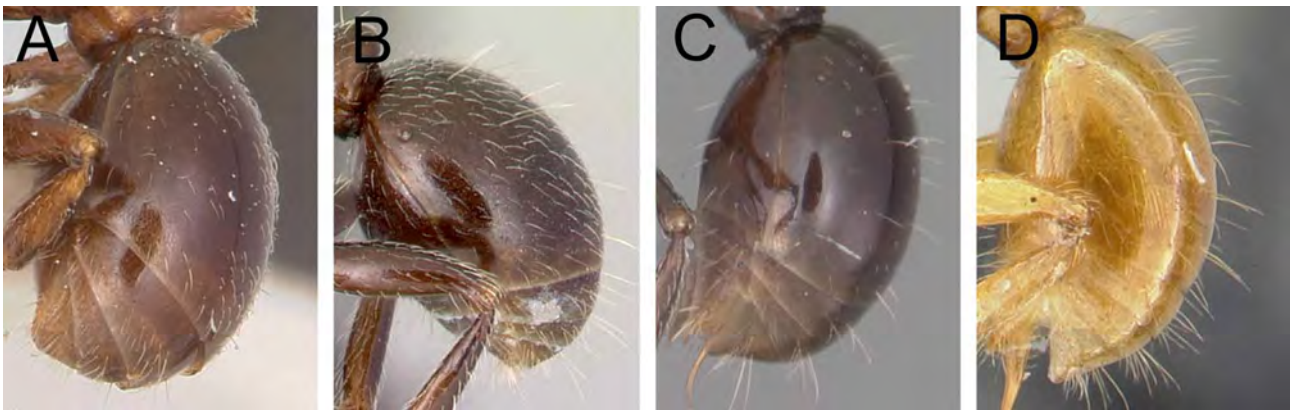


FIGURE 8. A. First gastral tergite of *Tetramorium bessonii* Forel, 1891 in profile illustrating the medium-sized, relatively dense pubescence on the first gastral tergite which is appressed to subdecumbent—CASENT0101277 (April Nobile 2006). B. First gastral tergite of *Tetramorium* MG005b (undescribed morphospecies in *T. bessonii* group) in profile with comparatively long appressed pubescence and few standing hairs—CASENT0454495 (Erin Prado 2010). C. First gastral tergite of *Tetramorium marginatum* Forel, 1895 in profile showing the typical pilosity consisting of relatively sparse erect hairs in combination with fewer, shorter appressed to decumbent hairs—CASENT0102398 (April Nobile 2006). D. First gastral tergite of *Tetramorium* MG005b (undescribed morphospecies in *T. marginatum* group) in profile showing the typical pilosity consisting of abundant erect hairs in combination with fewer, shorter appressed to decumbent hairs—CASENT0498037 (Erin Prado 2010).

9. Anterior face of mesosoma usually well-developed and anterodorsal angle distinct (Fig. 9.A); dorsum of mesosoma, especially on pronotum, with strong reticulate-rugose sculpturation; colouration variable. . . . . "New species group 1" (in parts)
- Anterior face of mesosoma not well-developed and anterodorsal angle absent, generally with a very short anterior portion rounding smoothly onto the dorsum (Fig. 9.B); either species dark brown to black and with almost reduced sculpturation on mesosomal dorsum, or species yellow to brown with weak irregular sculpturation on mesosomal dorsum. . . . . *T. marginatum* group

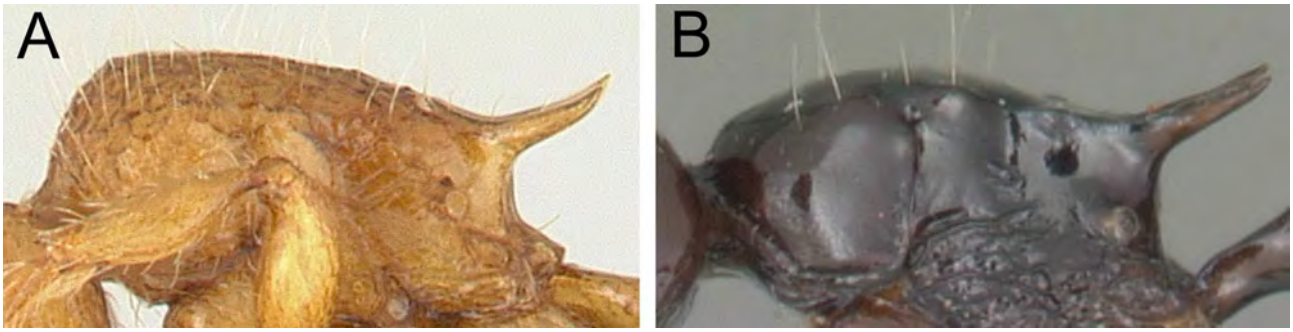


FIGURE 9. A. Mesosoma of *Tetramorium* MG016 (undescribed morphospecies in "New species group 1") in profile with well-developed anterior face and distinct anterodorsal angle CASENT0498388 (Erin Prado 2010). B. Mesosoma of *Tetramorium marginatum* Forel, 1895 in profile without well-developed anterior face and anterodorsal angle—CASENT0102398 (April Nobile 2006).

10. Frontal carinae never running to posterior head margin, generally ending between posterior eye margin and posterior head margin, though closer to posterior eye margin, often curving down ventrally and forming posterior margin of antennal scrobe; propodeal spines always short to medium-sized and elongate-triangular to triangular (Fig. 10.A). . . . . *T. ranarum* group

- Frontal carinae usually running back to posterior head margin or ending shortly before; propodeal spines always long and spinose (Fig. 10.B). 11

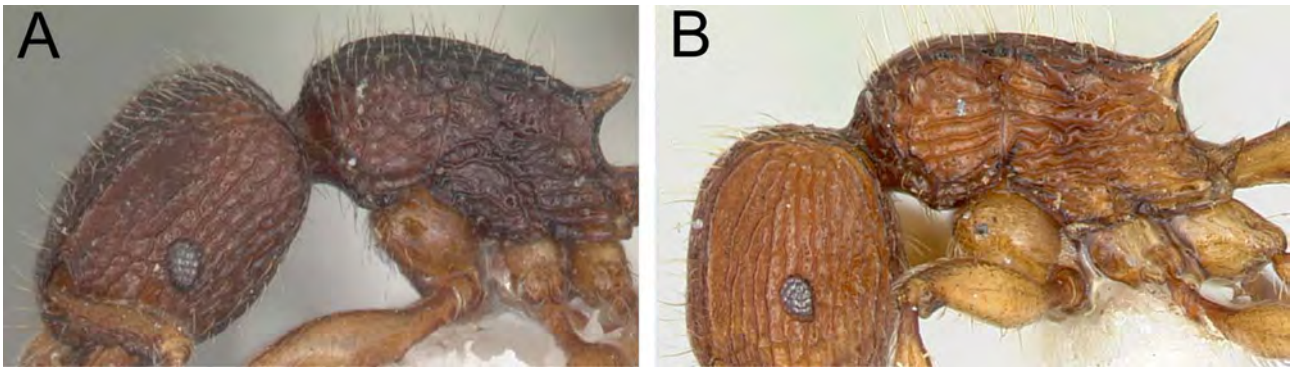


FIGURE 10. A. Head and mesosoma of *Tetramorium ranarum* Forel, 1895 in profile with shorter frontal carinae that end between posterior eye margin and posterior head margin, and with short propodeal spines—CASENT0102392 (April Nobile 2005). B. Head and mesosoma of *Tetramorium isectum* Bolton, 1979 in profile with longer frontal carinae running back to posterior head margin, and very long and spinose propodeal spines—CASENT0172829 (April Nobile 2007).

11. Petiolar node distinctly higher than long and usually weakly to distinctly wider than long; node in profile antero-posteriorly compressed, squamiform to high nodiform; sculpturation on both waist segments often weakly developed but generally present (Fig. 11.A) . . . . . *T. dysalum* group
- Petiolar node generally longer than high, only rarely roughly as long as high or weakly higher than long, node never antero-posteriorly compressed, generally rectangular nodiform and rarely clublike; both waist segments distinctly sculptured (Figs. 11.B, 11.C). . . . . *T. tortuosum* group

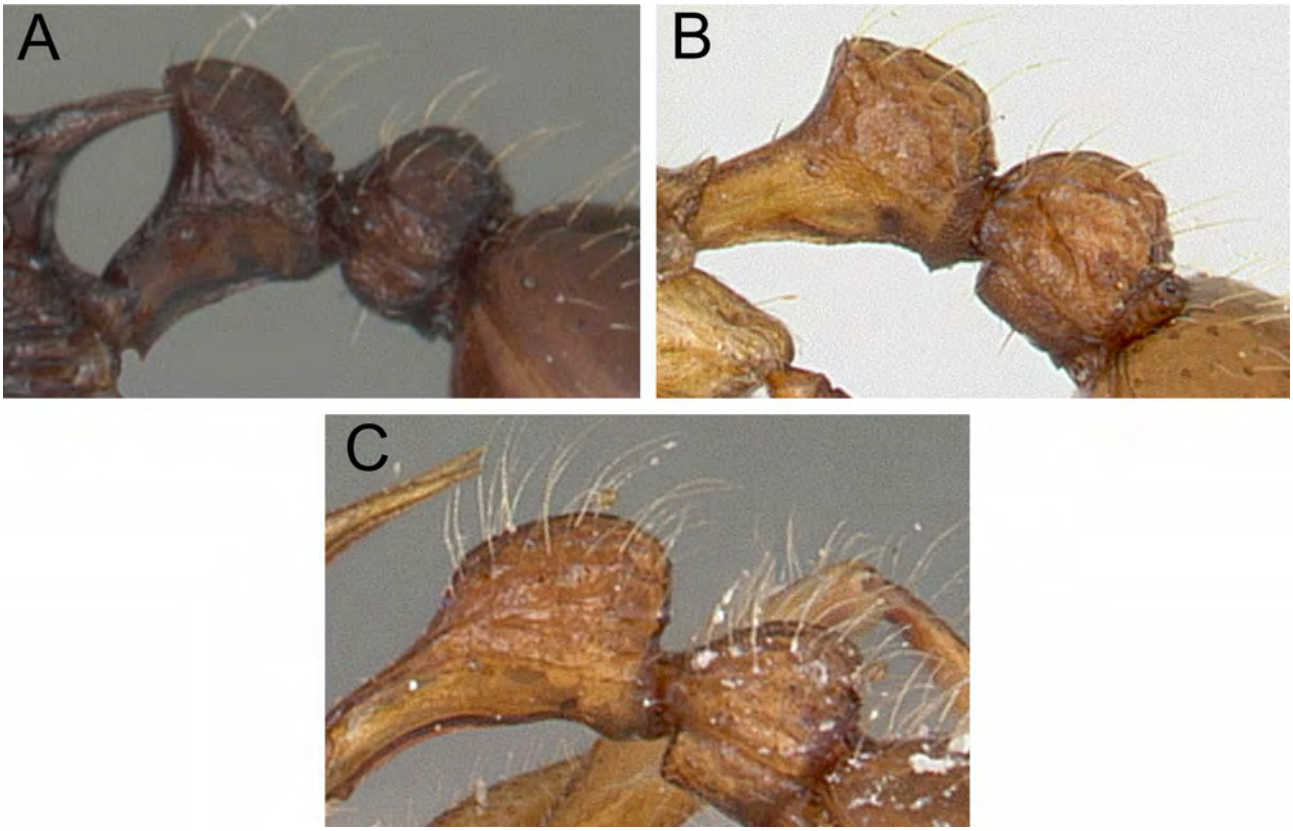


FIGURE 11. A. Weakly sculptured waist segments of *Tetramorium dysalum* Bolton, 1979 in profile with antero-posteriorly compressed petiolar node which is distinctly much higher than long—CASENT0102349 (April Nobile 2005). B. Distinctly sculptured waist segments of *Tetramorium isectum* Bolton, 1979 with rectangular nodiform petiolar node which is roughly as long as high—CASENT0172829 (April Nobile 2007). C. Distinctly sculptured waist segments of *Tetramorium kelleri* Forel, 1887 in lateral view with nodiform to club-like petiolar node which is longer than high—CASENT0101938 (April Nobile 2005).

12. Anterior clypeal margin with distinct median impression (Figs. 11.A) . . . . . *T. bicarinatum* group
- Anterior clypeal margin always entire and convex, never with distinct median impression (Figs. 12.B, 12.C) 13

FIGURE 12. A. Anterior head of *Tetramorium bicarinatum* (Nylander, 1846) in full-face view showing the distinctly impressed anterior clypeal margin—CASENT0060334 (April Nobile 2006). B. Anterior head of *Tetramorium sericeiventre* Emery, 1877 in full-face view with an entire anterior clypeal margin—CASENT0102388 (April Nobile 2005). C Anterior head of *Tetramorium simillimum* (Smith, F., 1851) in full-face view with an entire anterior clypeal margin—CASENT0102390 (April Nobile 2005).

13. Propodeum armed with long to extremely long spines, at least 2 to 3 times longer than propodeal lobes (Fig. 13.A) . . . . . *T. tosii* group
- Propodeum either unarmed, armed with small triangular teeth or denticles, or armed with medium-sized spinose spines, propodeal spines at most only as long or weakly longer than propodeal lobes, more often propodeal spines distinctly shorter than propodeal lobes (Figs. 13.B, 13.C) 14

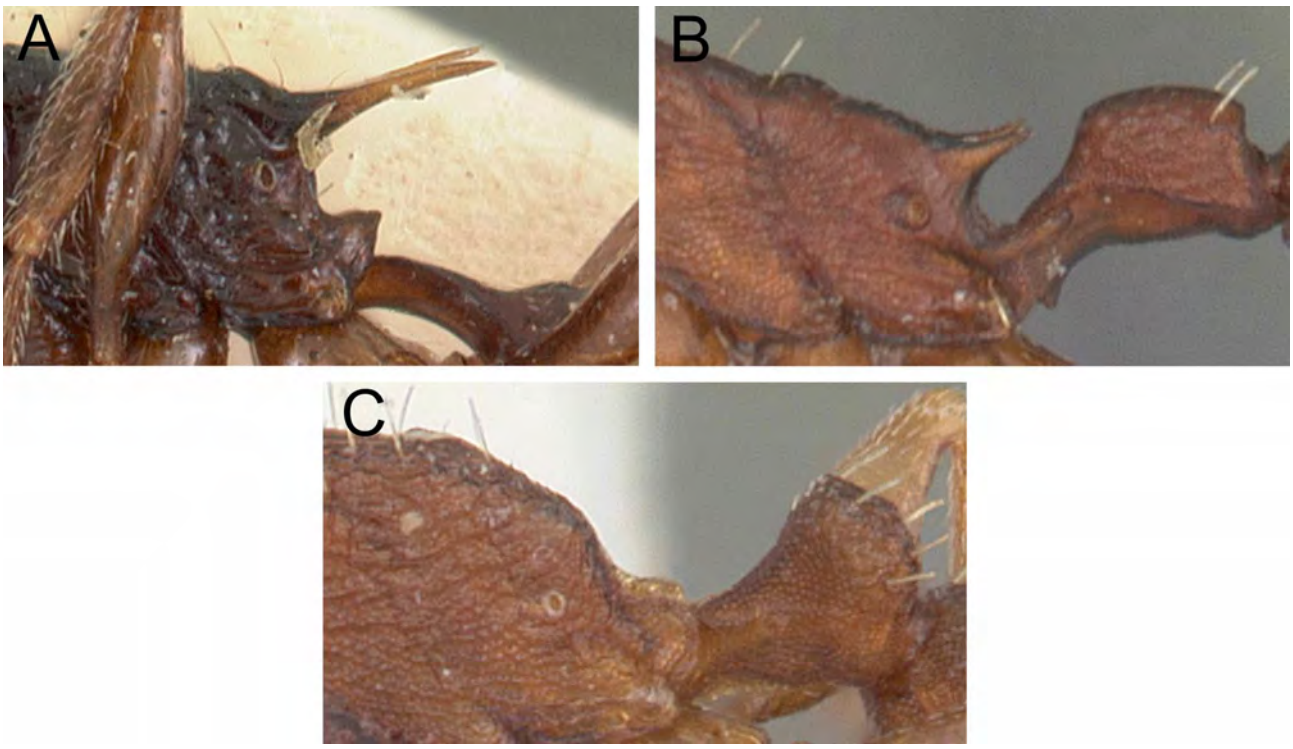


FIGURE 13. A. Posterior mesosoma of *Tetramorium tosii* Emery, 1899 in profile illustrating the very long propodeal spines which are much longer than propodeal lobes—CASENT0102072 (April Nobile 2007). B. Posterior mesosoma of *Tetramorium sericeiventre* Emery, 1877 in lateral view with propodeal spines and lobes of almost equal length—CASENT0102388 (April Nobile 2005). C. Posterior mesosoma of *Tetramorium anodontion* Bolton, 1979 with unarmed propodeum—CASENT0102334 (April Nobile 2005).

14. Lateral portion of clypeus prominent, raised to a tooth or denticle in full-face view (Fig. 14.A); propodeal spines medium-sized and spinose, roughly of same length as propodeal lobes . . . . . *T. sericeiventre* group
- Lateral portion of clypeus never modified as above (Fig. 14.B); propodeal spines usually strongly reduced to small triangular teeth or denticles that are shorter than propodeal lobes . . . . . *T. simillimum* group

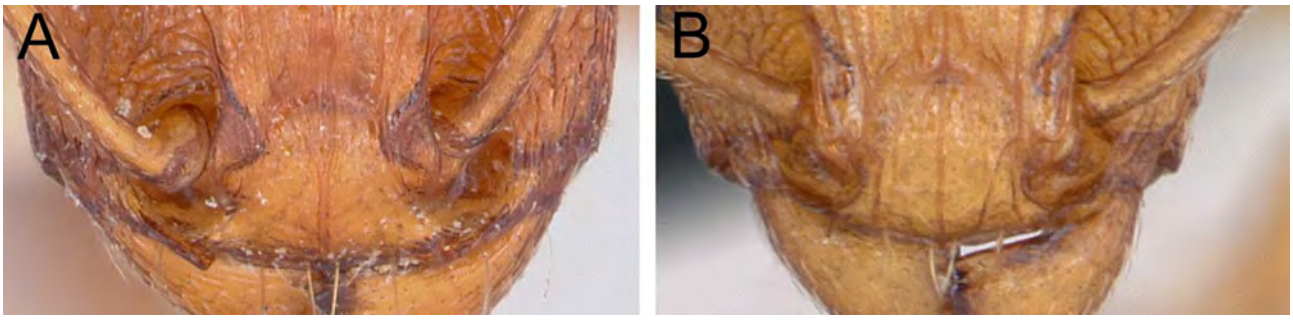


FIGURE 14. A. Clypeus of *Tetramorium sericeiventre* Emery, 1877 in frontal view showing the lateral clypeus modified into a tooth or denticle—CASENT0101265 (April Nobile 2006). B. Clypeus of *Tetramorium simillimum* (Smith, F., 1851) in frontal view without modified lateral clypeus—CASENT0102390 (April Nobile 2005).

Review of species

Tetramorium bicarinatum species group

Diagnosis

12-segmented antennae; anterior clypeal margin with distinct median impression; frontal carinae well-developed, ending shortly before or reaching posterior head margin; anterior face of mesosoma only weakly developed and rounding onto the dorsum; margination between lateral and dorsal mesosoma weak; propodeal spines medium-sized to long and spinose; propodeal lobes triangular to elongate-triangular, acute, and short to medium-sized; petiolar node nodiform, longer than high or as long as high, in two species posterodorsal angle higher situated than anterodorsal; postpetiole roughly rounded; mandibular sculpturation variable; cephalic sculpturation strongly developed, mostly reticulate-rugose, between frontal carinae close to posterior clypeus more rugose, ground sculpturation of head generally faint or absent; mesosoma and waist segments reticulate-rugose; first gastral tergite in some species with basigastral costulae, rest of the gaster unsculptured, smooth, and shiny; all dorsal surfaces with long, erect hairs; sting appendage triangular.

Comments

The *T. bicarinatum* group is represented in the Malagasy region by three species only, all being tramp species with wide distribution ranges. *Tetramorium bicarinatum*, *T. insolens*, and *T. pacificum* are most certainly not native to the Malagasy region and seem to have their native ranges in the Oriental and Indo-Australian regions (Bolton, 1977, 1979; McGlynn, 1999). *Tetramorium bicarinatum* is the most common of the three and can be found in many localities in Madagascar and its surrounding islands, whereas *T. insolens* and *T. pacificum* have not yet reached mainland Madagascar. *Tetramorium insolens* is only known from Mauritius and Reunion (Blard *et al*., 2002; Roberts & McGlynn, 2004) while *T. pacificum* occurs in the Seychelles and Mauritius.

In the Malagasy region, this group cannot be confused with another group with 12-segmented antennae since it is the only one with a medially impressed anterior clypeal margin. Within the species group, the three species can be morphologically well-separated by comparing the shape of the petiolar node, mandibular sculpturation, pilosity, and colouration.

Key to the species of the *T. bicarinatum* group in the Malagasy region (workers)

1. Mandibles with distinct sculpturation, usually striate; anterodorsal and posterodorsal angles of petiolar node equally developed and situated at about the same height; head, mesosoma, and waist segments yellow to orange-brown, gaster always much darker, dark brown to blackish (Fig. 15). . . . . *T. bicarinatum*
- Mandibles without any sculpturation, smooth, and shiny; anterodorsal and posterodorsal angles of petiolar node not equally developed, posterodorsal angle sharper and situated higher than the more rounded anterodorsal angle; uniformly coloured, either pale yellowish to orange-brown or very dark brown (Figs. 16, 17) 2

2. Uniformly dark brown to black colouration; first gastral tergite with basigastral costulae (Fig. 17). . . . . *T. pacificum*

- Uniformly yellow to orange-brown, gaster often of lighter colouration; first gastral tergite completely unsculptured (Fig. 16) . . . . . *T. insolens*

Tetramorium bicarinatum (Nylander, 1846)

(Figure 15)

Myrmica bicarinata Nylander, 1846:1061. Syntype workers, queen, U.S.A., California, 1840 [types lost, see Bolton 1977:94]. [Combination in *Tetramorium*: Mayr, 1862:740; Bolton, 1977: 94. Synonymy with *Formica guineensis* by Fabricius, 1793:357 (now in *Pheidole*); Mayr, 1862:740; revived from synonymy by Bolton, 1977: 94].

Myrmica cariniceps Guérin-Méneville, 1852:79. Holotype worker, DOMINICAN REPUBLIC, Santo Domingo Island, 19.IV.1850, (*A. Salle*) (ZSM) [examined]. [Synonymy with *Tetramorium guineense* by Roger, 1862:293; with *Tetramorium bicarinatum* by Bolton 1977:94; here confirmed].

Myrmica kollari Mayr, 1853:283. Syntype workers, queen, male, AUSTRIA, Vienna, in hothouses in botanical gardens (NMW) [examined]. [Synonymy with *Tetramorium cariniceps* by Roger, 1861:171; with *Tetramorium bicarinatum* by Bolton 1977:94; here confirmed].

Myrmica modesta Smith, F. 1860:108. Syntype workers, INDONESIA, Batjan Island, (*A.R. Wallace*) (OUMNH) [examined]. [Unresolved junior primary homonym of *Myrmica modesta* Foerster, 1850] [Combination in *Tetramorium* by Donisthorpe, 1932:463; Synonymy with *Tetramorium guineense* by Donisthorpe, 1932:463; with *Tetramorium bicarinatum* by Bolton 1977:94; here confirmed].

Myrmica reticulata Smith, F. 1862:33. Syntype workers, PANAMA, (*R.W. Stretch*) and UNITED KINGDOM, England, Exeter, botanic gardens, (*Parfitt*) (BMNH) [examined]. [Combination in *Tetramorium* by Mayr, 1862:740; Synonymy with *Myrmica guineensis* by Roger, 1862:293; with *Tetramorium bicarinatum* by Bolton 1977:94; here confirmed].
[Note: the names *bicarinata*, *cariniceps*, *kollari* and *reticulata* had previously been incorrectly synonymised with *Myrmica guineensis* Fabricius by Roger, 1862:293; *modesta* Smith was wrongly synonymised with *Tetramorium guineensis* by Donisthorpe, 1932:463. For a full taxonomic history of *Tetramorium bicarinatum* with discussion see also Bolton, 1977:94].

Diagnosis

Tetramorium bicarinatum can be well identified within the *T. bicarinatum* group in the Malagasy region because of its distinctly sculptured mandibles, rectangular nodiform petiolar node with antero- and posterodorsal angles at about the same height, and its characteristic bicolouration.

Description

HL 0.760–0.910 (0.848); HW 0.655–0.810 (0.740); SL 0.510–0.625 (0.575); EL 0.185–0.220 (0.201); PW 0.480–0.580 (0.532); WL 0.940–1.120 (1.037); PSL 0.175–0.240 (0.208); PTL 0.230–0.290 (0.262); PTH 0.260–0.330 (0.299); PTW 0.235–0.300 (0.264); PPL 0.220–0.280 (0.247); PPH 0.250–0.315 (0.292); PPW 0.295–0.365 (0.329); CI 85–89 (87); SI 75–80 (78); OI 26–28 (27); PSLI 22–26 (24); PeNI 46–52 (50); LPeI 84–93 (88); DPeI 96–106 (101); PpNI 59–66 (62); LPpI 81–91 (85); DPpI 128–139 (133); PPI 120–132 (124) (23 measured).

Head distinctly longer than wide (CI 85–89). Anterior clypeal margin with distinct median impression. Frontal carinae strongly developed, ending shortly before posterior head margin. Antennal scrobes weakly developed, narrow, shallow, and posterior and ventral margins never differentiated, as long as frontal carinae. Antennal scapes of moderate length, not reaching posterior margin of head (SI 75–80). Eyes relatively large (OI 26–28), with 11 to 14 ommatidia in longest row. Mesosomal outline dorsally flat, metanotal groove absent. Propodeal spines medium-sized to long (PSLI 22–26). Propodeal lobes small, triangular, and acute. Petiolar node rectangular nodiform, anterior and posterior faces roughly parallel, anterodorsal and posterodorsal angles at about same height, in dorsal view weakly longer than wide to weakly wider than long (DPeI 96–106), in lateral view higher than long (LPeI 84–93). Postpetiole in profile roughly rounded and higher than long (LPpI 81–91), in dorsal view distinctly wider than long (DPpI 128–139). Postpetiole in profile less voluminous than petiolar node, in dorsal view always distinctly wider than petiole (PPI 120–132). Mandibles distinctly longitudinally striate. Clypeus longitudinally rugose, usually with three strong rugae. Most of head with reticulate-rugose sculpturation, area between frontal carinae from posterior clypeal margin to posterior eye margin irregularly rugose with few cross-meshes; ground sculpturation on head weak and faint. Mesosoma and waist segments reticulate-rugose without ground sculpture. Gaster with basigastral costulae on the first tergite, remainder completely unsculptured, smooth, and shiny. All dorsal surfaces of head, mesosoma, waist segments, and gaster with numerous long, standing hairs; hairs on antennal scapes and tibiae appressed to suberect. Head, mesosoma, waist segments, and legs yellowish orange to orange brown, gaster always much darker, usually dark brown to blackish brown.

Notes

Tetramorium bicarinatum is one of the most successful, abundant, and widespread tramp species within the genus *Tetramorium*. It occurs in almost all tropical and subtropical habitats around the world, except for most of the Afrotropical, and also has been transferred to temperate countries where it can survive in constantly heated buildings (botanical gardens, zoos, etc.). The species is known to occur in most of the Oriental and Indo-Australian regions, including almost all Pacific island systems, the New World, Europe, the Malagasy region, and on several islands in the Atlantic and Indian Oceans.

Its native range was originally thought to be in Africa by a number of authors (Creighton, 1950; Brown, 1957; Taylor & Wilson, 1961; Wilson & Taylor, 1967).Yet the species is not even native to the Afrotropical region, and is only known there from very few introductions (Bolton, 1979, 1980). It seems that the Afrotropical members of the *T. bicarinatum* group, all endemic to this region, have the ability to hinder the establishment of *T. bicarinatum*. Outside of Africa, in the Malagasy, Neotropical, and parts of the Palaearctic and Neartic regions, these *T. bicarinatum* group species are absent, and *T. bicarinatum* can set up stable populations. The situation is different in the Oriental and Indo-Australian regions because *T. bicarinatum* is widespread and common but the *T. bicarinatum* species group is also present with a number of species closely related to *T. bicarinatum*. This fact led Bolton (1977, 1979, 1980) to the conclusion that the native range of *T. bicarinatum* is most probably in South East Asia, from which it was anthropogenically transferred to the rest of its actual, immense distribution range. This view is supported by several authors (McGlynn, 1999; Deyrup, 2000; Astruc *et al*, 2001) and we concur with this opinion.

As noted above, *T. bicarinatum* is almost surely not native to the Malagasy region and can be considered introduced. It is now a common species well-established in most of Eastern and Northern Madagascar, and also can be found in some tropical dry forest or gallery forest habitats in the western part of the country. It seems completely absent from the more arid Southwest and the High Plateau. In addition, *T. bicarinatum* can be commonly encountered on most of the surrounding islands, e.g. the Comoros, Mayotte, Seychelles, Reunion, and Mauritius.

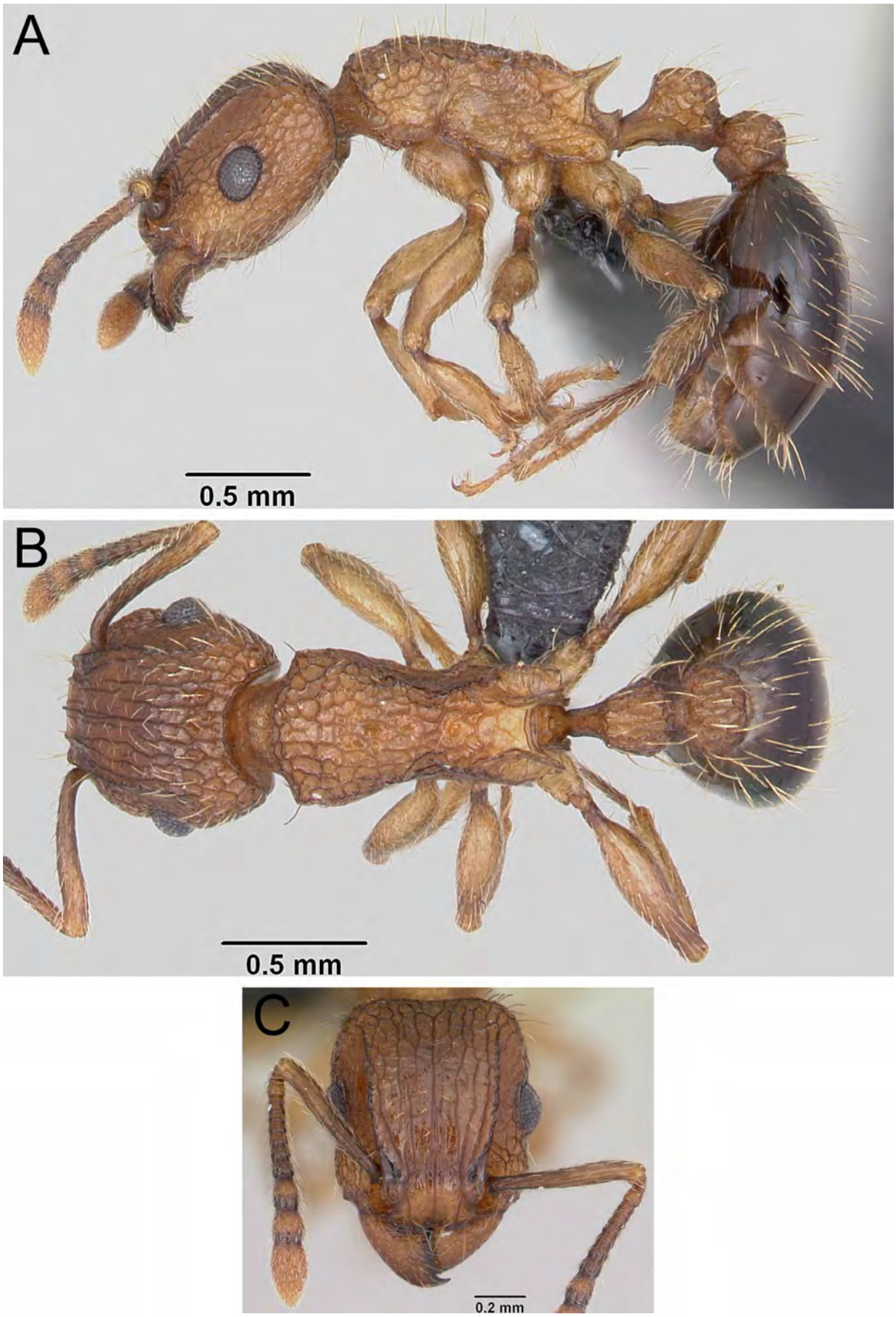
Within the *T. bicarinatum* species group it is the most successful tramp species with by far the largest distribution range. The two other species of this group treated in this study are also accomplished tramp species though markedly less successful. Despite the fact that *T. bicarinatum* is such a successful tramp, it is not considered a major agricultural, ecological, or household pest (Deyrup, 2000).

In the Malagasy region *T. bicarinatum* is easily separated from the other two species of the group. The most obvious character is the shape of the petiolar node. It is rectangular nodiform with antero- and posterodorsal angles at about the same height in *T. bicarinatum*, whereas the posterodorsal angle of the node is situated higher than the anterodorsal in the other two species. This character is better developed in *T. pacificum* than in *T. insolens*, but cannot be confused with that of *T. bicarinatum*. These species can also be distinguished by colouration. *Tetramorium bicarinatum* is distinctly bicoloured, with the gaster darker than the remaining body, while *T. pacificum* and *T. insolens* both have uniform colouration. Another diagnostic difference is the mandibular sculpturation, which is not developed in the latter two species but is strong in *T. bicarinatum*.

Material examined

AUSTRALIA: Cocos Islands, XI.1905 (*Williams*); The Boulders, near Babinda, 100 m, 10.XI.1962 (*E.S. Ross & D.Q. Cavagnaro*); **COMOROS**: Anjouan, 12.18771 S, 44.35929 E, 65 m, 26.I.2009 (*B.L. Fisher et al.*); Anjouan, 12.25764 S, 44.38915 E, 20 m, 27.I.2009 (*B. L. Fisher et al.*); Anjouan, Bimbini, 12.19635 S, 44.23752 E, 5 m, 27.I.2009 (*B.L. Fisher et al.*); Grand Comore, Mouandzaza, 11.7729 S, 43.24139 E, 5 m, 18.III.2008 (*B.L. Fisher et al.*); Mohéli, Lac Boundouni, 12.37915 S, 43.85165 E, 25 m, 20.-21.I.2009 (*B.L. Fisher et al.*); Mohéli, Ouallah, 12.32717 S, 43.65952 E, 10 m, 17.I.2009 (*B.L. Fisher et al.*); **COOK ISLANDS**: Pukapuka Island, 9.IV.1923 (*M. Willows*); **CUBA**: Soledad, Cienfuegos, 3.XI.1927 (*Creighton*); **ECUADOR**: Galapagos Islands, Albemarle Island, V.1932 (*M. Willows*); Galapagos Islands, Indefatigable Island, V.1932 (*M. Willewa*); **FIJI**: Koro Island, Mt. Kuitarua, 3 km WNW Nasau village, 17° 17.7' S, 179° 24.5' E, 420 m, 13.III.2005 (*E.M. Sarnat*); **INDONESIA**: Papua, Maffin Bay, VI.-VIII.1944 (*E.S. Ross*); **JAPAN**: Fukuoka, Higashi-ku, 33° 35' 12" N, 130° 26' 4" E, 14.IV.2007 (*M. Yoshimura*); Ogasawara Islands, Haha Island, Mt. Chibusa, 26° 36' 51.56" N, 142° 9' 45.72" E, 15.VIII.1999 (*M. Yoshimura*); Ogasawara Islands, Kitako Haha, 26° 41' 52.92" N, 142° 8' 36.25" E, 16.VIII.1999 (*M. Yoshimura*); **MADAGASCAR**: Antsiranana, Ambohitantely, 18° 11.68' S, 47° 16.89' E, 700 m, 20.I.-1.II.2004 (*Rin'Ha & E.M. Irwin*); Antsiranana, Androybesakalava, 3.52 km SW Ambanja, 13.70727 S, 48.43221 E, 22 m, 11.IV.2008 (*B.L. Fisher et al.*); Antsiranana, Ankazobe, 18° 18.97' S, 47° 06.95' E, 1241 m, 9.II.2007 (*B.L. Fisher et al.*); Antsiranana, Antalaha, 14° 54.7' S, 50° 16.85' E, 23 m, 26.III.2007 (*B.L. Fisher et al.*); Antsiranana, Nosy Faly, Tafiambotry, 35.3

km N Ambanja, 13.3654 S, 48.48775 E, 7 m, 12.IV.2008 (*B.L. Fisher et al.*); Antsiranana, Nosy Be, 13.39875 S, 48.29609 E, 5 m, 5.XII.2007 (*B.L. Fisher et al.*); Antsiranana, Nosy Be Airport, 10.3 km 30° Hell-Ville, 15° 57.76' S, 47° 26.29' E, 250 m, 13.-15.XII.2004 (*B.L. Fisher*); Antsiranana, Nosy Be, Réserve Naturelle Intégrale de Lokobe, 6.3 km 112° ESE Hell-Ville, 13° 25' S, 48° 20' E, 30 m, 19.-24.III.2001 (*B.L. Fisher et al.*); Antsiranana, Sambava, 14° 15.68' S, 50° 09.7' E, 23 m, 25.III.2007 (*B.L. Fisher et al.*); Fianarantsoa, Manakara, 20° 08.89' S, 41° 01.36' E, 10 m, 25.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Vangaindrano, 23° 21.04' S, 47° 36.27' E, 10 m, 20.XI.2006 (*B.L. Fisher et al.*); Fianarantsoa, Vevembe, 22° 47.46' S, 47° 10.91' E, 600 m, 23.-24.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Ranomafana, 22.I.1992 (*A. Pauly*); Fianarantsoa, Ranomafana National Park, Belle Vue trail, 1020 m, 21° 15.99' S, 47° 25.21' E, 26.III.2002 (*R. Harin'Hala*); Mahajanga, Forêt de Tsimembo, 8.7 km 336° NNW Soatana, 19° 01' S, 44° 26' E, 20 m, 21.-25.XI.2001 (*B.L. Fisher et al.*); Mahajanga, Parc National de Namoroka, 17.8 km 329° WNW Vilanandro, Mangotoky, 16.37667 S, 45.32667 E, 100 m, 8.-12.XI.2002 (*B.L. Fisher et al.*); Mahajanga, Saririaky, Mahavavy River, 6.2 km 145° SE Mitsinjo, 16.05167 S, 45.90833 E, 20 m, 1.-5.XII.2002 (*B.L. Fisher et al.*); Mahajanga, Parc National Tsingy de Bemaraha, 3.4 km 93° E Bekopaka, Tombeau Vazimba, 19° 09' S, 44° 50' E, 50 m, 6.-10.XI.2001 (*B.L. Fisher et al.*); Toamasina, Ambalahasina, 62.4 km 19° Toamasina, 17° 35.67' S, 49° 28.07' E, 15 m, 3.VIII.2006 (*B. Blaimer & F.N. Raharimalala*); Toamasina, Amban, 6.3 km S Ambanizana, Andranobe, 15° 41' S, 49° 57' E, 150 m, 15.XI.1993 (*B.L. Fisher*); Toamasina, Ambatondrazaka, 17° 49' S, 48° 25' E, 25.II.1991 (*A. Pauly*); Toamasina, Anosintany, 139 km 21° Toamasina, 16° 54.67' S, 49° 35.32' E, 10 m, 8.VIII.2006 (*B. Blaimer & F.N. Raharimalala*); Toamasina, Fenoarivo, 85.7 km 13° Toamasina, 17° 22.87' S, 49° 24.90' E, 10 m, 5.VIII.2006 (*B. Blaimer & F.N. Raharimalala*); Toamasina, Mahambo, 73.8 km 16° Toamasina, 17° 29.36' S, 49° 27.10' E, 10 m, 4.VIII.2006 (*B. Blaimer & F.N. Raharimalala*); Toamasina, Mahavelona, 17° 40.0' S, 49° 30.0' E, 10.XI.1993 (*A. Pauly*); Toamasina, Manakambahiny, near Vavatenina Forest, 9.II.1995 (*A. Pauly*); Toamasina, Maroantsetra, 15° 26.06' S, 49° 44.34' E, 11 m, 28.VII.2007 (*B.L. Fisher et al.*); Toamasina, Moramanga, 18° 56.65' S, 48° 13.84' E, 922 m, 14.II.2007 (*B.L. Fisher et al.*); Toamasina, P.N. Masoala, 40 km 154° SSE Maroantsetra, 15° 43.6' S, 49° 57.4' E, 150 m, 14.-22.X.2001 (*A. Dejean et al.*); Toamasina, Nosy Mangabe, 7.43 km S Maroantsetra, 15° 29.63' S, 49° 45.73' E, 5 m, 25.-27.VII.2007 (*B.L. Fisher et al.*); Toamasina, Tamatave, 18° 09.28' S, 49° 24.76' E, 20 m, 16.II.2007 (*B.L. Fisher et al.*); Toamasina, Tamatave, Brickaville, 18° 49.31' S, 49° 04.21' E, 24 m, 15.II.2007 (*B.L. Fisher et al.*); Toamasina, Tamatave, Mahanoro, 19° 53.96' S, 48° 48.53' E, 15 m, 18.II.2007 (*B.L. Fisher et al.*); Toamasina, Tamatave, Prison de Tamatave, 18° 10.0' S, 49° 23.0' E, 19.X,1994 (*A. Pauly*); Toamasina, Tampolo, Parcelle K7, 17° 17' S, 49° 25' E, 10 m, 20.IV.2004 (*B.L. Fisher et al.*); Toamasina, Vatomandry, 19° 19.97' S, 48° 58.77' E, 16 m, 17.II.2007 (*B.L. Fisher et al.*); Toamasina, Vavatenina, 17° 28' S, 49° 21' E, II.1993 (*A. Pauly*); Toliara, 10 km NW Amboasary, 25° 00.40' S, 46° 18.20' E, 85 m, 25.-26.XI.2002 (*E.M. Irwin*); Toliara, Parc National Andohahela, Col de Tanatana, 33.3km NW Tolagnaro, 24° 45.51' S, 46° 51.22' E, 275 m, 22.-24.XI.2006 (*B. L. Fisher*); Toliara, Berenty Special Reserve, 25° 01.40' S, 45° 18.20' E, 85 m, 2.-13.I.2004 (*Rin'Ha & E.M. Irwin*); Toliara, Berenty Special Reserve, 25° 01.26' S, 45° 18.33' E, 36.5 m, 10.-19.VI.2003 (*Rin'Ha & E.M. Irwin*); **MALAYSIA**: Kedah, 28.IV.1962 (*E.S. Ross & D.Q. Cavagnaro*); **MAURITIUS**: Brise Mt., 20° 20.73' S, 57° 45.28' E, 200 m, 27.V.2007 (*B.L. Fisher et al.*); Brise Mt., 20° 20.45' S, 57° 45.20' E, 200 m, 27.V.2007 (*A.V. Suarez*); Camizard Mt., 19° 97' S, 57° 43.38' E, 375 m, 27.V.2007 (*B.L. Fisher et al.*); La Nicoliere Reserve, 6.V.2007 (*M. Madl*); Rodrigues Island, Grand Montagne, 19° 42.3' S, 63° 27.9' E, 358 m, 14.VII.2005 (*L. Lach*); **MAYOTTE**: Baie de Tsingoni, 12.7926 S, 45.10764 E, 5 m, 26.XI.2007 (*B.L. Fisher et al.*); Coconi, DAF campus, 12° 50' S, 57° 45.7' E, 24.II.1999 (*R. Jocque & G. DeSmet*); Dapani, 12.97495 S, 45.16183 E, 1 m, 27.XI.2007 (*B.L. Fisher et al.*); Hajangoua, -12.85492 S, 45.19889 E, 10 m, 2.XII.2007 (*B.L. Fisher et al.*); Petite Terre, 12.79119 S, 45.29403 E, 125 m, 4.XII.2007 (*B.L. Fisher et al.*); Tanaraki, 12.75754 S, 45.06780 E, 10 m, 26.XI.2007 (*B.L. Fisher et al.*); **NEW CALEDONIA**: Isle of Pines, Vao, 0-100m, I.1985, (*N.L.H. Krauss*); **REUNION**: Bourg Murat, 21° 12.4' S, 55° 34.16' E, 1582 m, 9.III.2004 (*F. Blard*); Mare Longue, 21° 20.77' S, 55° 44.39' E, 450 m, 19.V.2007 (*B.L. Fisher et al.*); Mare Longue, 21° 20.53' S, 55° 44.31' E, 560 m, 19.V.2007 (*B.L. Fisher et al.*); Mare Longue, 21° 21.85' S, 55° 44.61' E, 30 m, 22.-23.V.2007 (*B.L. Fisher et al.*); **SEYCHELLES**: North Island, 30.VII.2000 (*J. Gerlach*); Silhouette Island, 4.49076 S, 55.25341 E, 20 m, 21.I.2010 (*B.L. Fisher et al.*); **SOLOMON ISLANDS**: Guadalcanal, Honiara, 0-100 m, III.1986 (*N.L.H. Krauss*); Guadalcanal, Tenaru River, I.1945 (*G.E. Robert*); **U.S.A.**: Louisiana, New Orleans, Audubon Zoo, 19.VIII.1999, (*L.M. Hooper & A.M. Pranschke*); Florida, Miami, 26.VI.193 (*Records*); Hawaii, Oahu, Mt. Tantalus, 5.X.1919 (*F.X.W. Williams*).



FIGURES 15. *Tetramorium bicarinatum* (Nylander, 1846)—CASENT0060334 (April Nobile 2006). A. body in profile. B. body in dorsal view. C. head in full-face view.

Tetramorium insolens (Smith, F., 1861)

(Figure 16)

Myrmica insolens Smith, F., 1861:47. Holotype queen, INDONESIA, Sulawesi, Menado (*A.R. Wallace*) (OUMNH) [examined].

Tetramorium insolens (Smith, F., 1861) Donisthorpe, 1932:468.

Tetramorium guineense var. *macra* Emery, 1914:415. Syntype workers, NEW CALEDONIA, Konè, 8.VIII.1911, (*Sarasin & Roux*) (NHMB) [examined]. [Synonymy with *Tetramorium insolens* by Bolton 1977:99; here confirmed].

Tetramorium pacificum var. *wilsoni* Mann, 1921:460. Syntype workers, FIJI ISLAND, Viti Levu, Nausori, Waiyanitu, 1915-1916 (*W.M. Mann*) (MCZ) [not examined]. [Raised to species by Taylor, 1967:1093; Synonymy with *Tetramorium insolens* by Bolton 1977:99; here confirmed].

Tetramorium melanogyna var. *pallidiventre* Wheeler, W.M., 1934:177. Holotype worker, SOLOMON ISLANDS, NW end of Bellona Island, 19.VI.1933 (*M. Willows*) (CASC: CASTYPE05027) [examined]. [Synonymy with *Tetramorium insolens* by Bolton 1977:99; here confirmed].

Diagnosis

The following character combination isolates *T. insolens* from the other members of the *T. bicarinatum* group in the Malagasy region: unsculptured mandibles, rectangular petiolar node with posterodorsal angle sharper and higher situated than the more rounded anterodorsal angle, and uniform pale yellow to orange-brown colouration with gaster always of same colour or lighter than the remainder of the body.

Description

HL 0.725–0.825 (0.775); HW 0.655–0.750 (0.698); SL 0.540–0.605 (0.576); EL 0.155–0.185 (0.170); PW 0.485–0.520 (0.503); WL 0.890–1.015 (0.953); PSL 0.210–0.250 (0.235); PTL 0.245–0.300 (0.267); PTH 0.248–0.305 (0.276); PTW 0.225–0.270 (0.246); PPL 0.225–0.270 (0.248); PPH 0.250–0.305 (0.274); PPW 0.280–0.340 (0.305); CI 89–91 (90); SI 81–85 (83); OI 24–26 (24); PSLI 29–32 (30); PeNI 46–52 (49); LPeI 91–100 (97); DPeI 89–96 (92); PpNI 58–65 (60); LPpI 87–94 (91); DPpI 120–127 (123); PPI 119–128 (124) (12 measured).

Head distinctly longer than wide (CI 89–91). Anterior clypeal margin with median impression. Frontal carinae strongly developed, ending shortly before posterior head margin. Antennal scrobes weakly developed, narrow, shallow, and posterior and ventral margins never differentiated, as long as frontal carinae. Antennal scapes of moderate length, not reaching posterior margin of head (SI 81–85). Eyes moderate to relatively large (OI 24–26), with 10 to 12 ommatidia in longest row. Metanotal groove absent. Propodeal spines long, spinose, and acute (PSLI 29–32). Propodeal lobes short to medium-sized, triangular to elongate triangular, and acute. Node of petiole rectangular nodiform, anterodorsal angle more rounded than sharper posterodorsal angle, anterodorsal angle situated lower than posterodorsal, in profile dorsum weakly rising posteriorly, in dorsal view weakly longer than wide (DPeI 89–96), in lateral view slightly longer than high to as long as high (LPeI 91–100). Postpetiole roughly rounded, in dorsal view distinctly wider than long (DPpI 120–127), and in lateral view weakly higher than long (LPpI 87–94). Postpetiole in profile less voluminous than petiolar node, in dorsal view always distinctly wider than petiole (PPI 119–128). Mandibles unsculptured, smooth, and shiny. Clypeus longitudinally rugose, usually with three strong rugae. Most of head with reticulate-rugose sculpturation, more rugose between frontal carinae anteriorly close to posterior clypeal margin; ground sculpturation on head weak and faint. Mesosoma and waist segments reticulate-rugose. Gaster completely unsculptured, smooth, and shiny. All dorsal surfaces of head, mesosoma, waist segments and gaster with numerous fine, long, standing hairs; hairs on antennal scapes and tibiae appressed to suberect. Colouration uniformly pale yellow to orange-brown, gaster often lighter than rest of body.

Notes

Tetramorium insolens is a pan-global tramp species with a relatively wide distribution range and is now considered invasive (Roberts & McGlynn, 2004). It was originally described from Sulawesi, Indonesia, and has since been recorded from other Indonesian islands, Sri Lanka, Philippines, New Guinea, the Solomon Islands, the Hawaiian Islands, and several more Pacific islands, but also from Los Angeles, California, England, and Germany (Bolton, 1977, 1979). Its distribution might be even larger than as described above since *T. insolens* often has been misidentified as *T. bicarinatum* in the past (Bolton, 1977); thus, many other introductions might have occurred without being noticed. Considering the above noted occurrences of *T. insolens*, then, its native range is most likely

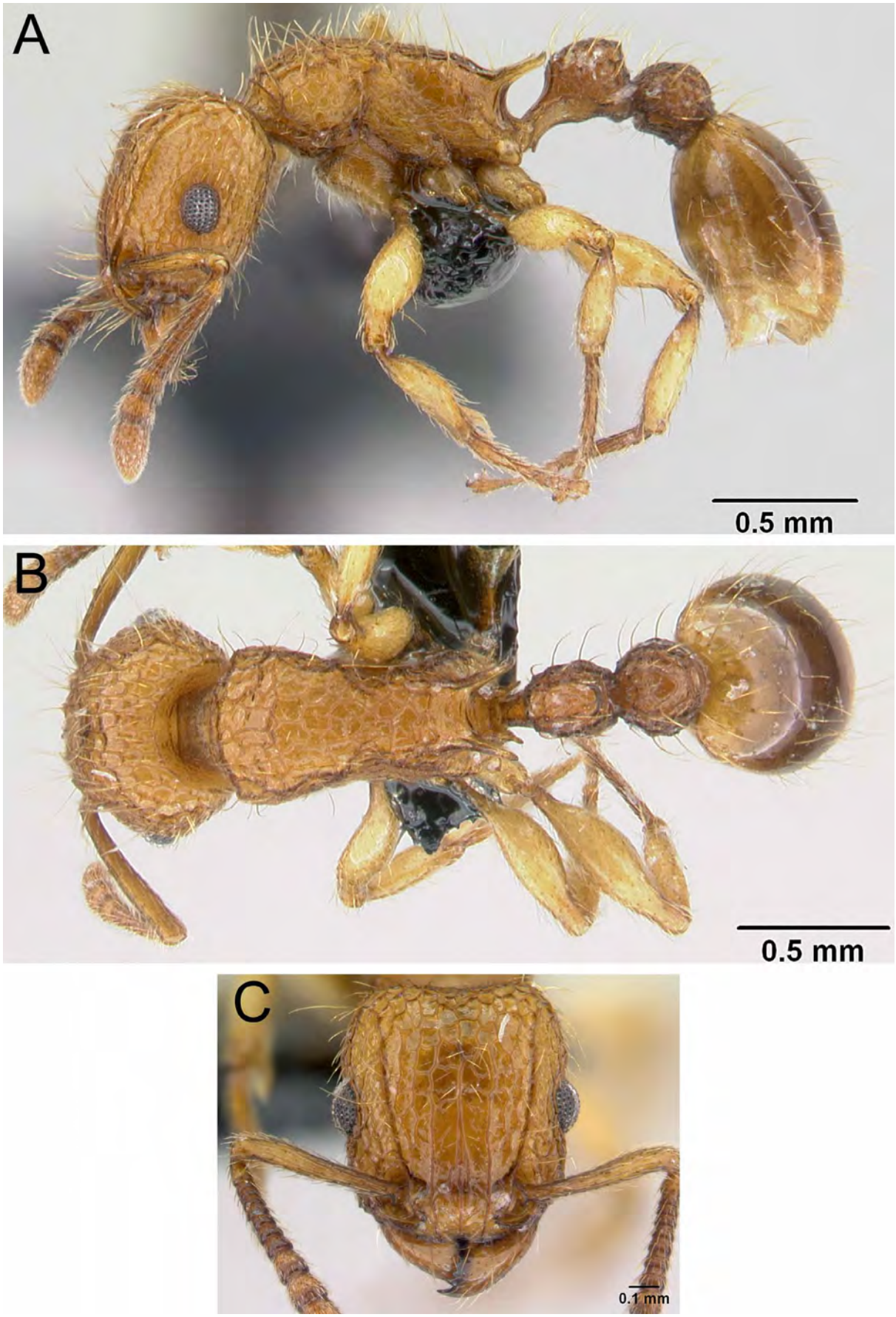


FIGURE 16. *Tetramorium insolens* (Smith, F., 1861)—CASENT0226471 (Erin Prado 2010). A. body in profile. B. body in dorsal view. C. head in full-face view.

the Indo-Australian region, from which it has been transferred by human activities. In the Malagasy region *T. insolens* is only known to occur on the islands of Mauritius and Reunion (Blard *et al*., 2003; Roberts & McGlynn, 2004), and has not been recorded from Madagascar or any other surrounding island, although it is not unlikely that this species might be transported there in the future.

Tetramorium insolens can be easily recognised within the *T. bicarinatum* group in the Malagasy region. It differs strongly from *T. pacificum* since the latter species has basigastral costulae on the first gastral tergite and is very dark brown to black in colour, whereas *T. insolens* has an unsculptured gaster and is coloured pale yellowish to orange-brown. The other species of the group, *T. bicarinatum*, is morphologically relatively close to *T. insolens*, and, as noted above, both have been confused in the past. However, *T. insolens* possesses unsculptured mandibles, a petiolar node with a posterodorsal angle situated higher than the anterodorsal, and is uniformly coloured, with the gaster often lighter than the rest of the body. These characters serve to distinguish it from *T. bicarinatum*, since the latter has sculptured mandibles, a petiolar node with a different shape, and is bicoloured, with the gaster always much darker than the rest of the body.

Material examined

FIJI: Kadavu, Moanakaka Bird Sanctuary, 0.25km SW Soladamu Village, 19.0775 S, 178.121 E, 60 m, 4.IX.2006 (*E.M. Sarnat*); **MAURITIUS**: Bel Ombre, Fixon, 23.XI.2004 (*L. Lach*); Bel Ombre, Fixon, 20° 28' 25" S, 57° 25' 14"E, 285 m, 30.V.2005 (*A. Suarez*); Bel Ombre, Fixon, 20° 28.4' S, 57° 25.2' E, 285 m, 14.VII.2005 (*L. Lach*); Bel Ombre, Fixon, 20° 27.7' S, 57° 26.0' E, 297 m, 2.VIII.2005 (*L. Lach*);

MALAYSIA: Sabah, Sungai Sapi, 5.7 N, 117.4 E, 28 m, 20.VII.2007 (*N.B. Tawatao*); **SOLOMON ISLANDS**: Bellona Island, NW end, 19.VI.1933 (*M. Willows*).

Tetramorium pacificum Mayr, 1870

(Figure 17)

Tetramorium pacificum Mayr, 1870:976. Syntype workers, queen, TONGA, Tongatabu (NMW, BMNH) [examined].

Tetramorium pacificum var. *subscabrum* Emery, 1893:246. Syntype workers, SRI LANKA, Kandy and Colombo (*E. Simon*) (MHNG) [examined]. [Subspecies of *Tetramorium pacificum* by Wheeler, W.M. 1909:340; Synonymy with *Tetramorium pacificum* by Bolton 1977:102; here confirmed].

Diagnosis

The combination of unsculptured mandibles, basigastral costulae, and very dark brown to blackish brown colour makes *T. pacificum* easy to identify within the *T. bicarinatum* group in the Malagasy region.

Description

HL 0.780–0.870 (0.845); HW 0.665–0.760 (0.737); SL 0.565–0.645 (0.626); EL 0.155–0.190 (0.178); PW 0.530–0.570 (0.554); WL 0.970–1.120 (1.067); PSL 0.215–0.255 (0.236); PTL 0.300–0.355 (0.332); PTH 0.290 0.340 (0.318); PTW 0.245–0.275 (0.259); PPL 0.270–0.300 (0.290); PPH 0.275–0.310 (0.296); PPW 0.310–0.350 (0.330); CI 85–90 (87); SI 81–88 (85); OI 23–25 (24); PSLI 26–30 (28); PeNI 44–49 (47); LPeI 101–106 (104); DPeI 75–82 (78); PpNI 56–62 (59); LPpI 93–101 (98); DPpI 110–120 (114); PPI 123–132 (127) (20 measured).

Head distinctly longer than wide (CI 85–90). Anterior clypeal margin with distinct median impression. Frontal carinae strongly developed, either reaching posterior head margin or ending shortly before. Antennal scrobes weakly developed, narrow and shallow, posterior and ventral margins never differentiated, not reaching posterior head margin. Antennal scapes of moderate length, not reaching posterior margin of head (SI 81–88). Eyes of moderate size (OI 23–25), with 11 to 14 ommatidia in longest row. Metanotal groove not impressed. Propodeal spines long, relatively narrow and acute (PSLI 26–30). Propodeal lobes elongate-triangular to triangular and acute. Node of petiole nodiform, in profile anterior and posterior faces roughly parallel, anterodorsal angle situated much lower than posterodorsal, dorsum slopes upwards posteriorly, node weakly longer than high (LPeI 101–106), in dorsal view node distinctly much longer than high (DPeI 75–82). Postpetiole in profile rounded, weakly higher than long to as high as long (LPpI 93–101), in dorsal view noticeably wider than long (DPpI 110–120) and much more volu-

minous than petiolar node (PPI 123–132). Mandibles unsculptured, smooth, and shiny. Clypeus with 3 well-developed longitudinal rugae. Most of head with reticulate-rugose sculpturation, area between frontal carinae close to posterior clypeal margin often more longitudinally rugose but always with cross-meshes; ground sculpturation on head weak and faint. Mesosoma and waist segments reticulate-rugose without any distinct ground sculpturation. First gastral tergite with basigastral costulae, rest of gaster completely unsculptured, smooth, and shiny. All dorsal surfaces of head, mesosoma, waist segments, and gaster with numerous long, standing hairs, depending on population hairs either fine or thick; hairs on antennal scapes and tibiae appressed to suberect. Colouration dark brown to blackish brown.

Notes

Tetramorium pacificum is the third best known tramp species within the *T. bicarinatum* species group present in the Malagasy region. It has a vast distribution range in the Oriental and Indo-Australian regions, and, as the species epithet suggests, is present in most Pacific island systems. In addition, *T. pacificum* has been introduced to Canada, California, Florida, Central America and the Caribbean, Switzerland (one record from the zoo in Zurich), and the Malagasy region. Schlick-Steiner *et al*. (2006b) point out that it might not be possible to delimit its native range due to frequent transfers by humans. However, its distribution suggests the native range of this species is most probably in the Indo-Australian region, including the island systems of the Pacific Ocean (McGlynn, 1999). In the Malagasy region, it seems almost certain that *T. pacificum* is an anthropogenically introduced species that occurs only on the islands of Mauritius and the Seychelles, and has not reached Madagascar yet. There is a high probability that *T. pacificum* might be a relatively recent introduction as it is absent in previous treatments on the ant fauna of Mauritius (Donisthorpe, 1946, 1949; Brown, 1974; Ward, 1990) or the Seychelles (Dorow, 1996). Also, even though a large amount of material from most of the known range was examined, no records from the Malagasy region were given by Bolton (1977, 1979).

As noted above for *T. bicarinatum* and *T. insolens*, *T. pacificum* can be differentiated clearly from the latter two species. First, the unsculptured mandibles and the characteristic shape of the petiolar node separate it from *T. bicarinatum*, and apart from this the latter is distinctly bicoloured whereas *T. pacificum* is uniformly dark brown to black. Second, the basigastral costulae on the first gastral tergite and the uniform dark colour of *T. pacificum* strongly contrast with the completely unsculptured gaster and uniform pale yellow to orange-brown colour of *T. insolens*.

Material examined

AUSTRALIA: Queensland, 27 km NNE Coen, 13° 44' S, 143° 20' E, 530 m, 24.VIII.2004 (*P.S. Ward*); **FIJI**: Viti Levu, Nakobalevu, 4 km WSW Colo-i-Suva Vlg., 18 03.4 S, 178 25.3 E, 325 m, 24.VIII.-12.IX.2004 (*E.M. Sarnat*); **MALAYSIA**: Sabah, Sepilok-Kabili, 5.86667 N, 117.94417 E, 20 m, 31.V.2005 (*B. Effendi*); **MAURITIUS**: Bel Ombre, Fixon, 20° 28' 25" S, 57° 25' 14" E, 285 m, 30.V.2005 (*A. Suarez*); Brise Mt., sugar cane field at base, 20° 20' 45" S, 57° 45' 20" E, 200 m, 27.V.2005 (*A. Suarez*); Brise Mt., Bambous, 20° 20.73' S, 57° 45.28' E, 200 m, 27.V.2005 (*B.L. Fisher et al.*); Camizard Mt., Bambous, 20° 19.97' S, 57° 43.38' E, 375 m, 27.V.2005 (*B.L. Fisher et al.*); Combo - upper, 20° 27.4' S, 57° 31.1' E, 369 m, 29.VII.2005 (*L. Lach*); Port Bor Dieu, 20.V.2007 (*M. Madl*); Rodrigues Island, Solitude, 19° 41.5' S, 63° 26.1' E, 250 m, 13.VI.2005 (*L. Lach*); Valley D' Est, 20° 19.9' S, 57° 43.6' E, 300 m, 29.V.2005 (*L. Lach*); Valley D' Est, 20° 19' 58" S, 57° 43' 23" E, 373 m, 27.V.2005 (*B.L. Fisher et al.*); **SEYCHELLES**: Mahé Island, Cascade, 4.67494 S, 55.49819 E, 150 m, 9.II.2010 (*B.L. Fisher et al.*); Mahé Island, Glacis la Réserve, 4.71023 S, 55.50435 E, 300 m, 9.II.2010 (*B.L. Fisher et al.*); Mahé Island, Le Niol, 4.63067 S, 55.43159 E, 345 m, 11.II.2010 (*B.L. Fisher et al.*); Mahé Island, Morne Blanc, 4.65988 S, 55.43743 E, 480 m, 10.II.2010 (*B.L. Fisher et al.*); Mahé Island, Mt. Copolia, 4.65121 S, 55.45835 E, 520 m, 8.-11.II.2010 (*B.L. Fisher et al.*); Mahé Island, Mont Sebert, 4.67859 S, 55.50408 E, 490 m, 9.II.2010 (*B.L. Fisher et al.*); **SOLOMON ISLANDS**: Guadalcanal, Tenaru River, I.1945 (*G.E. Robert*); Bellona island, NW end, 23.VI.1933 (*M. Willows*); **SWITZERLAND**: Zurich, Zurich Zoo, Masoala Hall (*M. Bauert*).

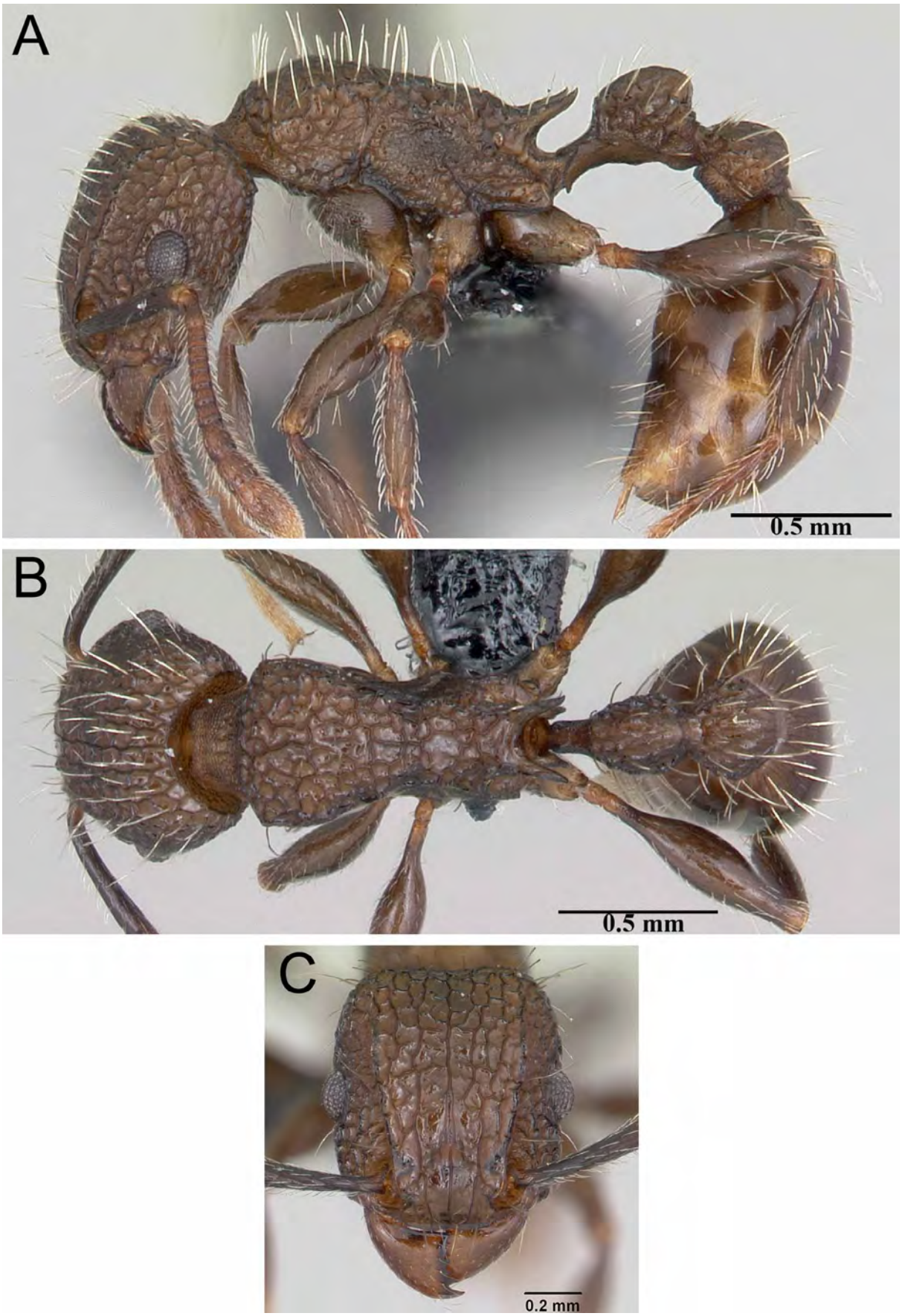


FIGURE 17. *Tetramorium pacificum* Mayr, 1870—CASENT0055878 (April Nobile 2006). A. body in profile. B. body in dorsal view. C. head in full-face view.

Tetramorium obesum species group

Diagnosis

12-segmented antennae; anterior clypeal margin with weak median impression; frontal carinae well-developed, ending between posterior eye margin and posterior head margin, curving down ventrally and forming the posterior scrobe margin; anterior face of mesosoma not developed and mesosomal profile strongly rounded; margination between lateral and dorsal mesosoma present; propodeal spines medium-sized to long and spinose; propodeal lobes triangular and short; petiolar node nodiform; postpetiole roughly rounded; mandibles usually sculptured; cephalic sculpturation well-developed, mostly reticulate-rugose, ground sculpturation of head generally faint or absent; mesosoma and waist segments reticulate-rugose; first gastral tergite unsculptured, smooth, and shiny; all dorsal surfaces with long, erect hairs, usually a mixture of simple and bifid hairs, less commonly including trifid hairs; sting appendage triangular.

Comments

Tetramorium lanuginosum is the only member of the *T. obesum* group that is present in the Malagasy zoogeographic region, and, it is another well-known and highly successful tramp species (Bolton, 1976; Wetterer, 2010). The presence of branched hairs distinguishes *T. lanuginosum* from all other Malagasy *Tetramorium* species.

Tetramorium lanuginosum Mayr, 1870

(Figure 18)

Tetramorium lanuginosum Mayr, 1870:972. Holotype worker, INDONESIA, Java, Batavia (NMW) [examined]. [Combination in *Triglyphothrix* by Emery, 1891:4; in *Tetramorium* by Bolton, 1985:247].

Tetramorium obesum r. *striatidens* Emery, 1889:501. Syntype workers, BURMA, Bhamo, VII.1886 (*L. Fea*) (MHNG) [examined]. [Synonymy with *lanuginosum* by Bolton, 1976:350; here confirmed].

Triglyphothrix striatidens var. *laevidens* Forel, 1900:284. Syntype workers, MEXICO (MHNG) [examined]. [Synonymy with *lanuginosum* by Bolton, 1976:350; here confirmed].

Triglyphothrix striatidens r. *australis* Forel, 1902a:449. Syntype workers, queens, AUSTRALIA, Queensland, Mackay (*Turner*) (MHNG; MCZ) [partly examined]. [Synonymy with *lanuginosum* by Bolton, 1976:350; here confirmed].

Triglyphothrix striatidens r. *orissana* Forel, 1902b:239. Syntype workers, INDIA, Orissa (*Taylor*) (MHNG) [examined]. [Synonymy with *lanuginosum* by Bolton, 1976:350; here confirmed].

Triglyphothrix striatidens var. *felix* Forel, 1912:160. Syntype workers, SEYCHELLES, Felicite, Silhoutte, Mare aux Cochons, 1908 (*H. Scott*) (MHNG; BMNH) [examined]. [Synonymy with *lanuginosum* by Bolton, 1976:350; here confirmed].

Triglyphothrix ceramensis Stitz, 1912:506. Holotype worker, INDONESIA, Seram Island (holotype location unknown). [Synonymy with *lanuginosum* by Bolton, 1976:350; here confirmed].

Triglyphothrix striatidens var. *flavescens* Wheeler, W.M., 1929:55. Syntype workers, SINGAPORE, Johore, 2.II.1925 (*F. Silvestri*) (MCZ) [not examined]. [Synonymy with *lanuginosum* by Bolton, 1976:350; here confirmed].

Triglyphothrix mauricei Donisthorpe, 1946:778. Holotype worker, MAURITIUS, Rose Hill, 1942 (R. Mamet) (BMNH) [examined]. [Synonymy with *lanuginosum* by Bolton, 1976:351; here confirmed].

Triglyphothrix tricolor Donisthorpe 1948:136. Paratype workers, queens, NEW GUINEA, Maffin Bay, 17. & 20.VI.1944 (*E.S. Ross*) (BMNH, CASC) [examined]. [Synonymy with *lanuginosum* by Bolton, 1976:351; here confirmed].

Diagnosis

Tetramorium lanuginosum is the only *Tetramorium* species in the Malagasy region with regularly branched hairs, which renders it immediately recognisable.

Description

HL 0.595–0.655 (0.626); HW 0.560–0.630 (0.590); SL 0.400–0.475 (0.438); EL 0.120–0.150 (0.137); PW 0.380–0.440 (0.418); WL 0.630–0.720 (0.683); PSL 0.155–0.205 (0.172); PTL 0.185–0.220 (0.200); PTH 0.190–0.215 (0.203); PTW 0.180–0.230 (0.210); PPL 0.170–0.215 (0.194); PPH 0.160–0.195 (0.179); PPW 0.190–0.230 (0.216); CI 92–98 (94); SI 71–76 (74); OI 21–25 (23); PSLI 25–31 (28); PeNI 47–54 (50); LPeI 93–105 (99); DPeI 97–110 (104); PpNI 48–55 (52); LPpI 100–116 (109); DPpI 105–121 (111); PPI 98–110 (103) (20 measured).

Head longer than wide (CI 92–98). Anterior clypeal margin with small but distinct median impression. Frontal carinae strongly developed, curving down ventrally between posterior eye level and posterior margin of head to form posterior and ventral margins of antennal scrobe. Antennal scrobes well-developed and broad, usually with

distinct margin all around. Antennal scapes relatively short, fitting well within antennal scrobe (SI 71–76). Eyes of moderate size (OI 21–25), with 8 to 10 ommatidia in longest row. Mesosoma convex in profile, sides rounding smoothly onto dorsum. Metanotal groove absent. Propodeal spines medium-sized to long and spinose (PSLI 25-31). Propodeal lobes small, triangular, and acute. Node of petiole rounded nodiform in profile, anterodorsal angle well-defined but not sharply angulate, situated much higher than rounded posterodorsal angle, causing dorsum to taper backward to posterior face; in dorsal view roughly as long as wide to weakly wider than long (DPeI 97–110), in lateral view roughly as long as high (LPeI 93–105). Postpetiole in lateral view rounded and much less voluminous than petiolar node, usually weakly longer than high (LPpI 100–116); in dorsal view postpetiole roughly as wide to weakly wider than petiole (PPI 98–110), and weakly wider than long (DPpI 105–121). Mandibles generally longitudinally striate, sometimes weakly developed. Clypeus usually longitudinally rugose, median ruga always developed with 1 to 2 weaker rugae at each side. Head reticulate-rugose, cephalic dorsum between frontal carinae dorsally more reticulate, close to the posterior clypeal margin often more longitudinally rugose. Ground sculpturation generally very weak to absent. Mesosoma and waist segments also reticulate-rugose, without any conspicuous ground sculpture. Gaster completely unsculptured, smooth, and shiny. Body pilosity usually very dense and relatively long but variable, generally all dorsal surfaces of head, mesosoma, waist segments, and gaster with numerous long bifid and simple hairs, usually a mixture of both present with either bifid or simple pilosity predominant, but both types always present; rarely some trifid hairs also present, though almost never on first gastral tergite. Variation in pilosity often observable within same series from same collection event. Frontal carinae and leading edges of antennal scapes with elongate, simple, standing hairs. Tibiae with relatively long suberect to erect standing hairs. Colouration variable, light brown to dark brown, gaster often darker than remaining body.

Notes

Tetramorium lanuginosum is a highly successful cosmopolitan tramp species, though it cannot be considered an invasive or pest ant (Wetterer, 2010). Today it can be found in much of the Oriental, Indo-Australian and Australasian regions, but also in the New World, southern Palaearctic, the Afrotropical and Malagasy regions (for a detailed analysis of all known distribution records, see Wetterer, 2010). The native range of *T. lanuginosum* was suspected to be in India (Wheeler, 1916; Creighton, 1950) or, more generally, in tropical Asia (Taylor & Wilson, 1961; Wilson & Taylor, 1967; Bolton, 1976). Consideration of all available records demonstrates that *T. lanuginosum* can be found in a fairly uninterrupted range from India, through tropical and subtropical Asia, to Northern Australia and Western Oceania, and is most likely native to this area (Wetterer, 2010). Outside of this native range, the species has been dispersed through human commerce, is an exotic in the Malagasy region, tropical Africa, the Mediterranean, Northern Europe (mostly in botanical gardens and zoos, see Bolton, 1976), Mexico, portions of the southeastern United States, the Caribbean, and the Eastern Pacific (Wetterer, 2010).

In the Malagasy region *T. lanuginosum* is relatively widespread. The species can be found in many locations of Northern Madagascar and on most of its surrounding island systems, e.g. the Comoros, Mayotte, Mauritius, Seychelles, and Reunion. Wetterer (2010) points out that *T. lanuginosum* might have reached the Malagasy region recently because almost all records of the species are dated after 2001. We only tentatively agree with this point of view since *T. mauricei*, now a synonym of *T. lanuginosum*, was collected in 1942 from Mauritius and later described by Donisthorpe (1946). Another reason to be cautious is that most collecting in the Malagasy region has been performed in the last two decades; thus, large numbers of fresher specimens does not necessarily prove that the species was not abundant previously. Nevertheless, *T. lanuginosum* was not mentioned from Mauritius by Ward (1990) so it is possible that the species was already present in the area but spread over the last one or two decades.

It is worthwhile to note that the Malagasy region has only one species of what used to be the genus *Triglyphothrix*, whereas the Afrotropical region possesses more than 30 valid species and the Oriental, Indo-Australian, and Australasian regions more than 20. *Tetramorium* species with regularly branched hairs are common faunal elements in all of these regions, and their absence in the Malagasy region until *T. lanuginosum* was introduced by humans is exceptional.

Tetramorium lanuginosum cannot be confused with any other Malagasy *Tetramorium* species because, as noted above, it is the only one with regularly branched pilosity.

Material examined

AUSTRALIA: Queensland, Mackay (*Turner*); **BURMA**: Bhamo, VII.1886 (*L. Fea*); **COMOROS**: Anjouan, 12.18771 S, 44.35929 E, 65 m, 26.I.2009 (*B.L. Fisher et al.*); Anjouan, 12.25764 S, 44.38915 E, 20 m, 27.I.2009

(*B.L. Fisher et al.*); Anjouan, 12.38051 S, 44.50217 E, 20 m, 28.I.2009 (*B.L. Fisher et al.*); Anjouan, Bimbini, 12.1943 S, 44.2395 E, 60 m, 27.I.2009 (*B.L. Fisher et al.*); Anjouan, Bimbini, 12.19635 S, 44.23752 E, 5 m, 27.I.2009 (*B.L. Fisher et al.*); Grande Comore, Mouandzaza, 11.7729 S, 43.24139 E, 5 m, 18.III.2008 (*B.L. Fisher et al.*); Grande Comore, Pidjani, 11.75447 S, 43.45148 E, 35 m, 18.III.2008 (*B.L. Fisher et al.*); Mohéli, Lac Boundouni, 12.37915 S, 43.85165 E, 25 m, 20.-21.I.2009 (*B.L. Fisher et al.*); Mohéli, Ouallah, 12.32717 S, 43.65952 E, 10 m, 17.I.2009 (*B.L. Fisher et al.*); **FIJI**: Central, Suva, 18° 09' S, 178° 26' E, 20 m, 21.I.2003, (*E.M. Sarnat*); **FRANCE**: Clipperton Island, 21.VII.1938, (*W.L. Smith*); **INDIA:** Orissa (*Taylor*); **INDONESIA**: Papua, Maffin Bay, 17.-20.VI.1944 (*E.S. Ross*); Papua, Maffin Bay, X.1944 (*E.S. Ross*); **JAPAN**: Ogasawara Islands, Haha Island, Mt. Chibusa, 28° 38' 52.56" N, 142° 9' 45.72" E, 15.VIII.1999 (*M. Yoshimura*); Okinawa, Funaura Iriomote Island, 24° 25' 2" N, 123° 47' 57" E, 19.VI.2001 (*M. Yoshimura*); Okinawa, Nago, 26° 35' 27" N, 127° 59' 56" E, 18.VI.2002 (*M. Yoshimura*); **MADAGASCAR**: Antsiranana, 3 km W Sakalava Beach, 12.28617 S, 49.36667 E, 40 m, 19.III.-4.IV.2001 (*E. Schlinger et al.*); Antsiranana, Ambanja, 13.68268 S, 48.45245 E, 30 m, 23.III.2007 (*B.L. Fisher et al.*); Antsiranana, Ambilobe, 13.19728 S, 49.04868 E, 61 m, 30.III.2007 (*B.L. Fisher et al.*); Antsiranana, Androybesakalava, 3.52 km SW Ambanja, 13.70727 S, 48.43221 E, 22 m, 11.IV.2008 (*B.L. Fisher et al.*); Antsiranana, Antalaha, 14.9013 S, 50.28095 E, 23 m, 26.III.2007 (*B.L. Fisher et al.*); Antsiranana, Forêt Ambato, 26.6 km 33° Ambanja, 13.4645 S, 48.55167 E, 150 m, 8.XII.2004 (*B.L. Fisher et al.*); Antsiranana, Nosy Be Airport, 13.3138 S, 48.31509 E, 25 m, 15.IV.2008 (*B.L. Fisher et al.*); Antsiranana, P.N. Montagne d'Ambre, 12.52028 S, 49.17917 E, 1125 m, 11.II.-4.II.2001 (*R. Harin'Hala*); Antsiranana, Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, 12.90889 S, 49.10983 E, 80 m, 10.-16.II.2001 (*B.L. Fisher et al.*); Antsiranana, Sambava, 14.26145 S, 50.16295 E, 23 m, 25.III.2007 (*B.L. Fisher et al.*); Mahajanga, Antsohihy, 14.881 S, 47.99333 E, 30 m, 16.XII.2005 (*B.L. Fisher et al.*); Mahajanga, Ambalahonko, 5.69 km S Antsohihy, 14.8439 S, 48.01421 E, 21 m, 10.IV.2008 (*B.L. Fisher et al.*); Mahajanga, Ambondromamy, 16.4375 S, 47.1575 E, 64 m, 7.II.2007 (*B.L. Fisher et al.*); Mahajanga, Maevatanana, 16.94817 S, 46.82767 E, 56 m, 7.II.2007 (*B.L. Fisher et al.*); Mahajanga, Mahavavy River, 6.2 km 145° SE Mitsinjo, 16.05167 S, 45.90833 E, 20 m, 1.-5.XII.2002 (*B.L. Fisher et al.*); Mahajanga, Majunga, 15.71783 S, 46.317 E, 5 m, 8.II.2007 (*B.L. Fisher et al.*); Mahajanga, Mampikony, 16.09323 S, 47.64278 E, 49 m, 20.III.2007 (*B.L. Fisher et al.*); Mahajanga, P.N. d'Ankarafantsika, Ampijoroa Station Forestière, 16.32083 S, 46.81067 E, 130 m, 26.III.-1.IV.2001 (*B.L. Fisher et al.*); Mahajanga, Port Berger, 15.56833 S, 47.61925 E, 61 m, 21.III.2007 (*B.L. Fisher et al.*); Toamasina, F.C. Andriantantely, 18.695 S, 48.81333 E, 530 m, 7.-10.XII.1998 (*H.J. Ratsirarson*); Toamasina, P.N. Masoala, 40 km 154° SSE Maroantsetra, 15.72667 S, 49.95667 E, 150 m, 14.-22.X.2001 (*A. Dejean et al.*); Toamasina, Vatomandry, 19.33283 S, 48.9795 E, 16 m, 17.II.2007 (*B.L. Fisher et al.*); Toliara, Miandrivazo, 19.52317 S, 45.4575 E, 80 m, 1.II.2007 (*B.L. Fisher et al.*); **MAURITIUS**: Rose Hill, 1942 (R. Mamet); Brise Mt., Bambous, 20.3455 S, 57.75467 E, 200 m, 27.V.2005 (*B.L. Fisher et al.*); **MAYOTTE**: Dapani, 12.96279 S, 45.15037 E, 135 m, 2.-4.XII.2007 (*B.L. Fisher et al.*); Hajangoua, 12.85492 S, 45.19889 E, 10 m, 2.XII.2007 (*B.L. Fisher et al.*); **REUNION**: Grotte Francais, 21.01617 S, 55.25983 E, 25 m, 21.V.2007 (*B.L. Fisher et al.*); Le Port, 26.94917 S, 55.3095 E, 70 m, 27.I.2004 (*F. Blard*); **SEYCHELLES**: Aldabra Island, Picard, 9.39606 S, 46.20465 E, 2 m, 4.III.2008 (*B.L. Fisher*); Aride Island, 4.21407 S, 55.6682 E, 10 m, 5.II.2010 (*B.L. Fisher*); Bird Island, 6.IV.2001 (*J. Gerlach*); Conception Island, 4.66311 S, 55.36821 E, 65 m, 12.-13.II.2010 (*B.L. Fisher et al.*); Curieuse Island, -4.28364° S, 55.7269° E, 5 m, 4.II.2010 (*B.L. Fisher et al.*); Félicité Island, 24.III.2002 (*J. Gerlach*); Félicité Island, 4.31991 S, 55.86909 E, 75 m, 1.II.2010 (*B.L. Fisher et al.*); Félicité Island, Silhoutte, Mare aux Cochons, 1908 (*H. Scott*); **SINGAPORE**: Johore, 2.II.1925 (*F. Silvestri*).

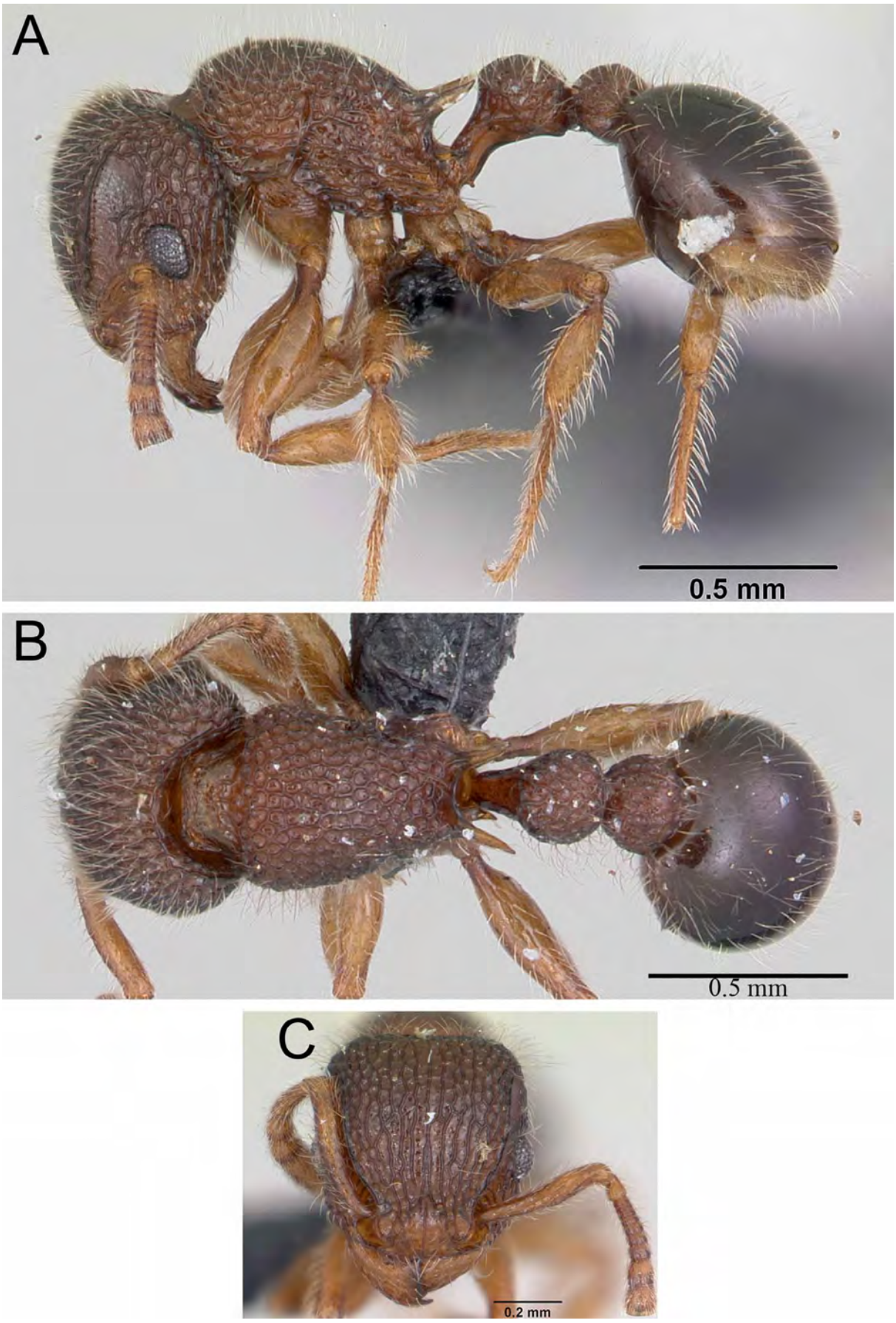


FIGURE 18. *Tetramorium lanuginosum* Mayr, 1870—CASENT0060515 (April Nobile 2006). A. body in profile. B. body in dorsal view. C. head in full-face view.

Tetramorium sericeiventre species group

Diagnosis

12-segmented antennae; anterior clypeal margin entire and without any median impression; lateral clypeus characteristically modified, in full-face view distinctly raised in front of antennal condyle and projecting forward as a tooth or denticle; frontal carinae weakly developed to absent; anterior face of mesosoma weakly developed, margination between dorsal and lateral mesosoma weak to absent; propodeal spines medium-sized; propodeal lobes elongate-triangular and roughly of same length as propodeal spines; petiolar node rectangular nodiform, longer than high to as long as high and longer than wide to as long as wide; postpetiole roughly rounded; mandibles strongly sculptured; sculpturation of head, mesosoma, and waist segments highly variable, usually reticulate-rugose with reticulate-punctulate ground sculpture providing granular appearance, but in one species all possible reductions of this sculpturation observable; first gastral tergite usually sculptured but to variable extent; all dorsal surfaces with sparse to moderately abundant standing pilosity; sting appendage triangular.

Comments

The *T. sericeiventre* species group is present in the Malagasy region in the form of two species, one of which is shared with the Afrotropical and Southern Palaearctic regions, while the other represents a new species endemic to Madagascar.

This group is a primarily Afrotropical group with 13 valid species found in this region, all of which are adapted to arid or semiarid habitats. Bolton (1980) divided the group into two complexes on the basis of pilosity. The *T. bequaerti* complex contains four species that possess abundant standing hairs on the antennal scapes and meso- and metatibiae. The *T. sericeiventre* complex holds the remaining 9 species, all of which lack standing hairs on the antennal scapes and meso- and metatibiae. Instead, only short decumbent to appressed pubescence is present. *Tetramorium sericeiventre* clearly belongs to the *T. sericeiventre* species complex whereas the new species, *T. mahafaly*, is more difficult to place. *Tetramorium mahafaly* is a fairly hairy species and possesses pilosity on the antennal scapes and meso- and metatibiae which is appressed. At present, we place this species within the *T. bequaerti* complex since it shares the presence of distinct pilosity on the antennal scapes and tibiae with the rest of the species complex, even though the pilosity in *T. mahafaly* is not suberect or erect.

The *T. sericeiventre* species group does not seem to be morphologically related to the other species groups with 12-segmented antennae. The absence of a notched anterior clypeal margin separates it from the *T. bicarinatum* group, while the raised lateral portion of the clypeus is not developed in the *T. simillimum* or the *T. tosii* groups. The two species of the *T. sericeiventre* species group, *T. sericeiventre* and *T. mahafaly*, are relatively easy to differentiate since they differ strongly from one another in terms of body size, petiolar node shape, and especially pilosity.

Tetramorium mahafaly Hita Garcia & Fisher sp. n.

(Figure 19)

Holotype worker, MADAGASCAR, Prov. Toliara, Mahafaly Plateau, 6.2 km 74° ENE Tampolo, 24° 39' S, 43° 69' E, 80 m, BLF05780, 21.-25.II.2002 (*B.L. Fisher et al.*) (CASC: CASENT0448984). Paratypes, 59 workers with same data as holotype (BMNH: CASENT0448977; CASC: CASENT0448972, CASENT0448973, CASENT0448974, CASENT0448976, CASENT0448978, CASENT0448979, CASENT0448980, CASENT0448981, CASENT0448982, CASENT0448985, CASENT0448986, CASENT0448989, CASENT0448990, CASENT0448991, CASENT0448992, CASENT0448993, CASENT0448994, CASENT0448995, CASENT0448996, CASENT0448997, CASENT0448998, CASENT0449000; MNHG: CASENT0448983).

Diagnosis

Tetramorium mahafaly can be clearly differentiated from the other species of the group by the following combination of characters: petiolar node rectangular nodiform, relatively square (LPeI 95–103; DPeI 89–98), in profile roughly as long as high and in dorsal view mostly only weakly longer than wide; antennal scapes and tibiae with moderately sized, appressed pilosity; generally hairy species, propodeum always with standing hairs.

Description

HL 0.610–0.680 (0.641); HW 0.545–0.610 (0.578); SL 0.580–0.655 (0.614); EL 0.110–0.135 (0.126); PW 0.400–0.475 (0.438); WL 0.760–0.875 (0.808); PSL 0.090–0.120 (0.110); PTL 0.190–0.220 (0.202); PTH 0.190–0.220 (0.206); PTW 0.170–0.205 (0.191); PPL 0.155–0.175 (0.165); PPH 0.200–0.225 (0.213); PPW 0.210–0.245 (0.229); CI 89–92 (90); SI 103–109 (106); OI 20–23 (22); PSLI 14–19 (17); PeNI 41–47 (44); LPeI 95–103 (98); DPeI 89–98 (94); PpNI 50–55 (52); LPpI 75–80 (78); DPpI 133–144 (139); PPI 115–124 (120) (20 measured).

Head distinctly longer than wide (CI 89–92). Anterior clypeal margin entire and convex, lateral clypeus characteristically modified, in full-face view distinctly raised in front of antennal condyle and projecting forward as a tooth or denticle. Frontal carinae absent. Antennal scrobes absent. Antennal scapes relatively long, distinctly surpassing posterior head margin (SI 103–109). Eyes relatively small (OI 20–23), with 11 to 13 ommatidia in longest row. Mesosomal profile weakly convex, metanotal groove absent. Propodeal spines elongate-triangular, relatively narrow and short (PSLI 14–19). Propodeal lobes elongate-triangular to triangular, usually blunt, and about equal in length to propodeal spines but generally more voluminous. Petiolar node rectangular nodiform, in profile anterior and posterior faces roughly parallel, dorsum weakly convex, antero- and posterodorsal angle at about same height, node roughly as long as high, more often weakly longer than high, rarely higher than long (LPeI 95–103), in dorsal view always weakly to distinctly longer than high (DPeI 89–98). Postpetiole in profile rounded, noticeably higher than long (LPpI 75–80), in dorsal view much wider than long (DPpI 133–144), and distinctly wider than petiolar node (PPI 115–124). Mandibles always sculptured, striate to longitudinally rugose. Clypeus with one well-developed longitudinal ruga and some weaker and more irregular rugae or rugulae laterally. Head laterally, ventrally, and posteriorly reticulate-rugose to rugose, cephalic dorsum more rugose; ground sculpture moderately reticulate-punctulate. Mesosoma and waist segments reticulate-rugose with reticulate-punctulate ground sculpturation. Head, mesosoma, and waist segments with granular appearance. First gastral tergite densely reticulate-punctulate at base, rarely extending more than half the length of tergite, rest of gaster completely unsculptured, smooth, and shiny. All dorsal surfaces of head, mesosoma, waist segments, and gaster with numerous long, standing hairs; antennal scapes and tibiae with appressed pilosity. Head, mesosoma, waist segments, and legs of reddish brown to brown colour contrasting with gaster of dark brown to black colour, postpetiole often darker as well, and almost of same dark colour as gaster.

Notes

Tetramorium mahafaly is only known from a few localities around the Mahafaly Plateau, and seems to be restricted to this area in South-Western Madagascar. At present, it is the only member of the *T. sericeiventre* group endemic to Madagascar, and seems to prefer relatively arid spiny forest or thicket habitats.

The new species can be separated from the only other species in the *T. sericeiventre* group present in the Malagasy region without any difficulty. The two differ significantly in terms of pilosity, size, and morphometry. The most obvious difference is pilosity, since *T. mahafaly* is much hairier than *T. sericeiventre*. The latter possesses only very short, appressed pubescence on the antennal scapes and tibiae whereas the first shows distinct, longer pilosity which is also appressed. In *T. sericeiventre* pilosity on all dorsal surfaces is sparse and absent on the propodeal dorsum while the pilosity of *T. mahafaly* is relatively more abundant and standing hairs are present on the propodeal dorsum. Furthermore, *T. mahafaly* (HL 0.610–0.680; PW 0.400–0.475; WL 0.760–0.875) is distinctly much smaller in size than *T. sericeiventre* (HL 0.770–0.990; PW 0.460–0.630; WL 0.950–1.30). Generally, body size must be treated with caution as there is a substantial intraspecific size variation observable within the genus *Tetramorium* (Bolton, 1977, 1979, 1980; Hita Garcia *et al*., 2010b). Even though *T. sericeiventre* shows impressive size variation, it is always much larger than *T. mahafaly.* In addition, the shape of the petiolar node is more square in *T. mahafaly* than in *T. sericeiventre* since the node of the latter is always much longer than high and also longer than wide (LPeI 104–120; DPeI 68–81), whereas the node of *T. mahafaly* (LPeI 95–103; DPeI 89–98) is generally roughly as long as high and sometimes only weakly longer than wide. The proportions of the widths of both waist segments also are fairly different. The postpetiole of *T. sericeiventre* (PPI 128–143) is usually between 1.3 to 1.4 times wider than the petiole whereas the postpetiole of *T. mahafaly* is generally around 1.2 times wider than the petiole (PPI 115–124).

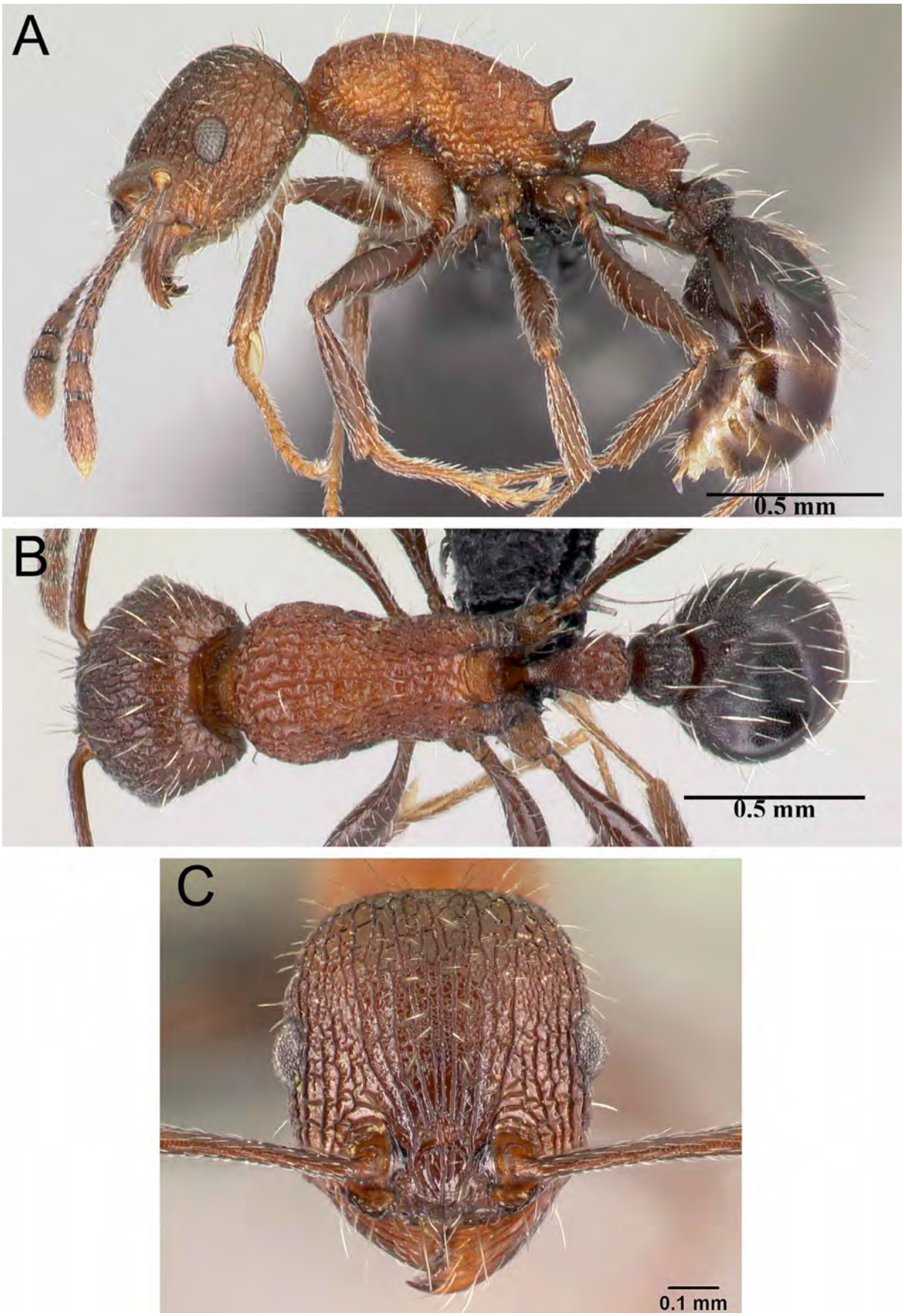


FIGURE 19. *Tetramorium mahafaly* sp. n.—holotype, CASENT0448984 (Erin Prado 2010). A. body in profile. B. body in dorsal view. C. head in full-face view

Material examined

MADAGASCAR: Toliara, Mahafaly Plateau, 6.2 km 74° ENE Tampolo, 24° 39' S, 43° 69' E, 80 m, 21.-25.II.2002 (*B.L. Fisher et al.*); Toliara, Parc National de Tsimanampetsotsa, Mitoho Cave, 6.4 km 77° ENE Efoetse, 17.4 km 170° S Beheloka, 24° 03' S, 43° 46' E, 40 m, 18.-22.II.2002 (*B.L. Fisher et al.*).

Tetramorium sericeiventre Emery, 1877

(Figures 20, 21, 22)

Tetramorium sericeiventre Emery, 1877:370. Syntype workers, ETHIOPIA, Bogos Sciotel (*O. Beccari*) (MHNG, MSNG) [partly examined].

Tetramorium quadrispinosum Emery, 1886:362. Syntype workers, SOUTH AFRICA, Cape of Good Hope (*L. Peringuey*) (RMCA; MHNG) [examined]. **Syn. n.**

Tetramorium blochmannii Forel, 1887: 384. Syntype workers, MADAGASCAR, Ivondro p. Tamatavé, (MNHN) [not examined]. [Synonymy with *sericeiventre* by Bolton, 1979:155; here confirmed].

Tetramorium blochmannii var. *montanum* Forel, 1891:152. Syntype workers, MADAGASCAR, near Tamatave (*C. Keller*) (MHNG) [examined]. [Synonymy with *quadrispinosum* by Bolton, 1979:155]. **Syn. n.**

Tetramorium sericeiventre var. *debile* Forel, 1894:80. Syntype workers, ETHIOPIA: 'Suedabessinien' (*Ilg*) (MHNG) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium sericeiventre subsp. *femoratum* Emery, 1895a:37. Syntype workers, SOUTH AFRICA, Makapan (*E. Simon*) (type location unknown, probably in MSNG) [not examined]. [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium neuvillei Forel, 1907:135. Syntype workers, ETHIOPIA, Dire Daoua, 1905 (*M. de Rothschild*) (MHNG) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium blochmanni subsp. *continentis* Forel, 1910:426. Syntype workers, SOUTH AFRICA, Natal (*Wroughton*); Natal (*Haviland*) (MHNG) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium sericeiventre var. *inversa* Santschi, 1910:384. Syntype workers, CONGO, Brazzaville and M'Pila (*A. Weiss*) (NHMB; RMCA) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium blochmanni var. *nigriventre* Stitz, 1910:144. Syntype workers, CAMEROON, Misahöhe (*Smend*) (MNHU) [not examined]. [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium sericeiventre var. *arenarium* Santschi, 1918:126. Syntype workers, TUNISIA, Kairouan (*F. Santschi*) (NHMB) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:333; here confirmed].

Tetramorium sericeiventre var. *bipartita* Santschi, 1918:126. Holotype worker, KENYA, (*Le Moult*) (NHMB) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:333; here confirmed].

Tetramorium sericeiventre st. *cinnamomeum* Santschi, 1918:124. Syntype workers, MOZAMBIQUE, Amatongas Forest, ii.1917 (*G. Arnold*) (BMNH; NHMB; RMCA) [examined]. [Also described as new by Arnold, 1926:249 from same material.] [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium quadrispinosum st. *elegans* Santschi, 1918:125. Syntype workers, SOUTH AFRICA, Cape Province, Willowmore (*H. Brauns*) (BMNH; NHMB) [examined]. [Synonymy with *quadrispinosum* by Bolton, 1980:330]. **Syn. n.**

Tetramorium sericeiventre var. *gamaii* Santschi, 1918:128. Syntype workers, ZIMBABWE, Gwari, 1912 (*G. Arnold*) (NHMB; BMNH) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:333; here confirmed].

Tetramorium sericeiventre var. *hori* Santschi, 1918:125. Syntype workers, SUDAN, Khartoum, 1895 (*Karawaiew*) (NHMB) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium sericeiventre var. *jasonis* Santschi, 1918:127. Syntype workers, queens, IVORY COAST, Jacqueville (*Lohier*); Dimbroke (*Le Moult*) (NHMB) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:333; here confirmed].

Tetramorium sericeiventre var. *munda* Santschi, 1918:127. Syntype workers, GUINEA, Kakubime (*F. Silvestri*) (NHMB) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:333; here confirmed].

Tetramorium sericeiventre var. *vascoi* Santschi, 1918:128. Syntype worker, queen, ZIMBABWE, Bulawayo, 14.XII.1912 (*G. Arnold*) (NHMB) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:333; here confirmed].

Tetramorium blochmanni var. *calvum* Stitz, 1923:162. Syntype workers, NAMIBIA, Kuibis, 15.VII.1911, (*W. Michaelsen*)) [types presumably lost; not examined]. [Synonymy with *quadrispinosum* by Bolton, 1980:330]. **Syn. n.**

Tetramorium quadrispinosum r. *beirae* Arnold, 1926:252. Syntype workers, MOZAMBIQUE, Beira, 2.VI.l920 (*G. Arnold*) (BMNH) [examined]. [Synonymy with *quadrispinosum* by Bolton, 1980:331]. **Syn. n.**

Tetramorium quadrispinosum r. *otaviensis* Arnold, 1926:253. Syntype workers, NAMIBIA, Otavi (*Lightfoot*) [types presumably lost]. [Synonymy with *quadrispinosum* by Bolton, 1980:331]. **Syn. n.**

Tetramorium sericeiventre var. *repertum* Santschi, 1926:242. Syntype workers, MOZAMBIQUE, Busi River, Inhangovu (*G. Arnold*) (NHMB) [examined]. [Synonymy with *quadrispinosum* by Bolton, 1980:330]. **Syn. n.**

Tetramorium sericeiventre var. *vividum* Santschi, 1926:242. Syntype workers, MOZAMBIQUE, Busi River, Inhangovu, 3.VI.l920 (*G. Arnold*) (NHMB) [examined]. [Synonymy with *sericeiventre* by Bolton, 1980:332; here confirmed].

Tetramorium quadrispinosum st. *angolense* Santschi, 1930:71. Syntype workers, ANGOLA, Cakindo (*Monard*) (NHMB)

[examined]. [Synonymy with *quadrispinosum* by Bolton, 1980:331]. **Syn. n.**

Atopula hortensis Bernard, 1948:173. Syntype workers, queen, males, LIBYA, Fezzan, V.1945; Fezzan, Sebha, 2.VI.l944 (*Bernard*); Sebha, 1945 (*Bernard*); Fezzan, El Jedid; Brak, 15.VI.1945 (*Mestre*) (MCZ) [not examined]. [Synonymy with *sericeiventre* by Bolton, 1976:363; here confirmed].

Tetramorium blochmanni st. *continentis* var. *eudoxia* Forel, 1914:231. Worker, SOUTH AFRICA, Cape Prov., Willowmore, I.1914 (*G. Arnold*) (MHNG) [examined]. [Unavailable Name; material referred to *quadrispinosum* by Bolton, 1980:330].

Tetramorium sericeiventre st. *femoratum* var. *colluta* Santschi, 1918:129. Worker, SOUTH AFRICA, Natal, Durban (*F. Demarchi*) (NHMB) [examined]. [Unavailable Name; material referred to *sericeiventre* by Bolton, 1980:333].

Tetramorium sericeiventre st. *inversa* var. *defricta* Santschi, 1918:129. Workers, ZIMBABWE, Malundi, 1914 (*G. Arnold*) (NHMB) [examined]. [Unavailable Name; material referred to *sericeiventre* by Bolton, 1980:333].

Tetramorium sericeiventre st. *continentis* var. *georgei* Santschi, 1918:131. Workers, queen, male, ZIMBABWE, Bulawayo (*G. Arnold*) (NHMB) [examined]. [Unavailable Name; material referred to *sericeiventre* by Bolton, 1980:333].

Tetramorium sericeiventre st. *continentis* var. *platonis* Santschi, 1918:130. Workers, BOTSWANA, (*Wroughton*) (NHMB) [examined]. [Unavailable Name; material referred to *sericeiventre* by Bolton, 1980:333].

Tetramorium sericeiventre st. *femoratum* var. *transversa* Santschi, 1918:128. Worker, SOUTH AFRICA, Transvaal, Pretoria, 1915 (*C. Brain*) (type location unknown, probably in NHMB) [not examined]. [Unavailable Name; material referred to *sericeiventre* by Bolton, 1980:333].

Tetramorium sericeiventre st. *inversum* var. *evidens* Santschi, 1928:206. Workers, D.R. CONGO, Kondue (*E. Luja*) (NHMB) [examined]. [Unavailable Name; material referred to *sericeiventre* by Bolton, 1980:333].

Tetramorium sericeiventre st. *continentis* var. *gladiator* Santschi, 1928:206. Workers, ZIMBABWE, Vumba Mts., Cloudland, 1830 m, 6-17.IV.1923 (*G. Arnold*) (NHMB) [examined]. [Unavailable Name; material referred to *sericeiventre* by Bolton, 1980:333].

Tetramorium sericeiventre st. *femoratum* var. *kenyense* Santschi, 1933:106. Workers, queen, KENYA, Kiambou (*R. H. Le Pelley*) (NHMB) [examined]. [Unavailable Name; material referred to *sericeiventre* by Bolton, 1980:333].

Tetramorium quadrispinosum st. *elegans* var. *benguelense* Santschi, 1937:232. Workers, ANGOLA, Kapelongo, no. 121 (*A. Monard*) (NHMB) [examined]. [Unavailable Name; material referred to *quadrispinosum* by Bolton, 1980:331].

Diagnosis

The following character combination distinguishes *T. sericeiventre* from the other species of its species group in the Malagasy region: petiolar node rectangular nodiform, relatively low and elongate (LPeI 104–120; DPeI 68–81), in profile always distinctly longer than high, in dorsal view always much longer than wide; antennal scapes and tibiae with very short and appressed pubescence; generally less hairy species with sparse pilosity only, propodeum without any standing hairs.

Description

HL 0.770–0.990 (0.871); HW 0.665–0.855 (0.753); SL 0.680–0.910 (0.813); EL 0.140–0.200 (0.171); PW 0.460–0.630 (0.548); WL 0.950–1.30 (1.117); PSL 0.135 -0.205 (0.159); PTL 0.240–0.350 (0.296); PTH 0.220–0.320 (0.268); PTW 0.180–0.260 (0.218); PPL 0.205–0.300 (0.240); PPH 0.230–0.330 (0.273); PPW 0.250–0.360 (0.294); CI 83–90 (86); SI 102–113 (108); OI 20–24 (23); PSLI 16–21 (18); PeNI 36–43 (40); LPeI 104–120 (111); DPeI 68–81 (74); PpNI 50–59 (54); LPpI 81–94 (88); DPpI 117–128 (123); PPI 128–143 (135) (38 measured).

Head distinctly longer than wide (CI 83–90). Anterior clypeal margin entire and convex, lateral clypeus characteristically modified, in full-face view distinctly raised in front of antennal condyle and projecting forward as a tooth or denticle. Frontal carinae weakly developed and short, usually ending at median eye level, very often distinctly shorter and ending much before anterior eye level. Antennal scrobes absent. Antennal scapes relatively long, surpassing posterior head margin (SI 102–113). Eyes small to moderate (OI 20–24), with 11 to 14 ommatidia in longest row. Mesosomal profile relatively flat. Metanotal groove absent. Propodeal spines short to medium-sized (PSLI 26–30), elongate-triangular to spinose, relatively narrow and acute. Propodeal lobes relatively long, generally of same length as propodeal spines, sometimes weakly longer or shorter, shape of lobes triangular to elongate-triangular, usually acute, sometimes blunt. Node of petiole rectangular nodiform, in profile anterior and posterior faces roughly parallel, dorsum weakly convex, antero- and posterodorsal angle at about same height, node always longer than high (LPeI 104–120), in dorsal view distinctly much longer than high (DPeI 68–81). Postpetiole in profile rounded, markedly higher than long (LPpI 81–94), in dorsal view distinctly wider than long (DPpI 117–128), and much wider than petiolar node (PPI 128–143). Mandibles usually strongly sculptured, longitudinally striate or rugose. Clypeus with 1 strongly developed longitudinal ruga. Cephalic sculpturation highly variable, usually with reticulate-rugose or reticulate-rugulose sculpturation ventrally and posteriorly, dorsally between frontal carinae more longitudinally rugose or rugulose, often rugulation to variable degree weaker developed, rarely rugae and

rugulae absent and cephalic dorsum almost unsculptured and relatively smooth, ground sculpture usually strongly and finely reticulate-punctulate providing head with a rough, matte, and granular appearance, often reduced and less conspicuous without granular appearance, rarely absent, head almost smooth and shiny. Sculpturation of mesosoma and waist segments highly variable, usually with longitudinal rugae or rugulae of varying strength with a reticulate-punctulate ground sculpturation, also with granular appearance, often only superficially punctulate with unsculptured areas and without granular appearance, only weakly matte. First gastral tergite also with variable sculpturation, generally densely punctulate and strongly shagreened along entire length, often only basally sculptured, sometimes with superficial punctulation only, and more rarely completely unsculptured, smooth, and shiny. All dorsal surfaces of head, mesosoma (except propodeum), waist segments, and gaster with very sparse and stout standing hairs, pronotum and mesonotum at most with 5 to 6 pairs of hairs, propodeum without; antennal scapes and tibiae with very short and appressed pubescence. Colouration reddish to brown, sometimes dark brown, gaster often darker than remaining body.

Notes

Tetramorium sericeiventre is a fairly widely distributed species within the Afrotropical, Malagasy, and Southern Palaearctic regions. It can be found from Northern Africa to South Africa, from West to East Africa, and is also present in the Arabian Peninsula. In the Malagasy region it is widespread in Madagascar and also occurs on the Comoros and the Seychelles. On the African continent it may be the most successful *Tetramorium* species in open habitats, occurring almost everywhere outside humid rainforest habitats. In Madagascar it is fairly common as well, but is less abundant than in Africa.

The new synonyms presented above require some explanations. *Tetramorium sericeiventre* and its junior synonym *T. quadrispinosum* are morphologically very close taxa and the one diagnostic character used to separate them was based on differences in sculpturation. Apart from this they share the same general morphology, morphometric ranges, and biology. Bolton (1979) stated that it is possible that both species may represent two extremes of the same highly variable species, with *T. quadrispinosum* representing a form with very weak sculpturation and *T. sericeiventre* being a much more sculptured form. In his revision of the Afrotropical *Tetramorium* Bolton (1980) considered the synonymisation of both species, again pointing out that the only character separating both species is sculpturation. Nonetheless, he decided to retain both species because the differences were geographically consistent and their distribution ranges only partially overlap.

In this study we have decided to synonymise both species for the following reasons. The uncomfortable diagnosis used to differentiate the two on the basis of sculpturation does not work for the material examined in this study. We were able to observe a gradual variation from strongly sculptured forms, formerly attributed to *T. sericeiventre*, to weakly sculptured or even almost unsculptured forms, formerly attributed to *T. quadrispinosum*. Taking the strongly developed reticulate-rugose or rugulose sculpturation with reticulate-punctulate, granular ground sculpturation as the base form, we could observe that sometimes reticulate-rugose or rugulose sculpturation remained stable but the ground sculpturation was reduced, or that the granular ground sculpture was very distinct but the superimposed rugae or rugulae were reduced, and very rarely almost all sculpturation was feeble or absent. These observations made it impossible to draw a line demarcating where one species ends and the other begins.

Furthermore, the distribution patterns of the differently sculptured forms do not support the two-species theory. On the African continent *T. sericeiventre* is the more common of the two forms occurring almost everywhere, whereas *T. quadrispinosum* is only known to occur in Angola, Botswana, Mozambique, and South Africa. Therefore, their distribution ranges overlap in Southern Africa. Both could be considered good species if they co-occured in sympatry and maintained their respective species characteristics, because this indicates reproductive isolation of the different forms. However, we found specimens from South Africa labelled as *T. quadrispinosum* that show sculpturation difficult to attribute to either of the two forms because it lies somewhere in-between. The finding of intermediate forms can be explained in two ways: first, with the two-species theory implying that both forms are different species and the intermediates represent hybrids; or second, with the one-species-theory, suggesting that a single species is highly variable in Southern Africa while it is mainly strongly sculptured in the rest of continent. If one considers only the African distribution patterns, this question is fairly difficult to answer. The use of genetic data from a good number of specimens from many African localities would likely provide additional arguments for one of the two theories, but unfortunately, there is no such data available.

In the Malagasy region, however, the distribution pattern is very different or even opposite what is found in

Africa, since *T. quadrispinosum* is the much more abundant and common form found in much of Madagascar and on the Comoros and Seychelles, save for the northern portion of Madagascar, whereas *T. sericeiventre* seems restricted to the northern area. Again, the distribution ranges of both forms do weakly overlap, though less so than in Africa. The specimens from northern Madagascar, which are attributed to *T. sericeiventre*, are almost all very strongly sculptured. The material from the rest of Madagascar, the Comoros, and the Seychelles, attributed to *T. quadrispinosum*, is mostly weakly to moderately sculptured, and more rarely almost unsculptured. Nevertheless, it is relatively difficult to write about intermediate forms because we observed the whole gradual range of variation imaginable, from almost unsculptured to moderately sculptured, and sometimes strongly sculptured. With this in mind, we cannot find a conclusive zoogeographic pattern that could explain the observed variation with the two-species theory. Considering *T. sericeiventre* and *T. quadrispinosum* as conspecific, then, it seems that the species is highly variable in terms of sculpturation in most of Madagascar while it is generally less variable on the northern portion of the island. In addition, preliminary data from mtDNA suggests that both taxa are conspecific (FHG & BLF, unpublished data), and offers further support for the one-species theory presented here. In the preliminary tree, strongly sculptured specimens cluster together with weakly or moderately sculptured specimens. However, this finding should be viewed with some caution, as we used only genetic material from the Malagasy region, and additional material from the Afrotropics needs to be included before the mtDNA data can be considered strong evidence.

Taking all of the arguments presented above into consideration, we consider both as conspecific and propose *T. quadrispinosum* and all its synonyms as junior synonyms of *T. sericeiventre*. With this extreme variability in mind, it seems that *T. sericeiventre* under its new definition is one of the most variable species within its genus in terms of sculpturation. The images provided below reflect this extreme variability (compare Figs. 20, 21 and 22).

Tetramorium sericeiventre can be differentiated easily from the second species of the *T. sericeiventre* species group that is present in Madagascar since both are fairly different in terms of pilosity, size, and petiolar node shape. How both species can be separated is discussed in detail in the species description of *T. mahafaly.*

Material examined

ANGOLA: Cakindo (*Monard*); Kapelongo, no. 121 (*A. Monard*); Vila Salazar, 8.IX.1949 (*B. Malkin*); **BOTSWANA**: no locality (*Wroughton*); **COMOROS**: Anjouan, Hajoho, 12.12195 S, 44.48795 E, 10 m, 28.I.2009 (*B.L. Fisher et al.*); **CONGO**: Brazzaville & M'Pila (*A. Weiss*); **D.R. CONGO**: Kondue (*E. Luja*); 70 ml. E. of Lulusbourg, 11.VIII.1957 (*E.S. Ross & R.E. Leech*); 99 ml. W. of Popokabaki, 2.VIII.1957 (*E.S. Ross & R.E. Leech*); **ETHIOPIA**: Bogos Sciotel (*O. Beccari*); Dire Daoua, 1905 (*M. Rothschild*); 'Suedabessinien' (*Ilg*); **GABON**: Port Gentil, 7.XII.1957 (*E.S. Ross & R.E. Leech*); **GUINEA**: Kakubime (*F. Silvestri*); **IVORY COAST**: Dimbroke (*Le Moult*); Jacqueville (*Lohier*); **KENYA**: Coast Province, Arabuko Sokoke Forest, 3.29° S, 39.98° E, 10–15 m, 24.V.2001 (*R.R. Snelling*); Coast Province, Kwale, ICIPE Muhaka Field Station, 4.32° S, 39.52 E, 25 m, 5.VI.2001 (*R.R. Snelling*); Kiambou (*R. H. Le Pelley*); Nairobi Province, Nairobi, ICIPE guesthouse, 01.22° S, 36.90° E, ca. 1800 m, 14.V.2003 (*R.R. Snelling*); Rift Valley Province, 25 ml. N. of Magadi, 900 m, 22.XI.1957 (*E.S. Ross & R.E. Leech*); Rift Valley Province, Laikipia, Mpala Ranch, 0.48° N, 36.85 E, 30.III.2001 (*R.R. Snelling*); Rift Valley Province, Laikipia, Mpala Research Centre, 00° 04' 50.44" N, 37° 00' 46.06" E, IV.-VII.2008 (*C. Warui & E. Abonjo*); Rift Valley Province, Maasai Mara Game Reserve, Mara River, 1700 m, 18.VII.2007 (*F. Hita Garcia*); Western Province, Kakamega Forest, Buyangu Hill, 00° 20' 29" N, 34° 51' 59" E, ca. 1650 m, 30.VII.2008 (*G. Fischer*); Western Province, Kakamega Forest, Yala River, 0.20° N, 34.88° E, 1450 m, 25.IV.2001 (*R.R. Snelling & A. Espira*); no locality (*Le Moult*); **MADAGASCAR**: Antananarivo, Alasora, 18.96245 S, 47.58925 E, 1434 m, 4.V.2007 (*B.L. Fisher et al.*); Antananarivo, Ambohidrabiby, 18.96245 S, 47.58925 E, 1434 m, 26.V.2007 (*B.L. Fisher et al.*); Antananarivo, Antsahadinta, 19.0128 S, 47.40668 E, 1403 m, 8.V.2007 (*B.L. Fisher et al.*); Antananarivo, Iharanandriana, 19.15823 S, 47.49702 E, 1513 m, 9.V.2007 (*B.L. Fisher et al.*); Antananarivo, Ilafy, 18.85415 S, 47.56575 E, 1385 m, 26.IV.2007 (*B.L. Fisher et al.*); Antananarivo, Kaloy, 18.59568 S, 47.65333 E, 1338 m, 27.IV.2007 (*B.L. Fisher et al.*); Antananarivo, Manakambahiny, 18.93217 S, 47.53617 E, 20.I.2004 (*C. Ranaivo*); Antananarivo, Mandoto, 19.57967 S, 46.28967 E, 870 m, 31.I.2007 (*B.L. Fisher et al.*); Antsiranana, Ambanja, 13.68268 S, 48.45245 E, 30 m, 23.III.2007 (*B.L. Fisher et al.*); Antsiranana, Ambilobe, 13.19728 S, 49.04868 E, 61 m, 30.III.2007 (*B.L. Fisher et al.*); Antsiranana, Ankobahoba, 32.3 km N Ambanja, 13.39166 S, 48.48249 E, 41 m, 12.IV.2008 (*B.L. Fisher et al.*); Antsiranana, Antsiranana, 12.27777 S, 49.29155 E, 43 m, 28.III.2007 (*B.L. Fisher et al.*); Antsiranana, Forét d'Analabe, 30.0 km 72° ENE Daraina, 13.08333 S, 49.90833 E,

30 m, 28.XI.2003 (*B.L. Fisher*); Antsiranana, Forét de Bekaraoka, 6.8 km 60° ENE Daraina, 13.16667 S, 49.71 E, 150 m, 7.XII.2003 (*B.L. Fisher*); Antsiranana, Forét d'Orangea, 3.5 km 128° SE Remena, 12° 16' S, 49° 22' E, 90 m, 22.-28.II.2001 (*G. Alpert et al.*); Antsiranana, Nosy faly, Tafiambotry, 13.3654 S, 48.48775 E, 7 m, 12.IV.2008 (*B.L. Fisher et al.*); Antsiranana, Réserve Analamerana, 28.4 km 99° Anivorano Nord Anivorano Nort, -12.74667 S, 49.49483 E, 60 m, 6.XII.2004 (*B.L. Fisher*); Antsiranana, Réserve Spéciale de l'Ankarana, 13.6 km 192° SSW Anivorano Nord, 12° 52' S, 49° 14' E, 210 m, 16.-21.II.2001 (*B.L. Fisher et al.*); Antsiranana, Réserve Spéciale de l'Ankarana, 13.6 km 192° SSW Anivorano Nord, 12° 55' S, 49° 07' E, 80 m, 10.-16.II.2001 (*B.L. Fisher et al.*); Antsiranana, Taizambato, 22,9 km NE Ambanja, 13.5092 S, 48.56722 E, 16 m, 12.IV.2008 (*B.L. Fisher et al.*); Fianarantsoa, Ambalavao, 21.83267 S, 46.93867 E, 1200 m, 13.XII.2006 (*B.L. Fisher et al.*); Fianarantsoa, Farafangana, 22.81967 S, 47.83 E, 10 m, 25.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Foret d'Analalava, 29.6 km 280° W Ranohira, 22.59167 S, 45.12833 E, 700 m, 1.-5.II.2003 (*B.L. Fisher et al.*); Fianarantsoa, Ihosy, 22.40317 S, 46.12917 E, 735 m, 12.XII.2006 (*B.L. Fisher et al.*); Fianarantsoa, Manakara, 22.14817 S, 48.02267 E, 10 m, 25.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Parc National d'Isalo, Ambovo Springs, 29.3 km 4° N Ranohira N RanohirN , 22.29833 S, 45.35167 E, 990 m, 9.-14.II.2003 (*B.L. Fisher et al.*); Fianarantsoa, Ranohira, 22.55817 S, 45.414 E, 845 m, 11.XII.2006 (*B.L. Fisher et al.*); Fianarantsoa, Vangaindrano, 23.35067 S, 47.6045 E, 10 m, 20.XI.2006 (*B.L. Fisher et al.*); Mahajanga, Ambalahonko, 5.69 km S Antsohihy, 14.8439 S, 48.01421 E, 21 m, 10.IV.2008 (*B.L. Fisher et al.*); Mahajanga, Antsohihy, 14.881 S, 47.99333 E, 30 m, 16.XII.2005 (*B.L. Fisher et al.*); Mahajanga, Bekopaka, 19.14667 S, 44.796 E, 100 m, 14.XI.2001 (*B.L. Fisher et al.*); Mahajanga, Foret Ambohimanga, 15.96267 S, 47.43817 E, 250 m, 15.XII.2004 (*B.L. Fisher*); Mahajanga, Maropapango, 52.3 km N Antsohihy, 14.32043 S, 48.03058 E, 18 m, 10.IV.2008 (*B.L. Fisher et al.*); Mahajanga, Parc National de Namoroka, 17.8 km 329° WNW Vilanandro , 16.37667 S, 45.32667 E, 100 m, 8.-12.XI.2002 (*B.L. Fisher et al.*); Majunga, Ambondromamy, 16.4375 S, 47.1575 E, 64 m, 7.II.2007 (*B.L. Fisher et al.*); Majunga, Port Berger, 15.56833 S, 47.61925 E, 61 m, 21.III.2007 (*B.L. Fisher et al.*); Toamasina, Ile Sainte Marie, Foret Ambohidena, 16.82433 S, 49.96417 E, 20 m, 21.XI.2005 (*B.L. Fisher et al.*); Toamasina, Mahavelona (Foulpointe), 17.66667 S, 49.5 E, 9.VI.1993 (*A. Pauly*); Toamasina, Manakambahiny, 17.75 S, 48.71667 E, 10.III.1991 (*A. Pauly*); Toamasina, S.F. Tampolo, 10 km NNE Fenoarivo Atn., 17.2825 S, 49.43 E, 10 m, 3.IV.1997 (*B.L. Fisher*); Toamasina, S.F. Tampolo, 10 km NNE Fenoarivo Atn., 17.2825 S, 49.43 E, 10 m, 10.IV.1997 (*B.L. Fisher*); Toliara, Amboasary, 25.03883 S, 46.3835 E, 25 m, 9.XII.2006 (*B.L. Fisher et al.*); Toliara, Ampanihy, 24° 41.62' S, 44° 44.82' E, 250 m, 10.XII.2006 (*B.L. Fisher et al.*); Toliara, Betioky, 23.72117 S, 44.38017 E, 270 m, 11.XII.2006 (*B.L. Fisher et al.*); Toliara, Ehazoara Canyon, 26 km E Betioky, 23.68333 S, 44.63333 E, 175 m, 27.IV.1997 (*B.L. Fisher*); Toliara, Ejeda, 24° 21.03' S, 44° 30.96' E, 250 m, 10.XI.2006 (*B.L. Fisher et al.*); Toliara, Foret de Kirindy, 20.045 S, 44.66222 E, 100 m, 28.XI.-3.XII.2001 (*B.L. Fisher et al.*); Toliara, Foret de Mite, Andranomite, 23.52417 S, 44.12133 E, 75m, 27.II.-3.III.2002 (*B.L. Fisher et al.*); Toliara, Ivahona, 23.45591 S, 46.17376 E, 820 m, 12.II.2009 (*B.L. Fisher et al.*); Toliara, Malaimbandy, 20.34317 S, 45.59567 E, 180 m, 2.II.2007 (*B.L. Fisher et al.*); Toliara, Parc National d'Andohahela, Foret de Manantalinjo, 24.81694 S, 46.61 E, 150 m, 12.-16.I.2002 (*B.L. Fisher et al.*); Toliara, Parc National d'Andohahela, Foret de Manantalinjo, 24.49 S, 46.37 E, 300 m, 12.-16.I.2002 (*B.L. Fisher et al.*); Toliara, Parc National de Kirindy Mite, 16.3 km 127° SE Belo sur Mer, 20.79528 S, 44.147 E, 40 m, 6.-10.I.2001 (B.L. Fisher et al.); Toliara, Parc National de Zombitse, 19.8 km 84° E Sakaraha, 22.84333 S, 44.71 E, 770 m, 5.-9.II.2003 (*B.L. Fisher et al.*); Toliara, Reserve Special Berenty, 25.01667 S, 46.3 E, 25 m, 10.XII.1992 (*B.L. Fisher*); Toliara, Reserve Special Berenty, 25.00667 S, 46.30333 E, 85 m, 27.XII.2002-7.I.2003 (*Rin'Ha & Irwin*); Toliara, Reserve Special Berenty, Foret de Bealoka, 14.6 km 329° NNW Amboasary, 24.95694 S, 46.2715 E, 35 m, 3.-8.II.2002 (*B.L. Fisher et al.*); Toliara, Reserve serve Special Berenty, Foret de Malaza, 8.6 km 314° NW Amboasary, 25.00778 S, 46.306 E, 40 m, 16.IV.2005 (*B.L. Fisher*); Toliara, Reserve Special Berenty, Foret de Malaza, 8.6 km 314° NW Amboasary, 25.00778 S, 46.306 E, 40 m, 16.IV.2005 (*B.L. Fisher*); Toliara, Reserve Special Berenty, Foret de Malaza, 8.6 km 314° NW Amboasary, 25.00778 S, 46.306 E, 40 m, 6.II.2002 (*B.L. Fisher et al.*); Toliara, Reserve serve Special Kalambatritra, Ambinanitelo, 23.45373 S, 46.45773 E, 1345 m, 11.II.2009 (*B.L. Fisher et al.*); Toliara, Sakaraha, 22.91233 S, 44.53283 E, 470 m, 11.XII.2006 (*B.L. Fisher et al.*); Toliara, Toliara, 23.3575 S, 43.669 E, 20 m, 11.XII.2006 (*B.L. Fisher et al.*); Toliara, Tsihombe, 25.31833 S, 45.48367 E, 30 m, 10.XII.2006 (*B.L. Fisher et al.*); Toliara, Tsivory, 24.07083 S, 46.07533 E, 400 m, 9.XII.2006 (*B.L. Fisher et al.*); nr. Tamatave (*C. Keller*); 20 km S of Betroka, 750 m, 10.XII.1959 (*E.S. Ross*); **MOZAMBIQUE**: Amatongas Forest, II.1917 (*G. Arnold*); Busi River, Inhangovu, 3.VI.l920 (*G. Arnold*); Beira, 2.VI.l920

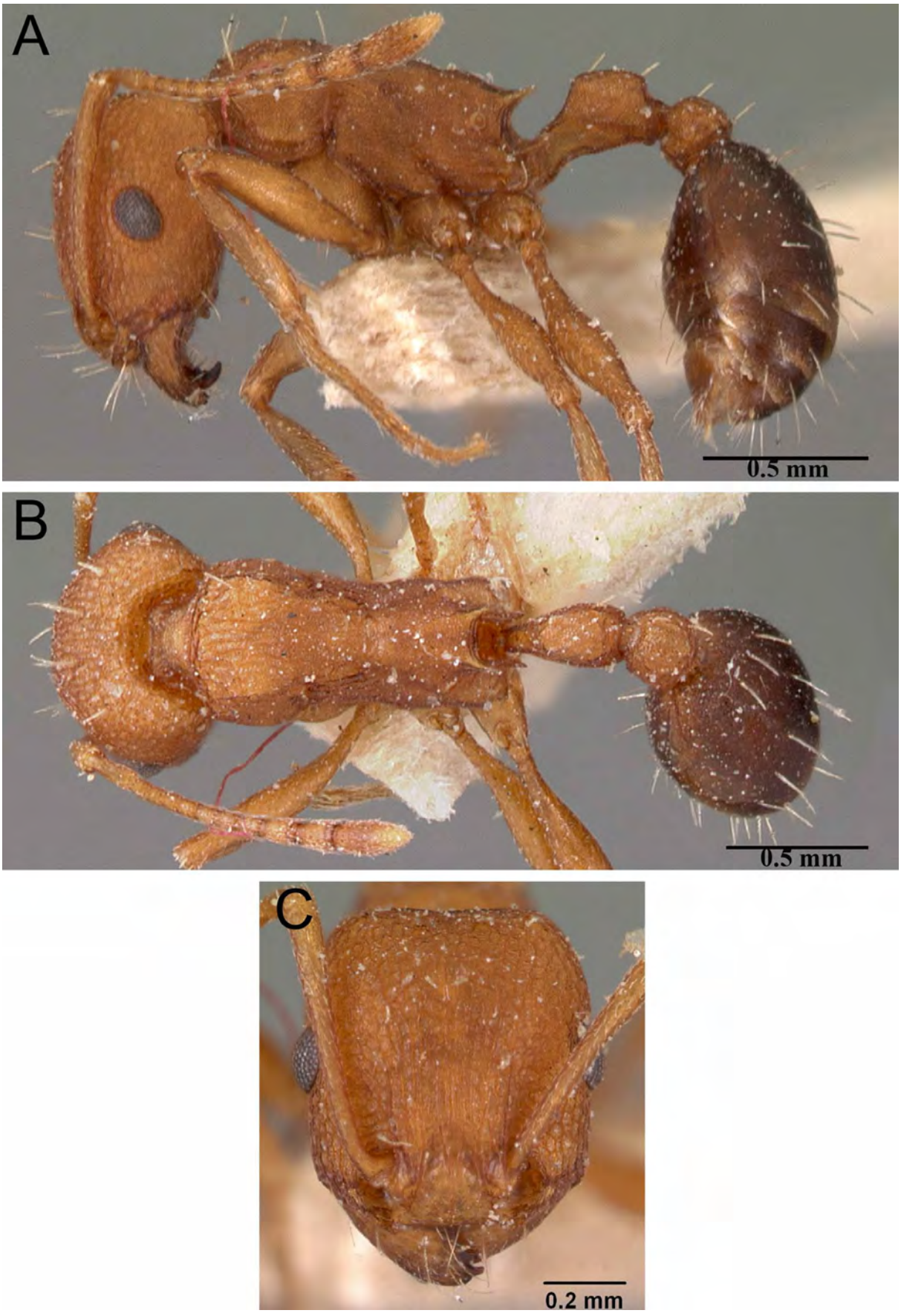


FIGURE 20. *Tetramorium sericeiventre* Emery, 1877—strongly sculptured form, CASENT0102073 (April Nobile 2007). A. body in profile. B. body in dorsal view. C. head in full-face view.

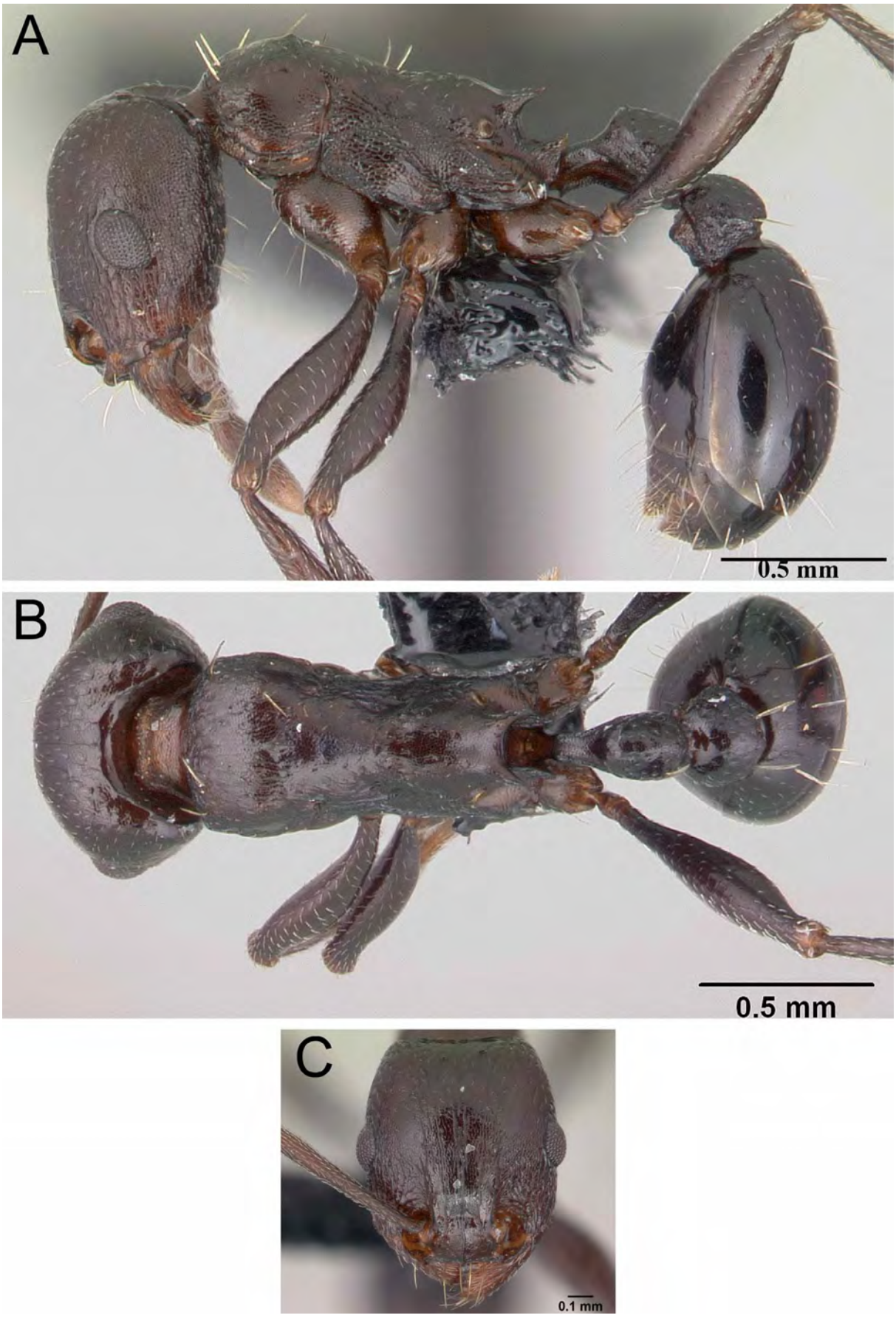


FIGURE 21. *Tetramorium sericeiventre* Emery, 1877—moderately sculptured form, CASENT0147456 (Erin Prado 2009). A. body in profile. B. body in dorsal view. C. head in full-face view.

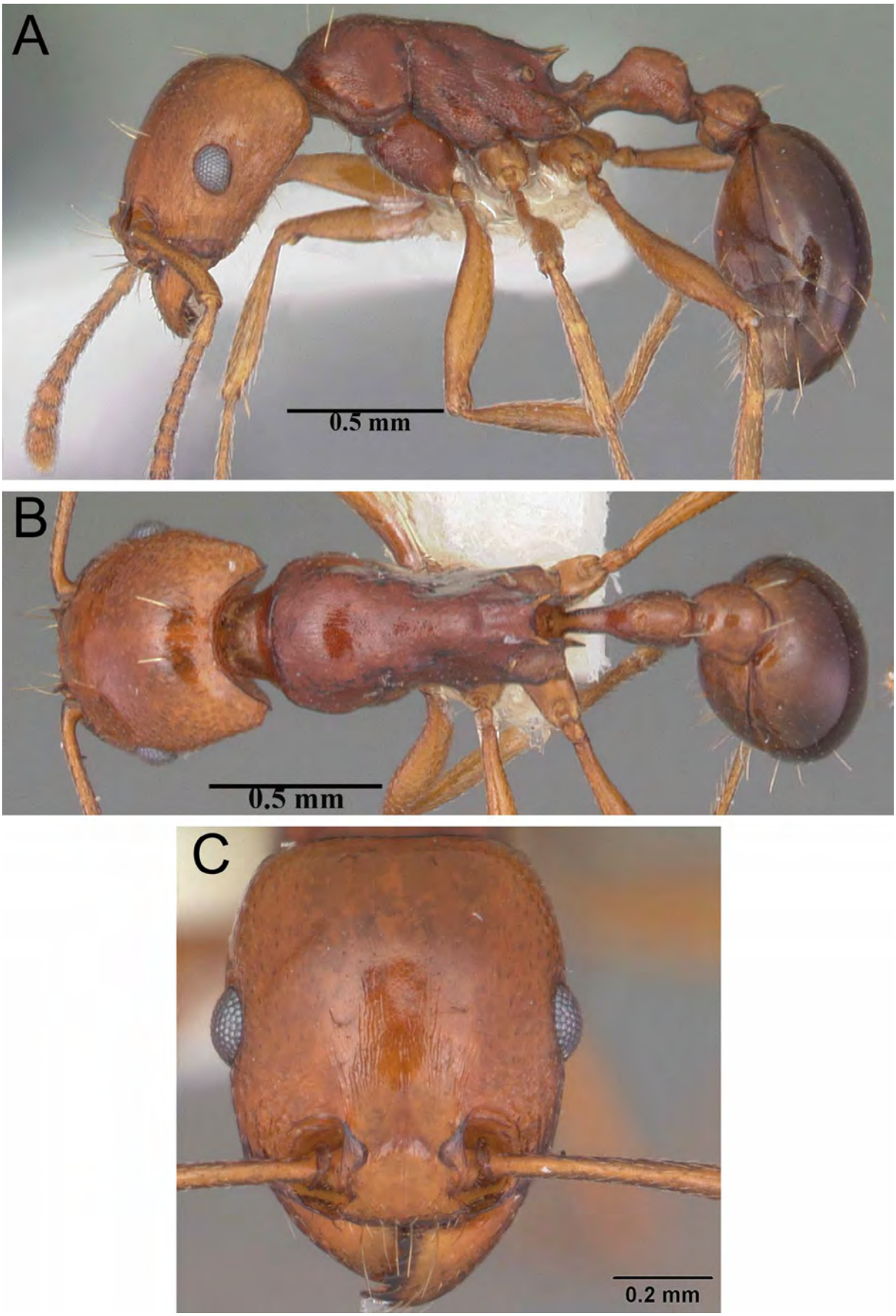


FIGURE 22. *Tetramorium sericeiventre* Emery, 1877—almost unsculptured form, CASENT0102385 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

(*G. Arnold*); Busi River, Inhangovu (*G. Arnold*); **SEYCHELLES**: Aldabra Island, Picard, 9.39606 S, 46.20465 E, 2 m, 4.III.2008 (*B.L. Fisher*); Assumption Island, 9.71207 S, 46.516 E, 2 m, 3.III.2008 (*B.L. Fisher*); Cosmoledo Atoll, 9.75444 S, 47.64806 E, < 10 m, 16.-19.XI.2008 (*G. Galman*); Cosmoledo Atoll, 9.75306 S, 47.64889 E, < 10 m, 21.-24.XI.2008 (*G. Galman*); Cosmoledo Atoll, 9.75611 S, 47.64667 E, < 10 m, 21.-24.XI.2008 (*G. Galman*); Cosmoledo Atoll, 9.76028 S, 47.64194 E, < 10 m, 21.-24.XI.2008 (*G. Galman*); **SUDAN**: Khartoum, 1895 (*Karawaiew*); **SOUTH AFRICA**: Cape Province, Cape of Good Hope (*L. Peringuey*); Cape Province, Willowmore, I.1914 (*G. Arnold*); Cape Province, Willowmore (*H. Brauns*); Cape Province, Western Cape, 22 km NE Clanwilliam, 32.08333 S, 19.06667 E, 450 m, 20.VI.1997 (*B.L. Fisher*); Natal (*Wroughton*); Natal (*Haviland*); Natal, Durban (*F. Demarchi*); **TANZANIA**: Iringa Region, 52 ml. NE. Iringa, 575 m, 15.XI.1957 (*E.S. Ross & R.E. Leech*); **TUNISIA**: Kairouan (*F. Santschi*); **UGANDA**: 8 ml. NE of Kaberamaido, 1175 m, 12.XI.1957 (*E.S. Ross & R.E. Leech*); **ZIMBABWE**: Bulawayo (*G. Arnold*); Bulawayo, 14.XII.1912 (*G. Arnold*); Gwari, 1912 (*G. Arnold*); Malundi, 1914 (*G. Arnold*); Vumba Mts., Cloudland, 1830 m, 6-17.IV.1923 (*G. Arnold*).

Tetramorium tosii species group

Diagnosis

12-segmented antennae; anterior clypeal margin entire and without any media impression; frontal carinae well-developed, ending shortly before posterior head margin; anterior face of mesosoma weakly developed, no distinct margination between lateral and dorsal mesosoma; propodeal spines long to extremely long and spinose; propodeal lobes triangular and short; petiolar node nodiform to clublike, longer than high and longer than wide; postpetiole roughly rounded; mandibles sculptured; cephalic sculpturation well-developed, mostly reticulate-rugose, between frontal carinae generally longitudinally rugose, ground sculpturation of head generally faint or absent; mesosoma irregularly rugose to reticulate-rugose, waist segments weakly sculptured; gaster unsculptured, smooth, and shiny; all dorsal surfaces with long, erect hairs; sting appendage triangular.

Comments

As already noted above and pointed out by Bolton (1979), in the Malagasy region the *T. tosii* species group is the only one with 12-segmented antennae that seems to be endemic to the region. However, there are striking similarities between the *T. tosii* group and some members of the *T. setigerum* group from the Afrotropical region, especially between *T. tosii* and *T. metactum* Bolton, 1980 and *T. youngi* Bolton, 1980. All three possess relatively long antennal scapes, reduced antennal scrobes, a long anterior peduncle, a more clublike petiolar node, and their overall appearance is relatively comparable. Based on these similarities, one could argue for the synonymisation of both groups. Nevertheless, there is also a possibility that the mentioned species have developed independently and their shared morphology is a result of convergent evolution as an adaptation to a more arboreal lifestyle in the vegetation or the canopy strata. In addition, *T. tantillum* is morphologically less close to these species and possesses relatively short antennal scapes in comparison to *T. tosii*, *T. metactum*, and *T. youngi*. Indeed, the scape index of *T. tantillum*, with SI 79 – 87, is distinctly lower than that of all *T. setigerum* group members. Consequently, we continue to consider both species groups as independent with some morphological similarities that are probably a result of convergent evolution.

This group cannot be confused with another Malagasy species group with 12-segmented antennae due to the character combination of entire anterior clypeal margin, long to very long propodeal spines, short propodeal lobes, and large body size. The two species of the *T. tosii* group can be distinguished easily from each other on the basis of the length of the antennal scapes and propodeal spines, but also by comparing the shape of the eyes and the petiolar node.

Tetramorium tantillum Bolton, 1979

(Figure 23)

Tetramorium tantillum Bolton, 1979:152. Holotype worker, MADAGASCAR, Mangabe Island, Antongil Bay, 19.II.1977, primary rain forest, AB 42 litter, (*W. L. & D. E. Brown*) (MCZ) [not examined]. Paratypes, 3 workers with same data as holotype (MCZ, BMNH) [partly examined].

Diagnosis

The antennal scapes of moderate length (SI 79–87) and the long propodeal spines (PSLI 30–33) render *T. tantillum* easily identifiable within the *T. tosii* species group.

Description

HL 1.010–1.080 (1.052); HW 0.900–0.970 (0.939); SL 0.750–0.810 (0.780); EL 0.180–0.205 (0.195); PW 0.695–0.720 (0.708); WL 1.294–1.338 (1.314); PSL 0.325–0.360 (0.343); PTL 0.345–0.370 (0.357); PTH 0.320–0.340 (0.327); PTW 0.350–0.380 (0.360); PPL 0.295–0.310 (0.303); PPH 0.330–0.350 (0.340); PPW 0.350–0.390 (0.371); CI 88–91 (89); SI 79–87 (83); OI 19–21 (21); PSLI 30–33 (33); PeNI 49–53 (51); LPeI 108–111 (109); DPeI 99–103 (101); PpNI 50–55 (52); LPpI 84–94 (89); DPpI 119–126 (123); PPI 99–107 (103) (5 measured).

Head distinctly longer than wide (CI 88–91). Anterior clypeal margin entire and convex. Frontal carinae well-developed, almost reaching posterior head margin. Antennal scrobes weakly developed, almost absent. Antennal scapes of moderate length, not reaching posterior margin of head (SI 79–87). Eyes relatively small (OI 19–21), with 11 to 13 ommatidia in longest row. Mesosomal profile relatively flat and only weakly convex, metanotal groove absent. Propodeal spines long, spinose, and acute (PSLI 30–33). Propodeal lobes triangular, short, and blunt. Node of petiole rectangular nodiform without sharp angles, in profile anterior and posterior faces roughly parallel, antero- and posterodorsal angles situated at about same height, dorsum moderately convex, node weakly longer than high (LPeI 108–111), in dorsal view roughly as long as wide (DPeI 99–103). Postpetiole in profile rounded, higher than long (LPpI 84–94), in dorsal view clearly wider than long (DPpI 119–126), as wide as petiolar node to weakly wider (PPI 99–107). Mandibles finely striate. Clypeus with 3 longitudinal rugae, median ruga more strongly developed. Head ventrally and laterally with distinct reticulate-rugose sculpturation, cephalic dorsum longitudinally rugose, with 6 to 8 rugae between frontal carinae; ground sculpturation on head weak and faint. Mesosoma and waist segments weakly reticulate-rugose without any distinct ground sculpturation. First gastral tergite completely unsculptured, smooth, and shiny. All dorsal surfaces of head, mesosoma, waist segments, and gaster with numerous long, standing hairs; hairs on antennal scapes and tibiae appressed. Colouration uniformly dark brown to blackish brown.

Notes

This relatively large and conspicuous species is known only from a handful of sampling events from a few rainforest localities in Eastern Madagascar. This is surprising because the other species of the *T. tosii* group, *T. tosii*, is relatively common across nearly all of the rainforest zone of Eastern Madagascar. The more abundant *T. tosii* could have the ability to displace the morphologically close *T. tantillum*, although presently no evidence supports this theory. More than half of the specimens were collected from lower vegetation, implying that *T. tantillum* lives predominantly in this stratum; fewer specimens were collected on the ground, where this ant also may forage.

Tetramorium tantillum can be identified clearly because it possesses distinctly shorter antennal scapes and propodeal spines than *T. tosii* (SI 97–104; PSLI 42–49). Also, the petiolar node shape is different, though this character should be considered with caution. Generally, the dorsum of the petiolar node of *T. tantillum* is less convex and the anterodorsal and posterodorsal angles are equally well-developed and of about the same height whereas the node of *T. tosii* shows a much more convex dorsum and the posterodorsal angle is always situated higher than the anterodorsal. However, some smaller specimens of *T. tosii* show a petiolar node shape that approaches the one viewed in *T. tantillum*.

Material examined

MADAGASCAR: Fianarantsoa, Reserve Forestiere d'Agnalazaha, Mahabo, 42.9 km 215° Farafangana, 23° 11.63' S, 47° 43.38' E, 20 m, 19.-20.IV.2006 (*B.L. Fisher et al.*); Toamasina, Ile Sainte Marie, Foret Kalalao, 9.9 km 34° Ambodifotatra, 16° 55.35' S, 49° 53.24' E, 200 m, 24.-27.XI.2005 (*B.L. Fisher et al.*); Toamasina, Mangabe Island, Antongil Bay, 19.II.1977 (*W. L. & D. E. Brown*); Toamasina, Res. Ambodiriana, 4.8 km 306° Manompana, along Manompana river, 16° 40.34' S, 49° 42.07' E, 125 m, 20.XI.2005 (*B.L. Fisher et al.*); Toamasina, S.F. Tampolo, 10 km NNE Fenoarivo Atn., 17° 17' S, 49° 25' E, 10 m, 3.IV.1997 (*B.L. Fisher*).

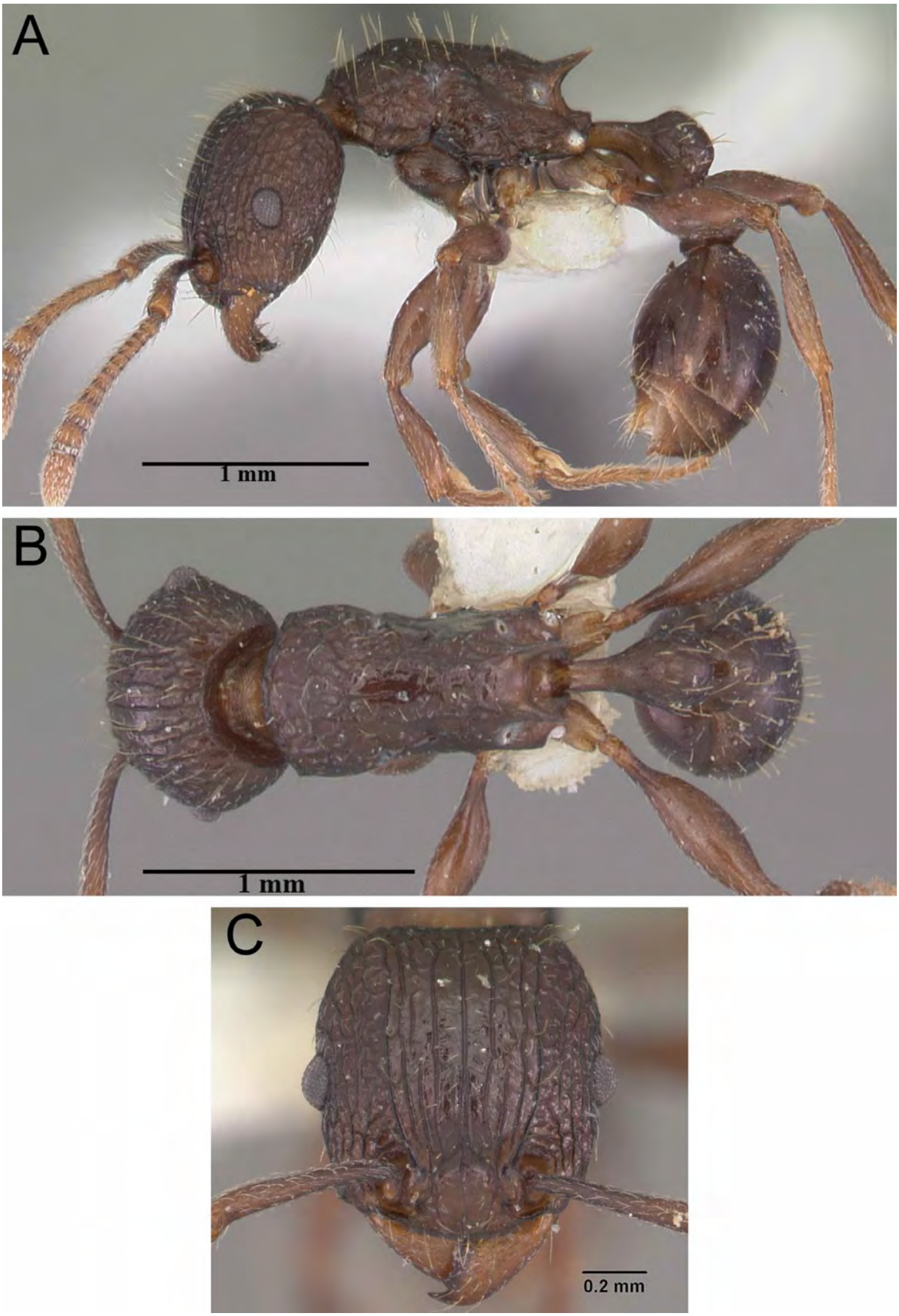


FIGURE 23. *Tetramorium tantillum* Bolton, 1979—CASENT0102338 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

***Tetramorium tosii* Emery, 1899**
(Figure 24)

Tetramorium tosii Emery, 1899:284. Syntype workers, MADAGASCAR, Baie d' Antongil, (*Mocquerys*) (MHNG) [examined].

Diagnosis

The extremely long propodeal spines (PSLI 42–49) and long antennal scapes (SI 97–104) make *T. tosii* easily recognisable within the species group.

Description

HL 0.900–1.150 (1.013); HW 0.770–1.030 (0.884); SL 0.770–1.020 (0.888); EL 0.160–0.215 (0.186); PW 0.610–0.810 (0.707); WL 1.150–1.571 (1.340); PSL 0.395–0.560 (0.465); PTL 0.345–0.440 (0.394); PTH 0.290–0.400 (0.352); PTW 0.290–0.380 (0.337); PPL 0.290–0.355 (0.332); PPH 0.305–0.410 (0.366); PPW 0.310–0.395 (0.355); CI 85–90 (87); SI 97–104 (101); OI 18–22 (21); PSLI 42–49 (46); PeNI 44–53 (48); LPeI 104–121 (112); DPeI 83–88 (86); PpNI 46–55 (50); LPpI 85–99 (91); DPpI 104–111 (106); PPI 101–109 (105) (20 measured).

Head distinctly longer than wide (CI 85–90). Anterior clypeal margin entire and convex. Frontal carinae well-developed, almost reaching posterior head margin. Antennal scrobes reduced and absent. Antennal scapes relatively long and surpassing posterior head margin (SI 97–104). Eyes relatively small to moderately sized (OI 18–22), with 12–16 ommatidia in longest row, often characteristically modified, projecting from each side as strongly protuberant semicircles. Mesosomal profile relatively flat and only very weakly convex, metanotal groove absent. Propodeal spines extremely long, spinose, and acute (PSLI 42–49). Propodeal lobes short, triangular, and blunt to acute. Node of petiole elongate nodiform or clublike with a very long and up-curved peduncle, in profile posterodorsal angle much higher than anterodorsal, dorsum strongly convex and sloping upwards posteriorly, node longer than high in lateral view (LPeI 104–121), in dorsal view node distinctly longer than high (DPeI 83–88). Postpetiole in profile rounded, higher than long (LPeI 104–121), in dorsal view weakly wider than long (DPpI 104–111), and weakly wider than petiolar node (PPI 101–109). Mandibles distinctly sculptured, generally striate or longitudinally rugose. Clypeus with 3 well-developed longitudinal rugae. Head ventrally, laterally, and posteriorly with reticulate-rugose sculpturation, cephalic dorsum between frontal carinae longitudinally rugose, usually with 5 to 6 longitudinal rugae, merging with reticulate-rugose sculpturation posteriorly shortly before posterior head margin; ground sculpturation on head weak and faint. Mesosoma laterally irregularly rugose to rugulose, dorsally sculpturation much weaker, partly with weak, irregular rugulae and partly unsculptured, without any ground sculpture. Waist segments weakly sculptured, petiole laterally with weak irregular rugulation and dorsally almost unsculptured, postpetiole with distinctly less sculpturation than petiole, with few weak irregular rugulae to almost unsculptured, smooth, and shiny. First gastral tergite completely unsculptured, smooth, and shiny. All dorsal surfaces of head, mesosoma, waist segments, and gaster with abundant, long, standing hairs; hairs on antennal scapes and tibiae appressed. Colouration in almost all examined material uniformly dark brown to blackish brown, except one series with conspicuous yellowish-orange to orange-brown colour from Foret de Binara.

Notes

This large and noticeable species is relatively abundant and common in most rainforests of Eastern and Northern Madagascar. Like *T. tantillum* it seems to be primarily arboreal or sub-arboreal, although it was often sampled on the ground as well.

Bolton (1979) pointed out that the combination of 12-segmented antennae and the unique eye shape isolate this species from all other Malagasy *Tetramorium* species. However, we treat this diagnosis with caution. Examination of several hundred specimens from all Eastern Madagascar showed that the eye shape of *T. tosii* is more variable than originally described by Bolton (1979). Around the type locality in the Antongil Bay most specimens showed the strongly protuberant eye shape described by Bolton, but this character becomes gradually weaker in northern localities and most other rainforests south of this bay until it is not differently developed compared to *T. tantillum* or other species. Therefore, we strongly recommend against using eye shape to differentiate between *T. tosii* and other species. Another character that deserves some attention is the shape of the petiolar node. In general, it is clublike to elongate nodiform with the posterodorsal angle much higher than the anterodorsal, and a strongly convex dorsum that slopes upwards posteriorly. Nevertheless, in some smaller specimens the anterodorsal angle was better

developed and the dorsum less convex, making this character close to the petiolar node shape of *T. tantillum*. Even though both shapes are still quite different, the similarities can be misleading, and the safest means to separate *T. tosii* from *T. tantillum* is to compare the lengths of the antennal scapes and propodeal spines.

An additional important variation observed in *T. tosii* is its colouration. Almost all of the examined material from most of the distribution range was coloured dark brown to black. However, in the northernmost locality of its known distribution, the Foret de Binara, all specimens were yellowish-orange to orange-brown. The locality is of particular interest since it is comparatively isolated from most other rainforests where *T. tosii* was collected. The examination of all available specimens from Foret de Binara, however, did not provide any diagnostic character able to separate this population from *T. tosii*, and differential colouration alone is not sufficient to justify this step.

Material examined

MADAGASCAR: Antsiranana, Ambanizana, Andranobe, 15° 40 S, 49° 58' E, 425 m, 23.XI.1993 (*B.L. Fisher*); Antsiranana, Betaolana Forest, 14.54484 S, 49.45163 E, 740 m, 6.III.2009 (*B.L. Fisher et al.*); Antsiranana, Foret Ambanizana, 14° 40.76 S, 50° 11.02' E, 240 m, 25.-28.XI.2004 (*B.L. Fisher et al.*); Antsiranana, Foret de Binara, 9.1 km 233° SW Daraina, 13.26333 S, 49.60333 E, 650-800 m, 3.-7..XII.2003 (*B.L. Fisher*); Antsiranana, Foret de Binara, 9.1 km 233° SW Daraina, 13.26333 S, 49.60333 E, 800 m, 21.XI.2004 (*B.L. Fisher et al.*); Antsiranana, Befingotra, Anjanaharibe-Sud, 14° 45' S, 49° 30' E, 875 m, 17.-31.X.1994 (*B.L. Fisher*); Antsiranana, P.N. Majorery, 14° 26.29' S, 49° 46.44' E, 488 m, 15.-26.I.2005 (*Rin'Ha & Irwin*); Antsiranana, P.N. Majorery, 14° 26.1' S, 49° 45.6' E, 775 m, 11.-14.XII.2005 (*B.L. Fisher et al.*); Antsiranana, P.N. Majorery, 28.0 km 38° NE Andapa, 14° 26.2' S, 49° 46.5' E, 450 m, 12.-15.XI.2003 (*B.L. Fisher et al.*); Antsiranana, P.N. Majorery, 28.0 km 38° NE Andapa, 14° 26.2' S, 49° 46.5' E, 450 m, 23.-25.XI.2004 (*B.L. Fisher et al.*); Fianarantsoa, Foret de Vet de Vevembe, 22.791 S, 47.18183 E, 600 m, 24.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Manombo, 23° 00.95 S, 47° 43.14' E, 30 m, 21.-22.IV.2008 (*B.L. Fisher et al.*); Toamasina, Ambohidena, 16° 49.46' S, 49° 57.85' E, 20 m, 24.XI.2005 (*B.L. Fisher et al.*); Toamasina, Baie d' Antongil (*Mocquerys*); Toamasina, F.C. Andriantantely, 18° 41.7' S, 48° 48.8' E, 530 m, 4.-7.XII.1998 (*H.J. Ratsirarson*); Toamasina, F.C. Sandranantitra, 18° 02.9' S, 49° 05.5' E, 450 m, 18.-21. I.1999 (*H.J. Ratsirarson*); Toamasina, Ile Sainte Marie, Foret Ambohidena, 22.8 km 44° Ambodifotatra, 16.82433 S, 49.96417 E, 20 m, 24.XI.2005 (*B.L. Fisher et al.*); Toamasina, Manakambahiny, near Vavatenina Forest, 9.II.1995 (A. Pauly); Toamasina, Montagne Anjanaharibe, 18.0 km 21° NNE Ambinanitelo, 15° 11.3' S, 49° 36.9' E, 470 m, 8l.-12.III.2003 (*B.L. Fisher et al.*); Toamasina, Montagne d'Akirindro, 15.28833 S, 49.54833 E, 600 m, 17.-21.III.2003 (*B.L. Fisher et al.*); Toamasina, Parc National Mananara-Nord, 16.455 S, 49.7875 E, 225 m, 16.XI.2005 (*B.L. Fisher et al.*); Toamasina, Reserve Ambodiriana, 16.67233 S, 49.70117 E, 125 m, 19.XI.2005 (*B.L. Fisher et al.*); Toamasina, Reserve Betampona, Camp Rendrirendry, 17.924 S, 49.19967 E, 390 m, 28.XI.2005 (*B.L. Fisher et al.*); Toamasina, Reserve Betampona, Camp Vohitsivalana, 17.88667 S, 49.2025 E, 520 m, 3.XII.2005 (*B.L. Fisher et al.*); Toamasina, Reserve Nationale Integrale Betampona, Betampona, 35.1 km NW Toamasina, 17.91801 S, 49.20074 E, 500 m, 16.XII.2007 (*B.L. Fisher et al.*); Toamasina, Reserve Speciale Ambatovaky, Sandrangato river, 16.7633 S, 49.26692 E, 520 m, 22.II.2010 (*B.L. Fisher et al.*); Toamasina, Reserve Speciale Ambatovaky, Sandrangato river, 16.77274 S, 49.26551 E, 450 m, 23.II.2010 (*B.L. Fisher et al.*); Toamasina, Reserve Speciale Ambatovaky, Sandrangato river, 16.81745 S, 49.2925 E, 400 m, 26.II.2010 (*B.L. Fisher et al.*); Toamasina, Sahafina forest 11.4 km W Brickaville, 18.81445 S, 48.96205 E, 140 m, 13.-14.XII.2007 (*B.L. Fisher*); Toamasina, Tampolo, 15° 43.08' S, 49° 57.63' E, 14 m, 29.VIII.2007 (*B.L. Fisher et al.*); Toliara, 11 km NW Enakara, 24.56667 S, 46.83333 E, 800 m, 17.XI.1992 (*B.L. Fisher*); Toliara, 24.77167 S, 47.0025 E, 20 m, 9.-11.XII.1998 (*B.L. Fisher & J. Baptiste*); Foret Ivohibe 55.0 km N Tolagnaro, 24.569 S, 47.204 E, 200 m, 2.-4..XII.2006 (*B.L. Fisher et al.*); Toliara, Foret Mandena 8.5 km N Tolagnaro, 24.95267 S, 47.0025 E, 20 m, 5.XII.2006 (*B.L. Fisher et al.*); Toliara, Manantantely, 24° 58.89' S, 46° 55.54' E, 100 m, 27.XI.2006 (*B.L. Fisher et al.*); Toliara, Parc National d'Andohahela, Manampanihy River, 24.76389 S, 46.76683 E, 650 m, 21.-25.I.2002 (*B.L. Fisher et al.*); Toliara, Parc National d'Andohahela, Col de Tanatana, 33.3 km NW Tolagnaro, 24.7585 S, 46.85367 E, 275 m, 24.XI.2006 (*B.L. Fisher et al.*).

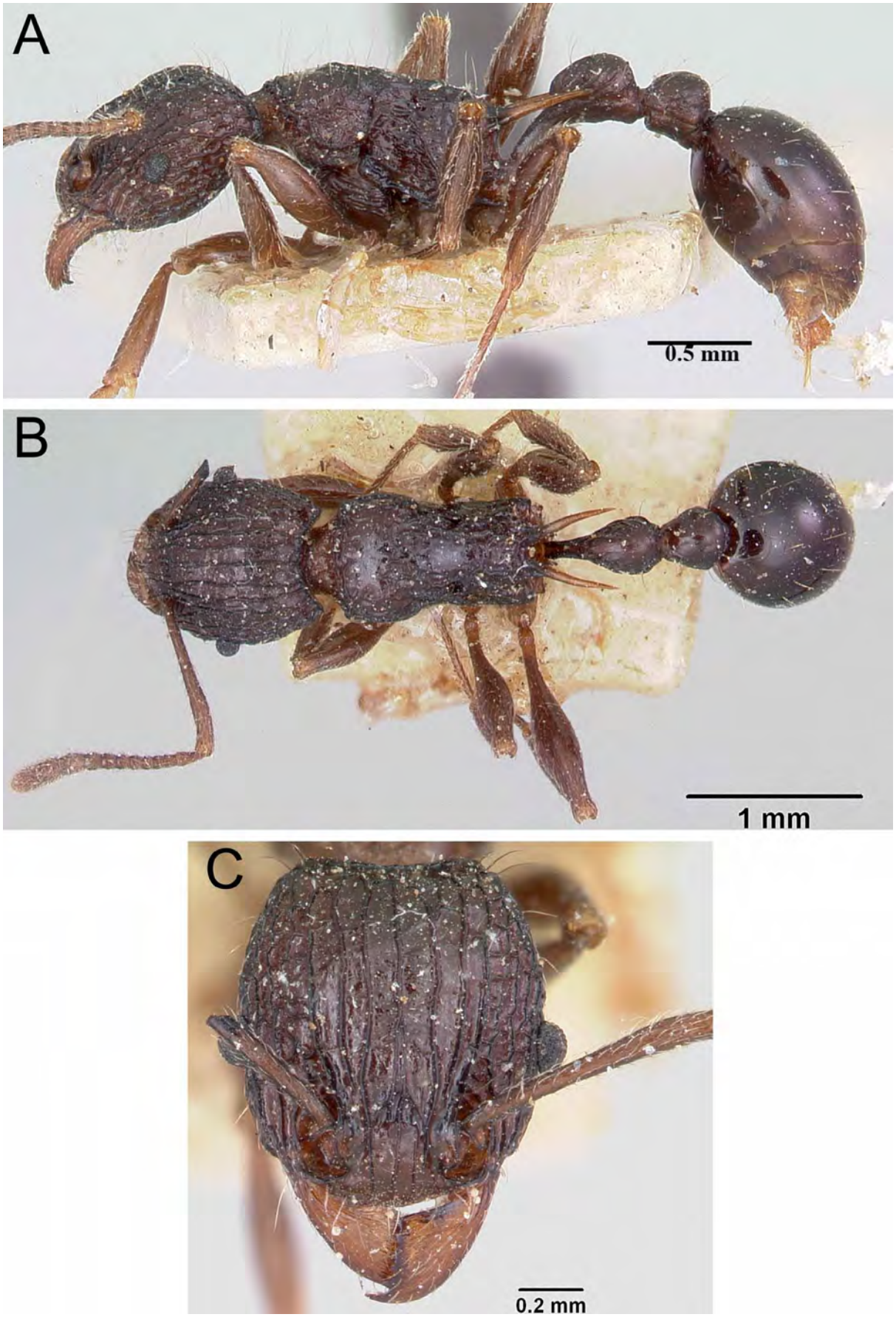


FIGURE 24. *Tetramorium tosii* Emery, 1899—CASENT0102072 (April Nobile 2007). A. body in profile. B. body in dorsal view. C. head in full-face view.

Species groups not revised in this study

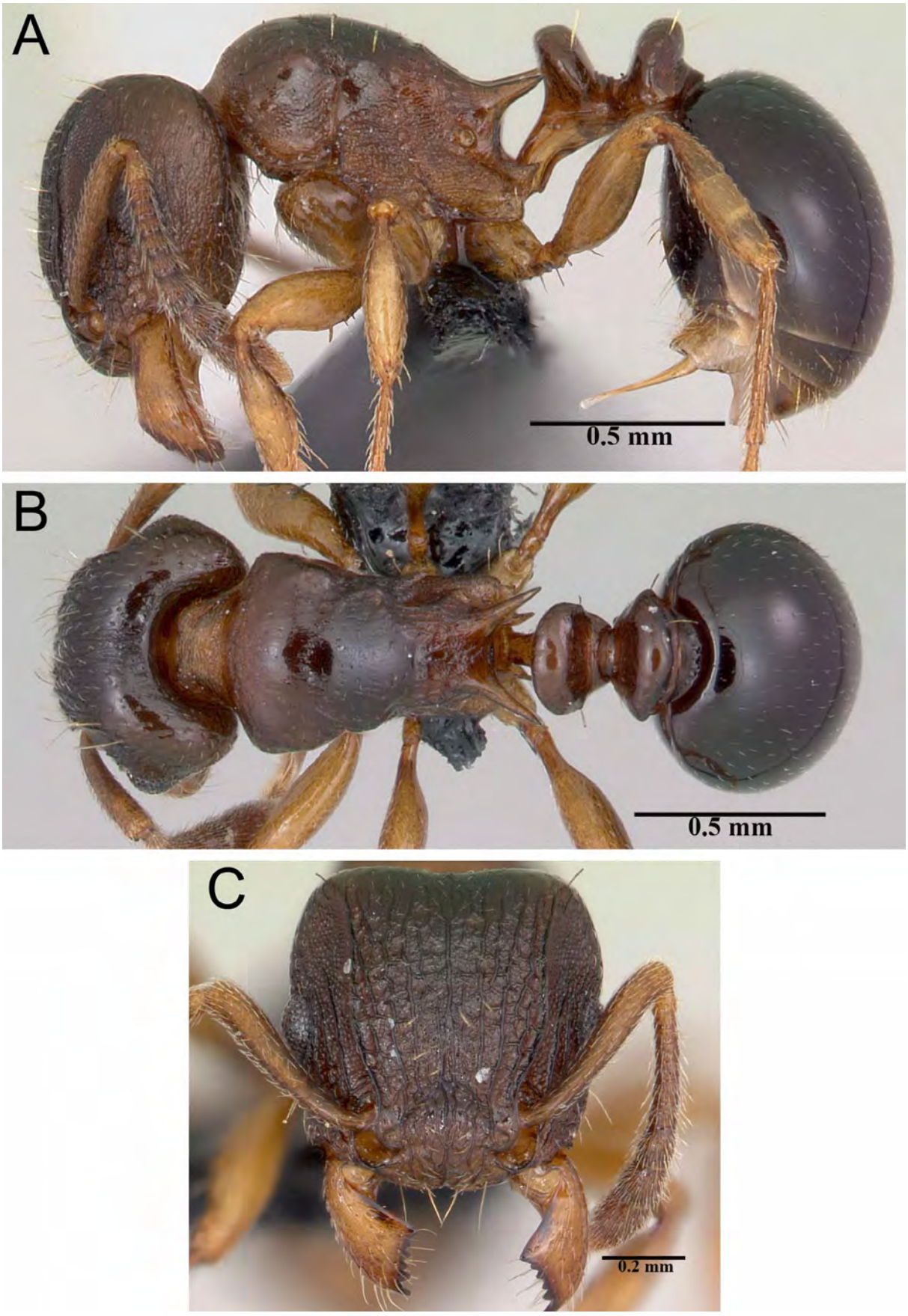


FIGURE 25. *Tetramorium humbloti* Forel, 1891—CASENT0059691 (April Nobile 2006). A. body in profile. B. body in dorsal view. C. head in full-face view.

Tetramorium weitzeckeri species group

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae well-developed, almost reaching posterior head margin; anterior face of mesosoma not well-developed and no distinct anterodorsal angle present; no distinct margination between lateral and dorsal mesosoma, sides of mesosoma round smoothly onto the dorsum; propodeal spines long and spinose; propodeal lobes triangular and short; petiolar node and postpetiolar node strongly squamiform and anteroposteriorly compressed, in profile much higher than long, in dorsal view much wider than long and transverse, anterior and posterior faces parallel, antero- and posterodorsal angles at about same height; mandibles longitudinally rugose; cephalic sculpturation well-developed, mostly reticulate-rugose with reticulate-punctate ground sculpturation; mesosoma very weakly sculptured; waist segments and gaster unsculptured, smooth, and shiny; dorsal surfaces of head, mesosoma, and waist segments with erect hairs, much scarcer on mesosoma and waist segments; first gastral tergite without standing hairs, with appressed pubescence only; sting appendage spatulate.

Comments

As already pointed out above, the *T. weitzeckeri* group is represented in the Malagasy region by one species only: *T. humbloti*. As already noted by Bolton (1979), this species almost certainly has been transferred from the Afrotropics since it is widely distributed in East and South Africa, but also in most island systems from the African continent to Madagascar.

This species group is not likely to be confused with any other group with 11-segmented antennae because of the strongly squamiform shape of both waist segments. Species from other groups also possess a more or less squamiform petiolar node, but then, the postpetiole is never squamiform.

Tetramorium bessonii species group

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae well-developed and usually ending between posterior eye margin and posterior head margin; anterior face of mesosoma not well-developed and no distinct anterodorsal angle present; no distinct margination between lateral and dorsal mesosoma, sides of mesosoma smoothly rounding onto dorsum; propodeal spines medium-sized to long, elongate-triangular to spinose; propodeal lobes triangular and short; petiolar node usually moderately squamiform and anteroposteriorly compressed to triangular or cuneiform, in profile much higher than long, in dorsal view typically distinctly wider than long, anterior and posterior faces not parallel, anterodorsal angle generally better developed than posterodorsal angle, and rarely at about same height, dorsum generally tapering strongly backwards; postpetiole roughly rounded; mandibles generally sculptured; cephalic sculpturation to large extent reduced; mesosoma usually unsculptured, in one species superficial, weak sculpturation present; waist segments and gaster unsculptured, smooth, and shiny; pilosity on dorsal surfaces of head, mesosoma, and waist segments variable; first gastral tergite either without any standing hairs at all, only with short to relatively long, appressed to decumbent pubescence, or with medium-sized appressed to decumbent pubescence intermixed with relatively few erect hairs; sting appendage spatulate.

Comments

The *T. bessonii* species group is a relatively small group endemic to Madagascar, with one valid species, *T. bessonii*, and four additional new species that will be described elsewhere.

The 11-segmented antennae, the shape of the petiolar node, and unsculptured waist segments seem to place the *T. bessonii* group morphologically close to the "New species group 1", *T. marginatum*, and *T. weitzeckeri* groups. However, it differs from the latter by the absence of a strongly squamiform postpetiolar node, it lacks the margination from lateral to dorsal mesosoma present in the *T. marginatum* group, and the reduction of sculpturation on the mesosomal dorsum clearly distinguishes it from the "New species group 1". Furthermore, the variability of gastral pilosity and pubescence observable in the *T. bessonii* group is not shared with any other of these groups.

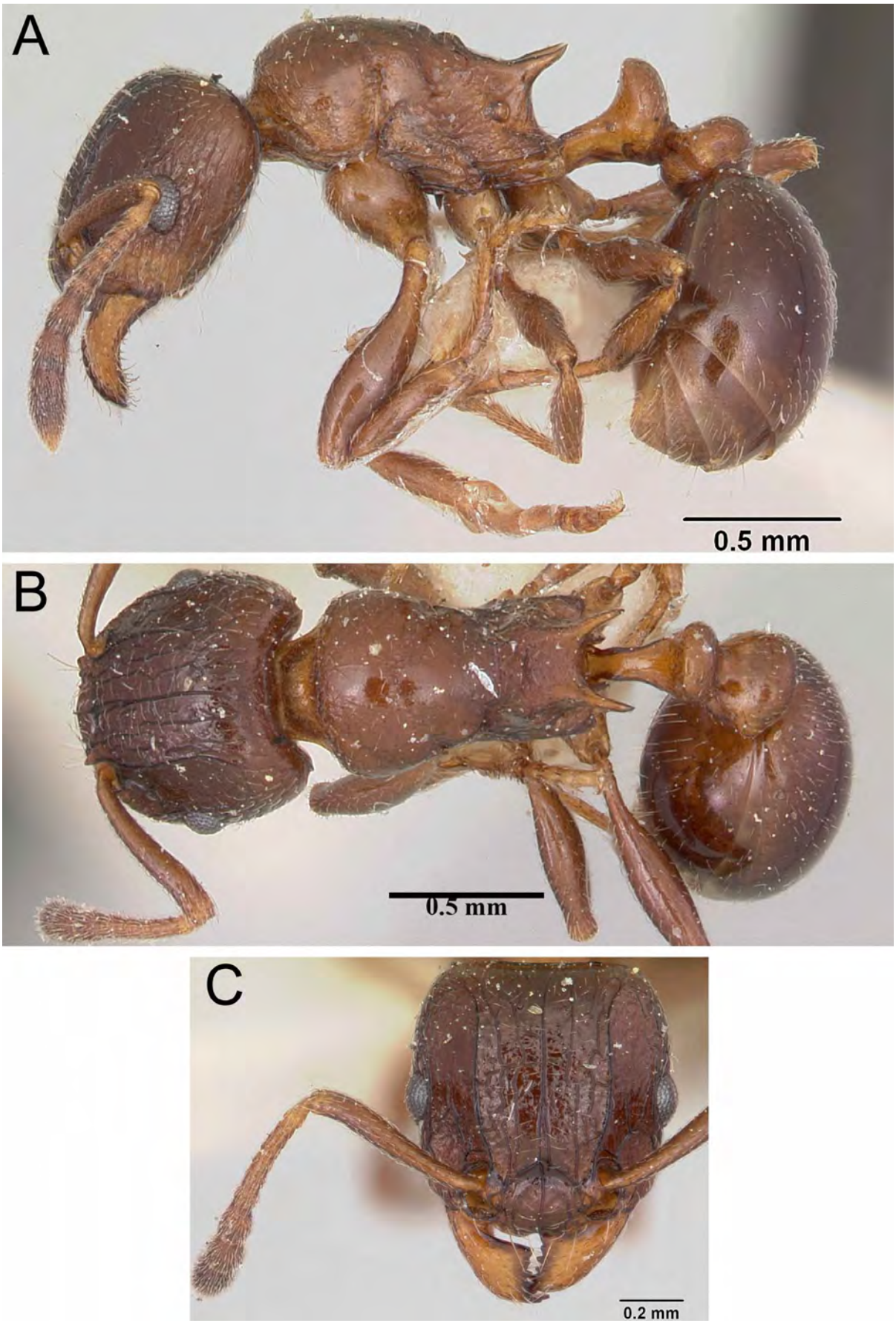


FIGURE 26. *Tetramorium bessonii* Forel, 1891—CASENT0101277 (April Nobile 2006). A. body in profile. B. body in dorsal view. C. head in full-face view.

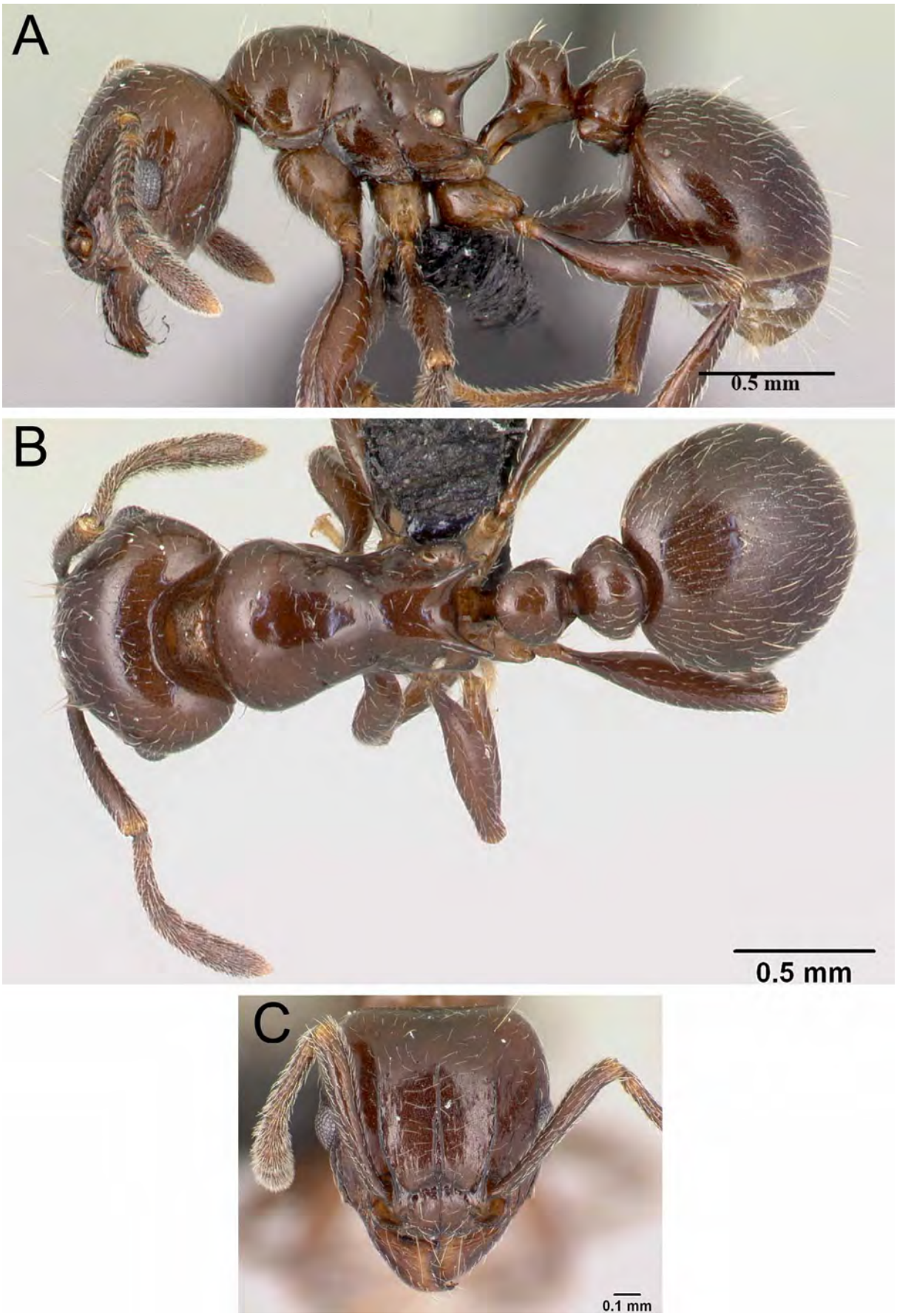


FIGURE 27. *Tetramorium* MG005b—undescribed morphospecies, CASENT0454495 (Erin Prado 2009). A. body in profile. B. body in dorsal view. C. head in full-face view.

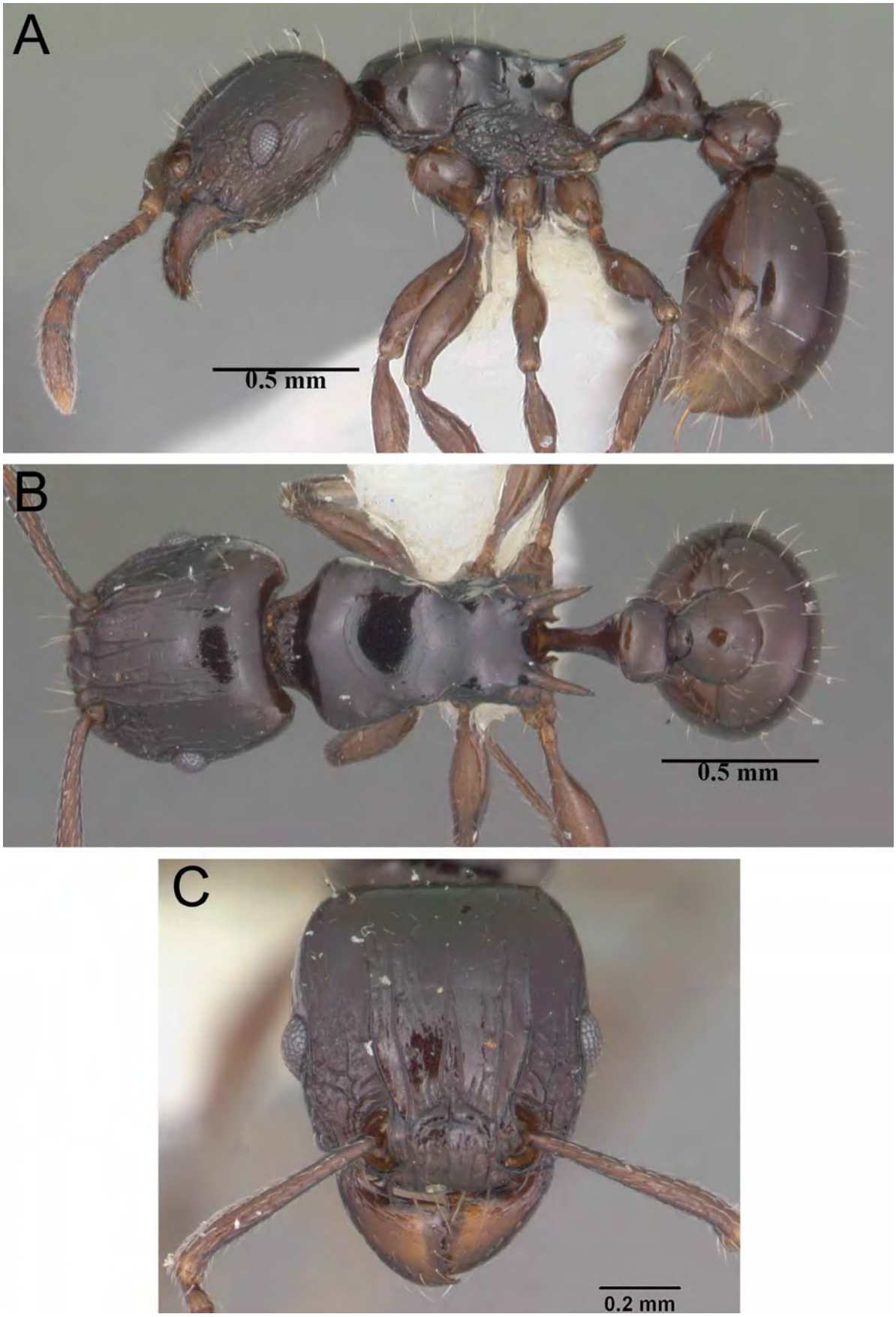


FIGURE 28. *Tetramorium marginatum* Forel, 1895—CASENT0102398 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

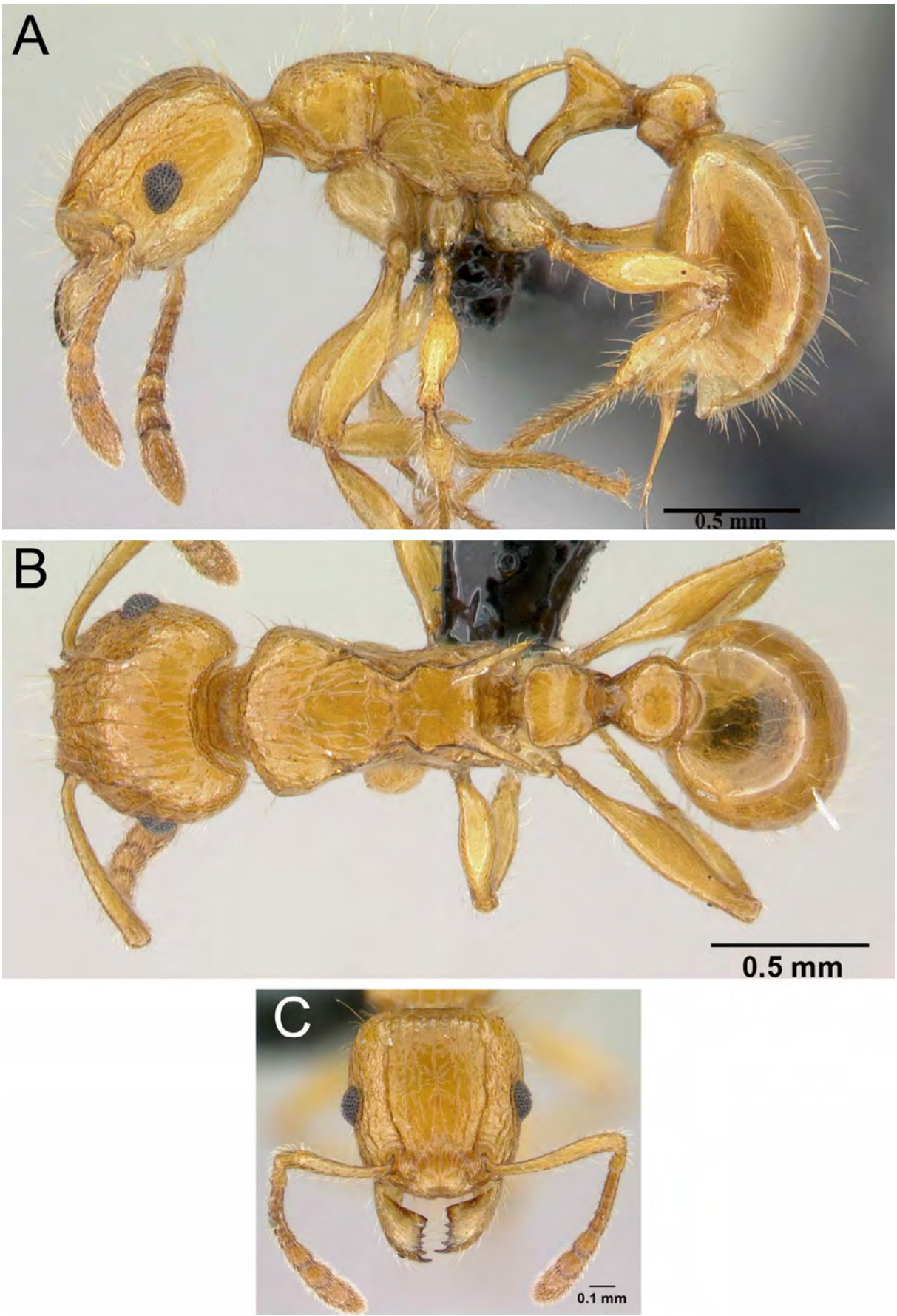


FIGURE 29. *Tetramorium* MG012—undescribed morphospecies, CASENT0489037 (Erin Prado 2010). A. body in profile. B. body in dorsal view. C. head in full-face view.

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae well-developed and usually ending between posterior eye margin and posterior head margin; anterior face of mesosoma not well-developed and no distinct anterodorsal angle present; mesosoma moderately to strongly marginated, dorsum usually sharply separated from lateral mesosoma; propodeal spines long to extremely long, and spinose; propodeal lobes triangular and short; petiolar node in profile triangular or cuneiform, anteroposteriorly compressed dorsally, in profile much higher than long, in dorsal view typically distinctly wider than long and transverse, anterior and posterior faces not parallel, anterodorsal angle much better developed and higher situated than posterodorsal angle, dorsum usually tapering strongly backwards posteriorly; postpetiole roughly rounded; mandibular sculpturation usually strongly to completely reduced; cephalic sculpturation to a large extent reduced and absent; mesosoma in most species completely unsculptured, in two species weak irregular longitudinal rugae/rugulae present; waist segments and gaster unsculptured, smooth, and shiny; all dorsal surfaces of head, mesosoma, waist segments and first gastral tergite with few to relatively abundant standing hairs, never short, dense, and appressed; sting appendage spatulate.

Comments

This species group is also endemic to Madagascar, and includes 6 species from which only *T. marginatum* has been described; the remainder are new and will be treated taxonomically in the next publication.

As noted above, the *T. bessonii*, *T. marginatum*, *T. weitzeckeri*, and "New species group 1" all share a combination of 11-segmented antennae, generally unsculptured waist segments, and a generally squamiform, anteroposteriorly compressed, cuneiform, or triangular petiolar node shape. However, the *T. bessonii* and *T. weitzeckeri* groups both display a more rounded mesosoma without distinct margination between lateral and dorsal mesosoma, which is typical for the *T. marginatum* group. Additionally, the latter lacks a strongly reticulate-punctate posterior head and dorsal pronotum as can be always observed in the "New species group 1".

New species group 1

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae usually developed, but generally weak, rarely moderate; anterior face of mesosoma usually well developed with distinct anterodorsal angle separating anterior face from dorsum, sometimes with anterodorsal angle shaped into a distinct bulge or protuberance; no distinct margination between lateral and dorsal mesosoma, sides of mesosoma smoothly rounding onto dorsum; propodeal spines medium-sized to long, elongate-triangular to spinose; propodeal lobes triangular and short; petiolar node in profile triangular, squamiform, or cuneiform, usually anteroposteriorly compressed dorsally, in profile much higher than long, in dorsal view typically distinctly wider than long and transverse, anterior and posterior faces generally not parallel, anterodorsal angle much better developed and higher situated than posterodorsal angle, dorsum usually tapering strongly backwards posteriorly; postpetiole roughly rounded; mandibles sculptured; cephalic sculpturation distinct, between frontal carinae predominantly longitudinally rugose, posterior head and mesosoma with well-developed reticulate-rugose sculpturation; waist segments and gaster unsculptured, smooth, and shiny, rarely weak sculpturation present; all dorsal surfaces of head, mesosoma, waist segments, and first gastral tergite with few to abundant standing hairs, never short, dense, and appressed; sting appendage spatulate.

Comments

The species assembled in this group are all previously completely unknown forms that will be described in a future taxonomic treatment. At present, 8 undescribed species are known, and the distribution of this group seems to be restricted to the island of Madagascar.

The "New species group 1" is one the four groups with 11-segmented antennae, unsculptured waist segments, and a petiolar node that is generally squamiform, anteroposteriorly compressed, triangular, or cuneiform in appearance. Nevertheless, it is comparatively easy to identify since the other groups, the *T. bessonii*, *T. marginatum*, and *T. weitzeckeri* groups all lack the strongly developed reticulate-rugose sculpturation on posterior head and anterior dorsal mesosoma present in all species of the "New species group 1". Some species in this group possess a distinct protuberance or bulge at anterodorsal mesosoma, and the anterior face of the mesosoma is generally well developed. The other mentioned groups do not show either of these characters.

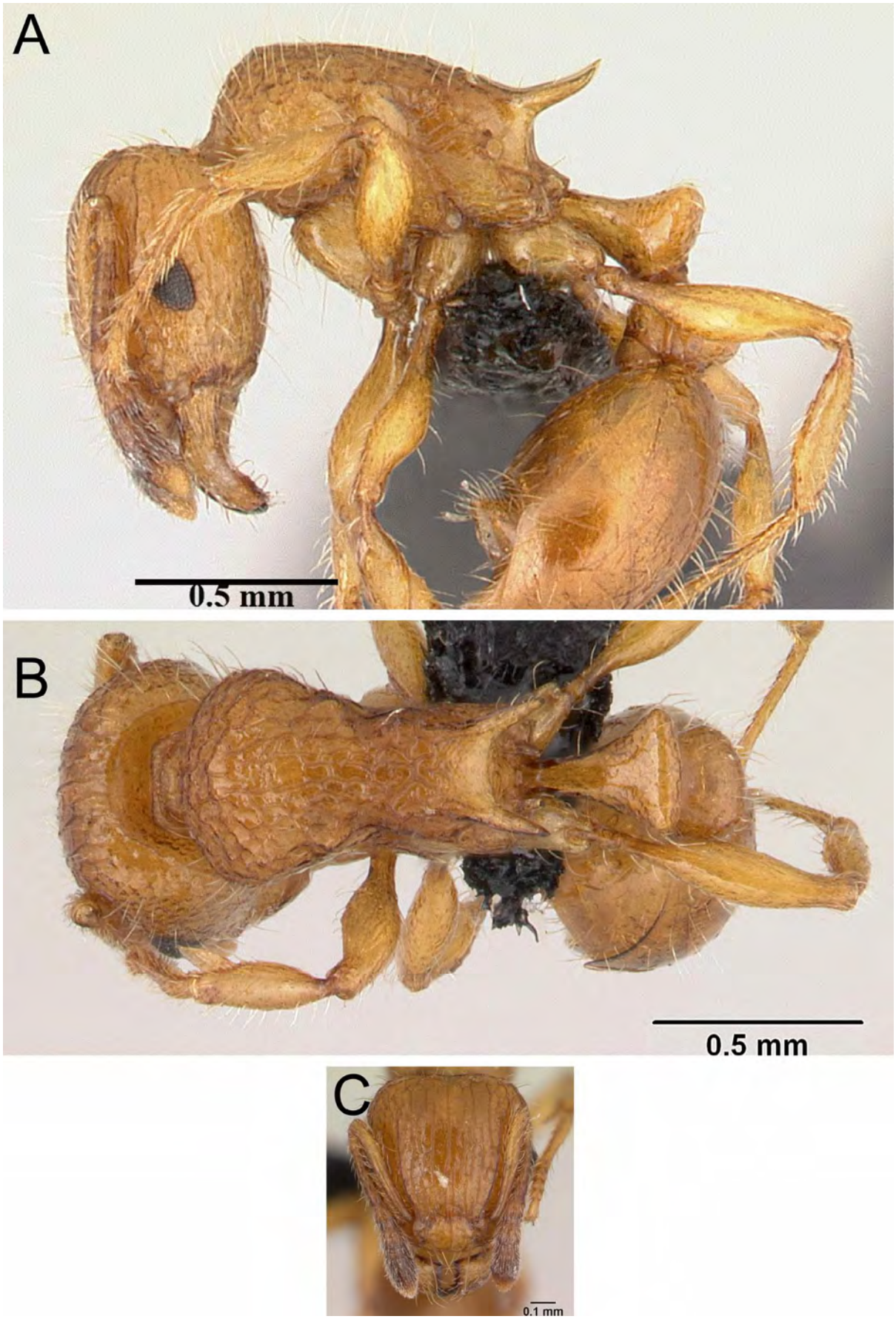


FIGURE 30. *Tetramorium* MG016—undescribed morphospecies, CASENT0498388 (Erin Prado 2009). A. body in profile. B. body in dorsal view. C. head in full-face view.

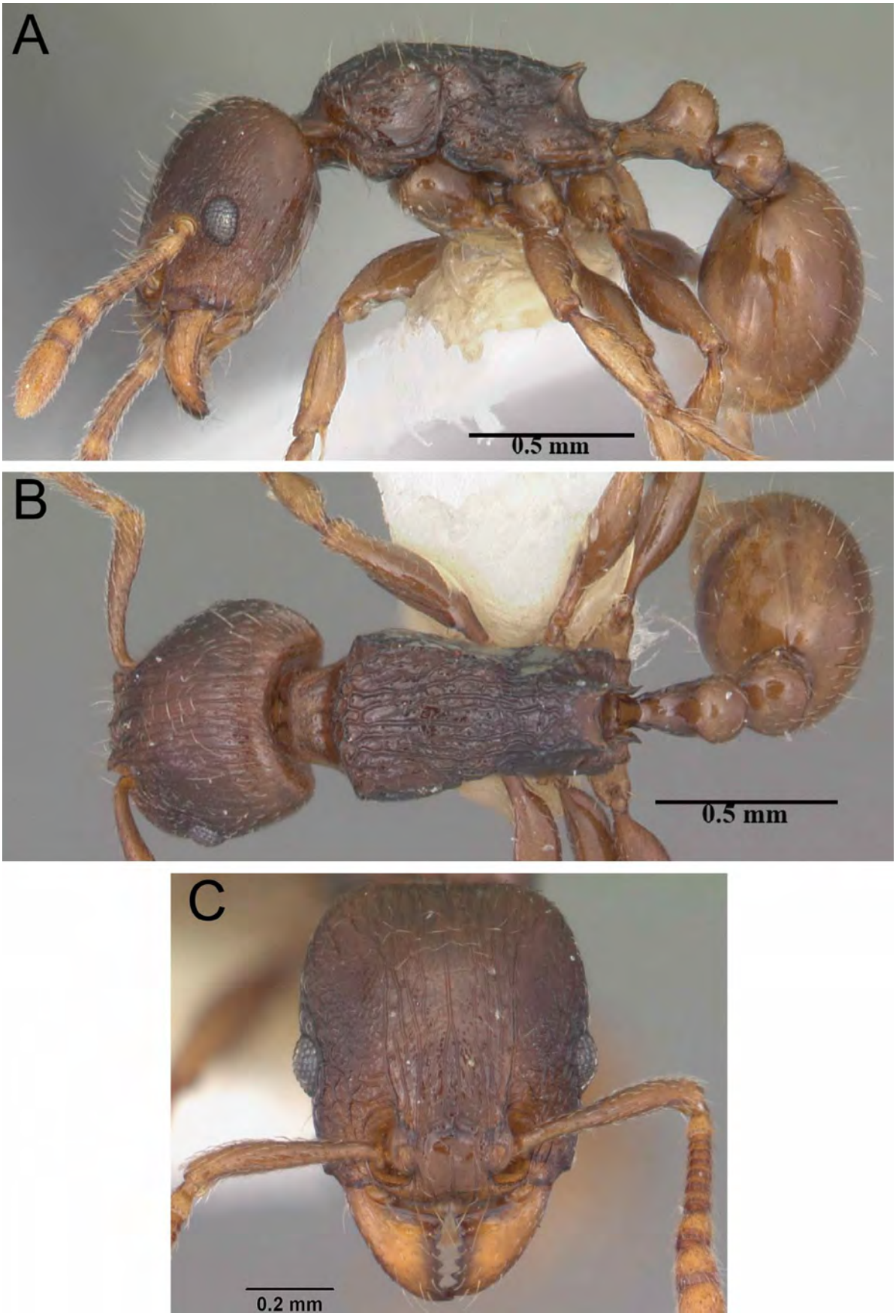


FIGURE 31. *Tetramorium xanthogaster* Santschi, 1911—CASENT0102400 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

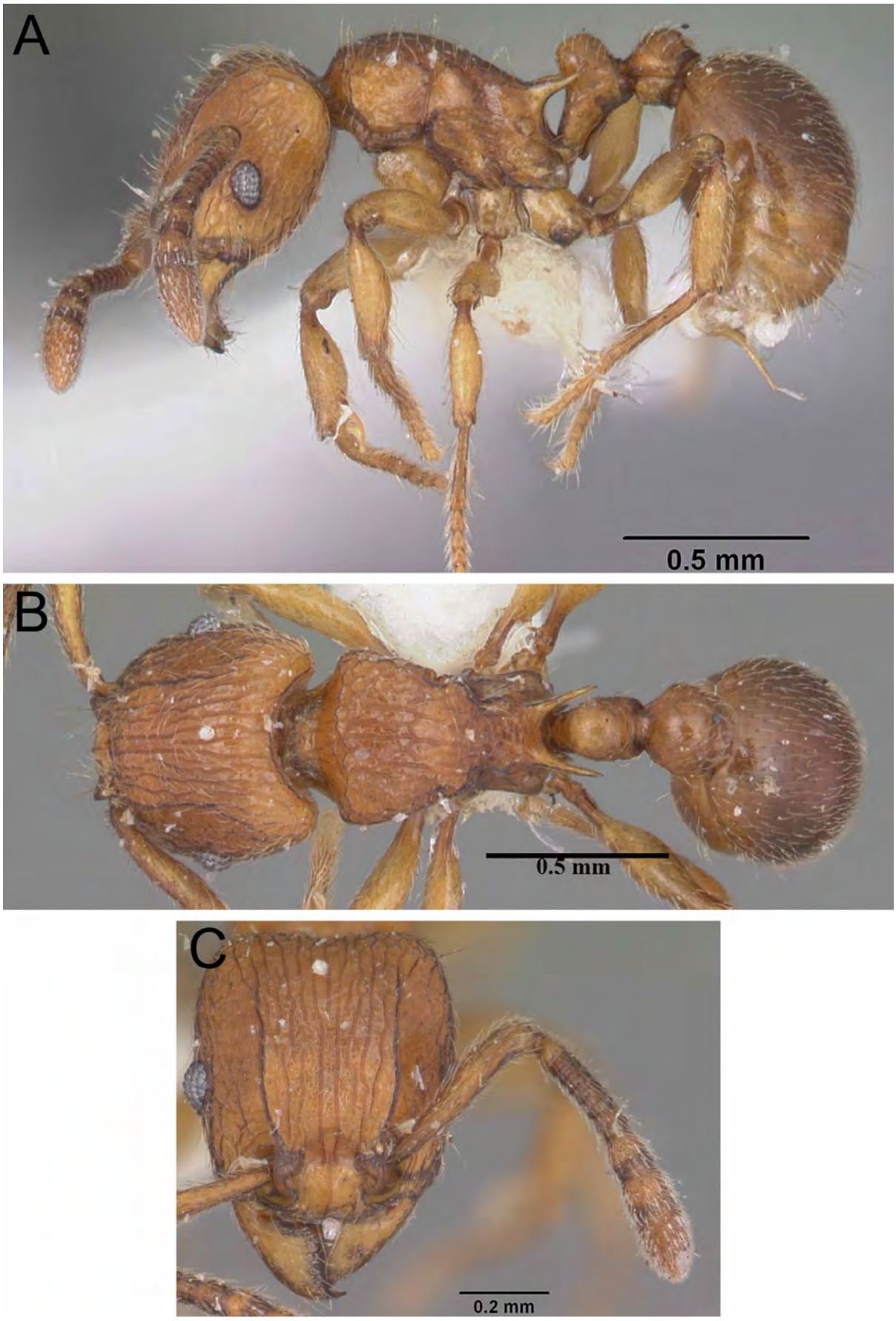


FIGURE 32. *Tetramorium naganum* Bolton, 1979—CASENT0102346 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae variable; anterior face of mesosoma only weakly developed and rounding onto the dorsum; margination between lateral and dorsal mesosoma weak; propodeal spines triangular and short to absent; propodeal lobes triangular and short; petiolar node in profile rounded high nodiform, rarely weakly antero-posteriorly compressed, anterior and posterior faces of the node roughly parallel, and all sides rounding smoothly onto the dorsal face without distinct angles, in profile much higher than long, in dorsal view mostly as wide as long; postpetiole roughly rounded; mandibles usually unsculptured, smooth, and shiny; cephalic sculpturation distinct and predominantly longitudinally rugose; mesosoma with distinct sculpturation; waist segments and gaster unsculptured, smooth, and shiny; all dorsal surfaces of head, mesosoma, and waist segments with sparse to abundant long, fine hairs; first gastral tergite usually with scattered to dense, appressed to decumbent pubescence, rarely absent; often pubescence mixed with standing medium-sized pilosity; sting appendage spatulate.

Comments

The *T. schaufussii* group is another species group endemic to the Malagasy region. With only 6 described species it appears to be relatively small, although the number of undescribed species might be well over 40. This would make this group by far the largest known from the region.

The combination of 11-segmented antennae, unsculptured waist segments, and especially the rounded high nodiform petiolar node render the *T. schaufussii* group easily recognisable. Only the *T. severini* group shares this characters, although the general appearance of both groups is fairly different. Species of the *T. schaufussii* group are generally of comparatively small body size, possess only small to moderate propodeal spines, and a compact shape of the mesosoma whereas *T. severini* is a large and elongate species with long to very long propodeal spines.

Tetramorium severini species group

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae developed and usually ending between posterior eye margin and posterior head margin; anterior face of mesosoma only weakly developed and rounding onto the dorsum; margination between lateral and dorsal mesosoma weak; propodeal spines very long and spinose; propodeal lobes triangular and short; petiolar node in profile rounded high nodiform, anterior and posterior faces of the node roughly parallel, and all sides rounding smoothly onto the dorsal face without distinct angles, in profile much higher than long, in dorsal view about as wide as long; postpetiole roughly rounded; mandibles usually unsculptured; cephalic sculpturation distinct and predominantly longitudinally rugose; mesosoma with weak sculpturation; waist segments and gaster unsculptured, smooth, and shiny; cephalic dorsum with abundant dorsal long, fine hairs, mesosoma and waist segments with very few hairs, first gastral tergite without pilosity, only very sparse, short pubescence present; sting appendage spatulate.

Comments

This species group contains a single species, *T. severini*, that is one of the most conspicuous *Tetramorium* species found in Madagascar. It was formerly placed in the *T. schaufussii* group with the main arguments for this placement being the shape of the petiolar node and the unsculptured mandibles. However, as noted above, size, mesosomal shape, and propodeal spine development differ substantially from all members of the *T. schaufussii* group, and at present, *T. severini* is kept in its own group.

The single representative of the group is very distinctive due to the large body size, relatively slender mesosoma, very long propodeal spines, and a rounded high nodiform petiolar node, and misidentifications with other species groups are not likely.

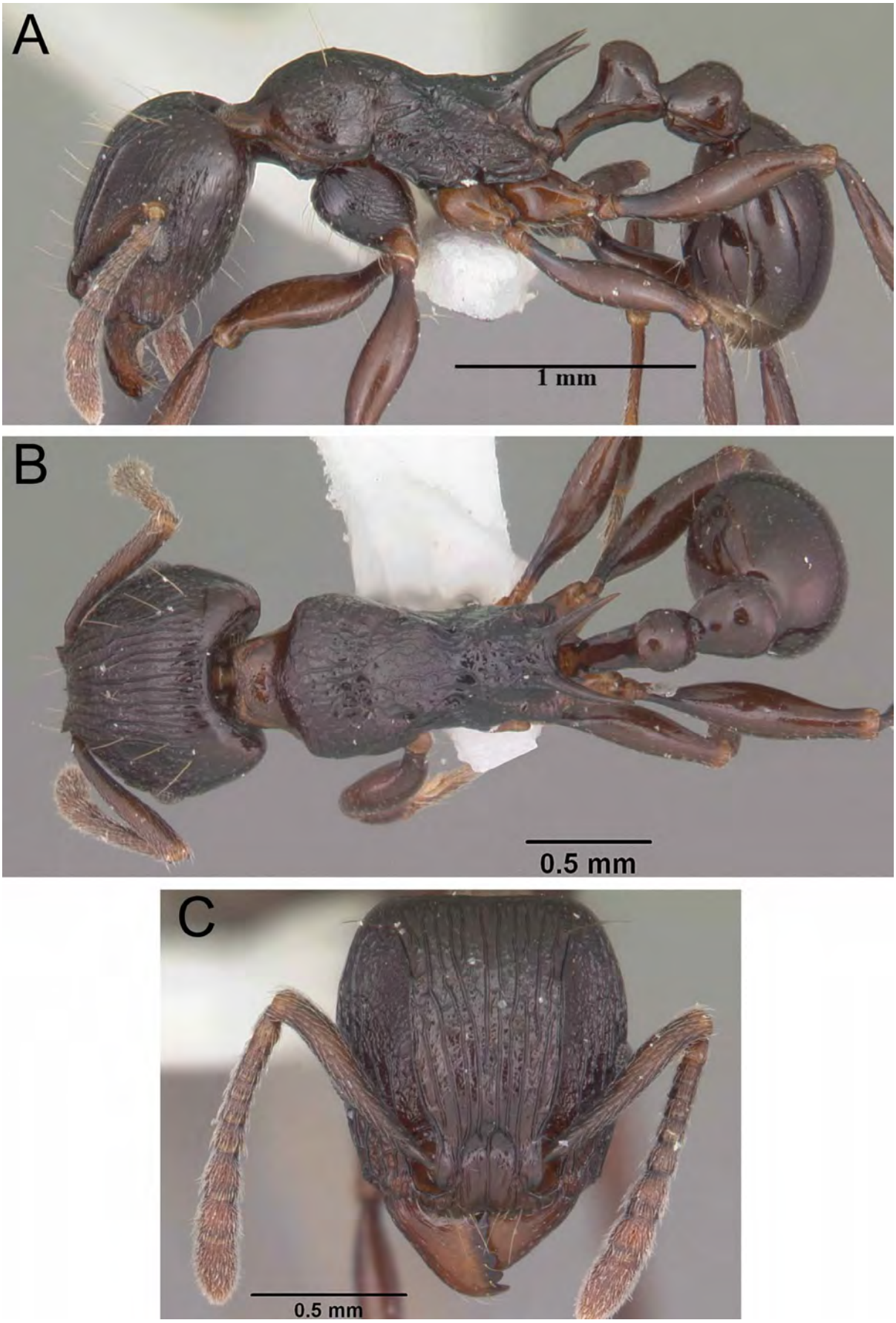


FIGURE 33. *Tetramorium severini* Emery, 1895—CASENT0102346 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

***Tetramorium dysalum* species group**

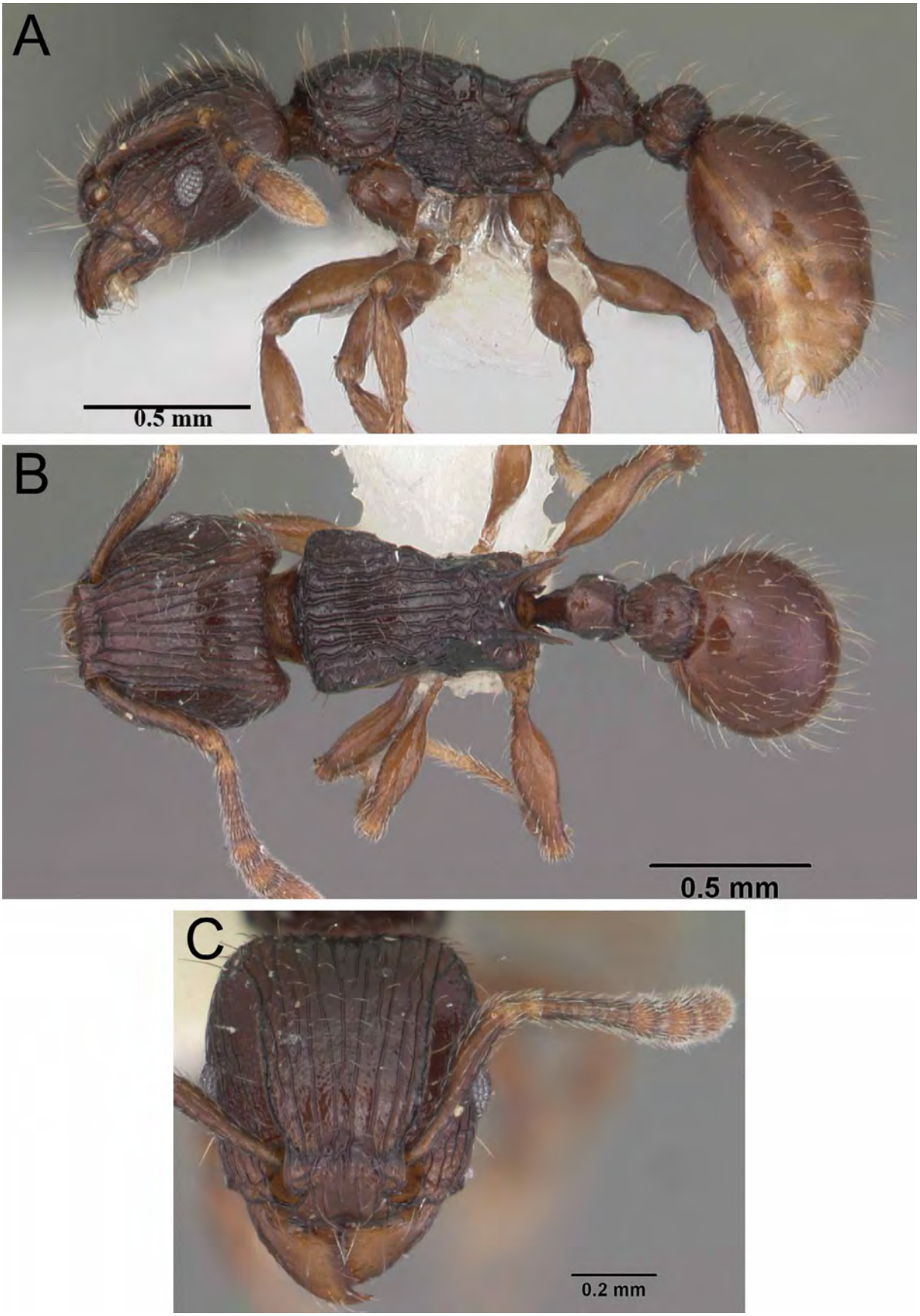


FIGURE 34. *Tetramorium dysalum* Bolton, 1979—CASENT0102349 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

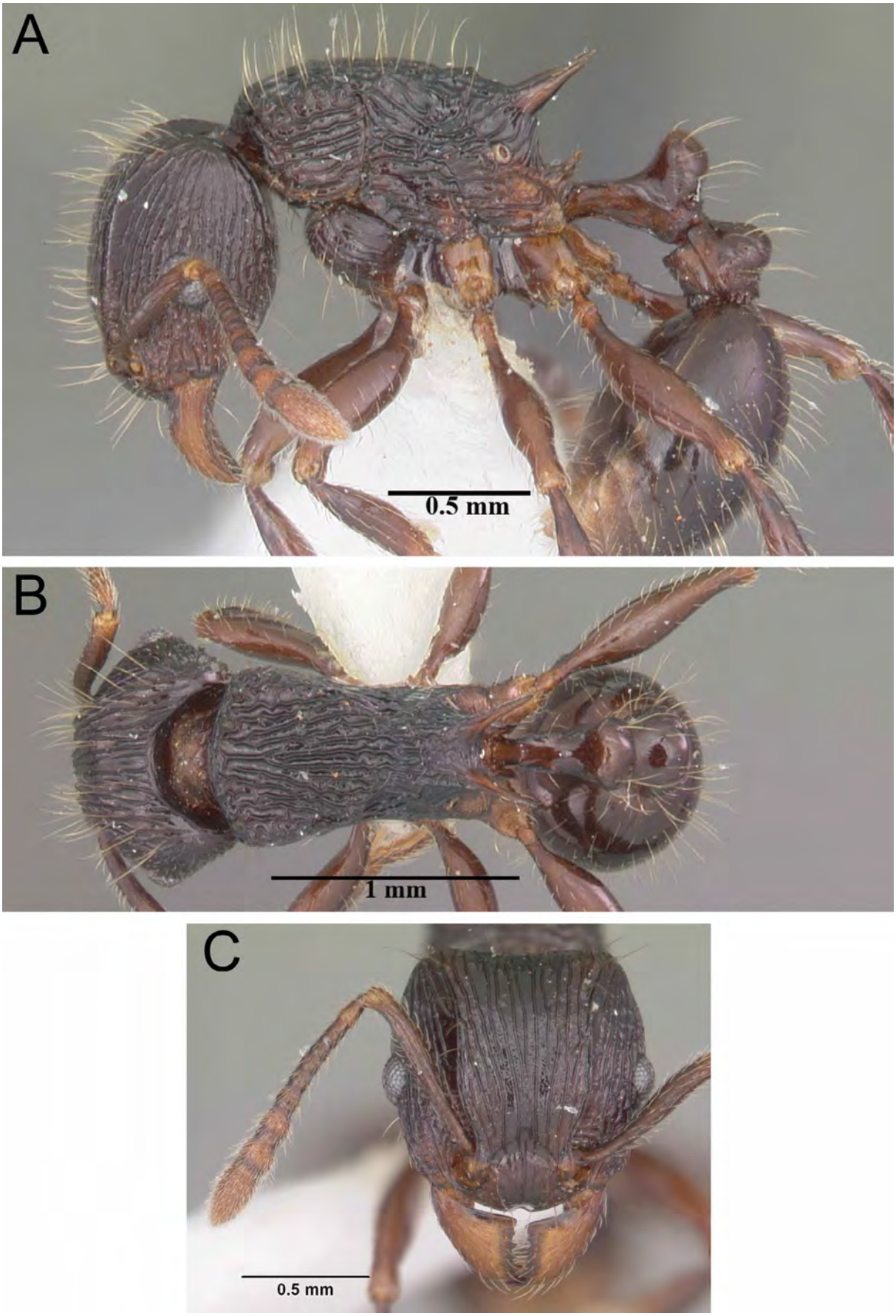


FIGURE 35. *Tetramorium steinheili* Forel, 1892—CASENT0102393 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae well-developed and usually ending close to posterior head margin; anterior face of mesosoma not well-developed and no distinct anterodorsal angle present; mesosoma moderately to strongly marginated, dorsum sharply separated from lateral mesosoma; propodeal spines usually long to very long, elongate-triangular to spinose, and often thick, stout, and curved; propodeal lobes triangular and short; petiolar node in profile squamiform and anteroposteriorly compressed to high nodiform, in profile much higher than long, in dorsal view typically distinctly wider than long, anterior and posterior faces sometimes parallel, positions of anterodorsal and posterodorsal angles variable; postpetiole roughly rounded to weakly anteroposteriorly compressed; mandibular sculpturation variable; cephalic sculpturation distinct and predominantly longitudinally rugose; mesosoma with distinct sculpturation; at least one waist segment sculptured, sculpturation often very weak but always present; gaster generally unsculptured, smooth, and shiny; all dorsal surfaces of head, mesosoma, waist segments, and first gastral tergite with few to abundant standing hairs, never short, dense, and appressed; sting appendage spatulate.

Comments

The *T. dysalum* species group consists of the two species *T. dysalum* and *T. steinheili* together with more than 15 undescribed species, and all seem to be endemic to the Malagasy region.

Morphologically, within the 11-segmented Malagasy Tetramorium this group lies between the groups with generally unsculptured waist segments ("New species group 1", *T. bessonii*, *T. marginatum* and *T. weitzeckeri* groups) and the strongly sculptured *T. tortuosum* group, although its actual affinities remain unclear. The general appearance with large body size, strongly longitudinally rugose head and mesosoma, generally long pilosity, and long to very long propodeal spines appears to place the *T. dysalum* species group very close to the *T. tortuosum* group. Nevertheless, the petiolar node shape of the latter group is always rectangular nodiform or clublike with distinct sculpturation while the node of the *T. dysalum* group members is sometimes only weakly sculptured and the shape can be squamiform, dorsally anteroposteriorly compressed, or high nodiform.

Tetramorium tortuosum species group

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae well-developed and usually running to posterior head margin; anterior face of mesosoma weakly developed; margination between lateral and dorsal mesosoma variably developed; propodeal spines always long to very long, and spinose; propodeal lobes triangular and short; petiolar node rectangular nodiform to clublike, antero- and posterodorsal angles usually well-defined, usually longer than high and longer than wide, sometimes roughly as long as high but then longer than wide; postpetiole usually roughly rounded; mandibles strongly sculptured in most species; cephalic sculpturation distinct and predominantly longitudinally rugose; mesosoma and waist segments with distinct sculpturation; gaster generally unsculptured and smooth, but sculpturation present in a few species; in most species all dorsal surfaces of head, mesosoma, waist segments and first gastral tergite with abundant long, standing hairs, never short, dense, and appressed; sting appendage spatulate.

Comments

The *T. tortuosum* group is widespread and present in most zoogeographic regions except the Palaearctic. Nevertheless, the highest species richness can be found in the Oriental and Indo-Australian regions while the Afrotropics and the New World are relatively species-poor. In the Malagasy region it is represented by 7 described species and around 10 new species.

As mentioned above, the *T. tortuosum* group is morphologically close to the *T. dysalum* species group due to the shared character combination of 11-segmented antennae, large body size, strongly longitudinally rugose head and mesosoma, and long to very long propodeal spines. Despite this morphological similarities, both groups differ strongly in sculpturation and shape of the petiolar node, which is rectangular nodiform or clublike in the *T. tortuosum* group versus squamiform to high nodiform in the *T. dysalum* group. The rectangular nodiform petiolar node could lead to misidentify some species of the *T. tortuosum* group with members of the *T. ranarum* group that have a rectangular nodiform node, too. However, both groups should not be confused with each other since species of

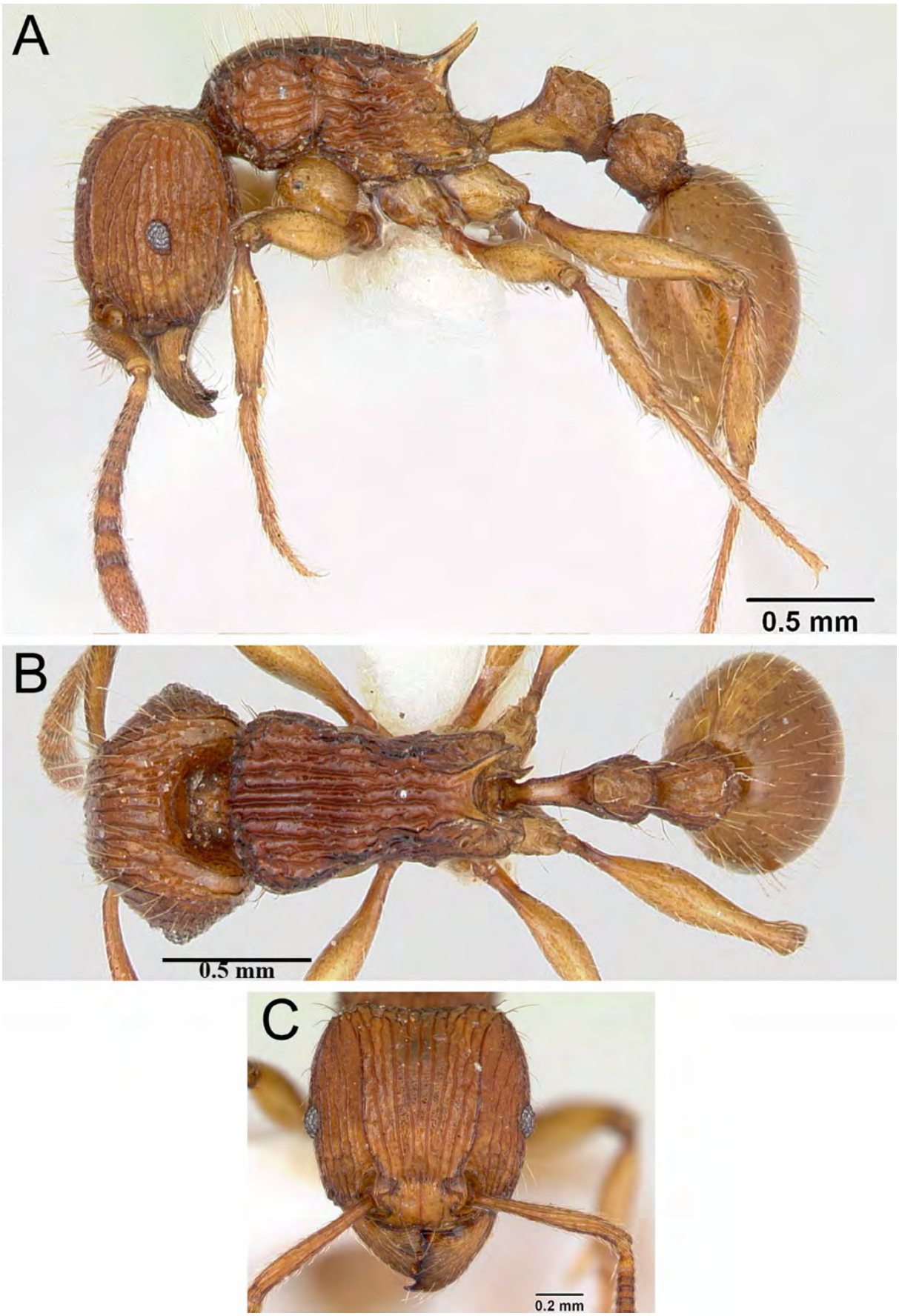


FIGURE 36. *Tetramorium isectum* Bolton, 1979—CASENT0172829 (April Nobile 2007). A. body in profile. B. body in dorsal view. C. head in full-face view.

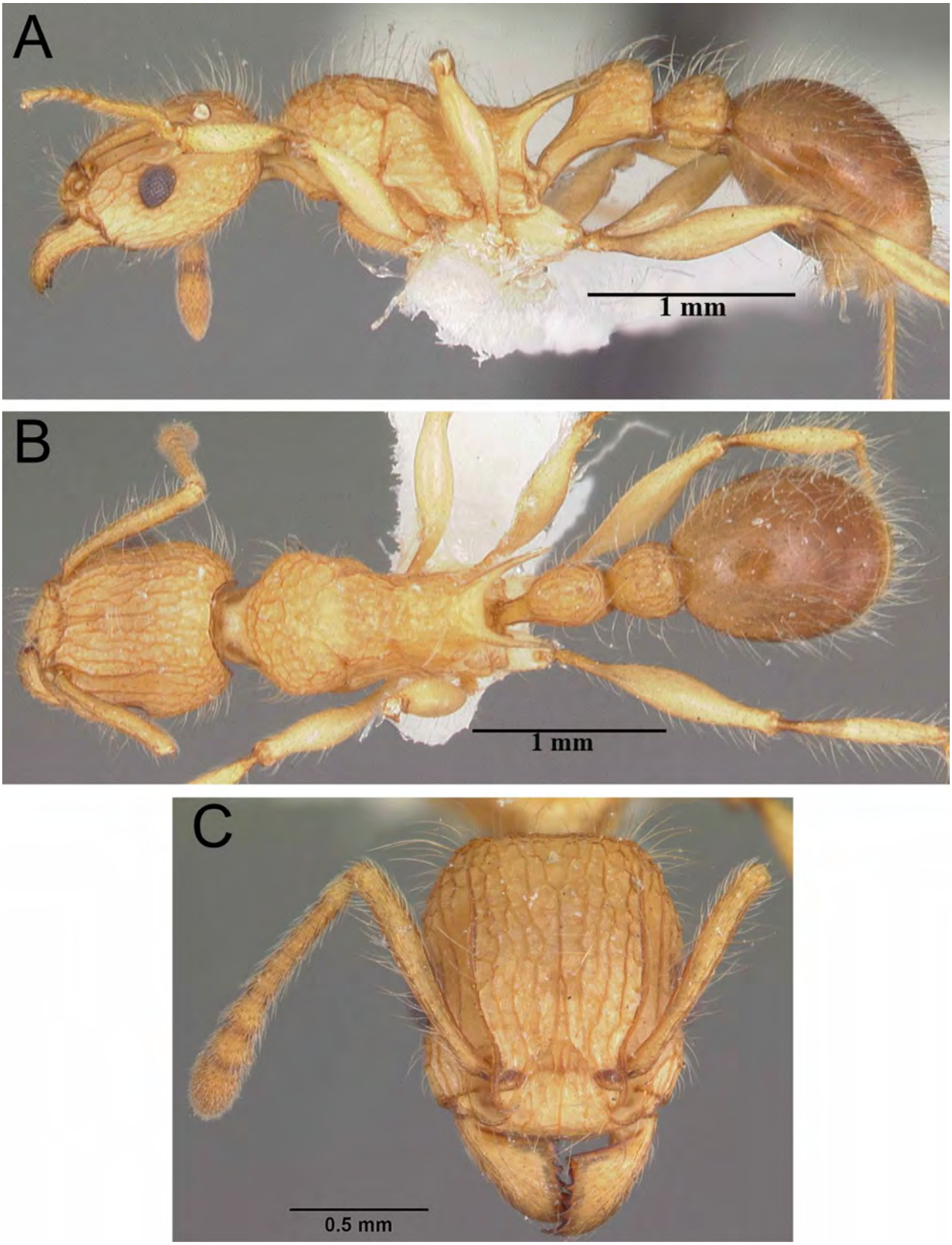


FIGURE 37. *Tetramorium kelleri* Forel, 1887—CASENT0102339 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

the *T. ranarum* group are all comparatively small in body size, possess shorter frontal carinae, an often well-developed antennal scrobe, and small propodeal spines, whereas all *T. tortuosum* species are quite large with frontal carinae extending to or close to the posterior head margin, and long to very long propodeal spines.

***Tetramorium ranarum* species group**

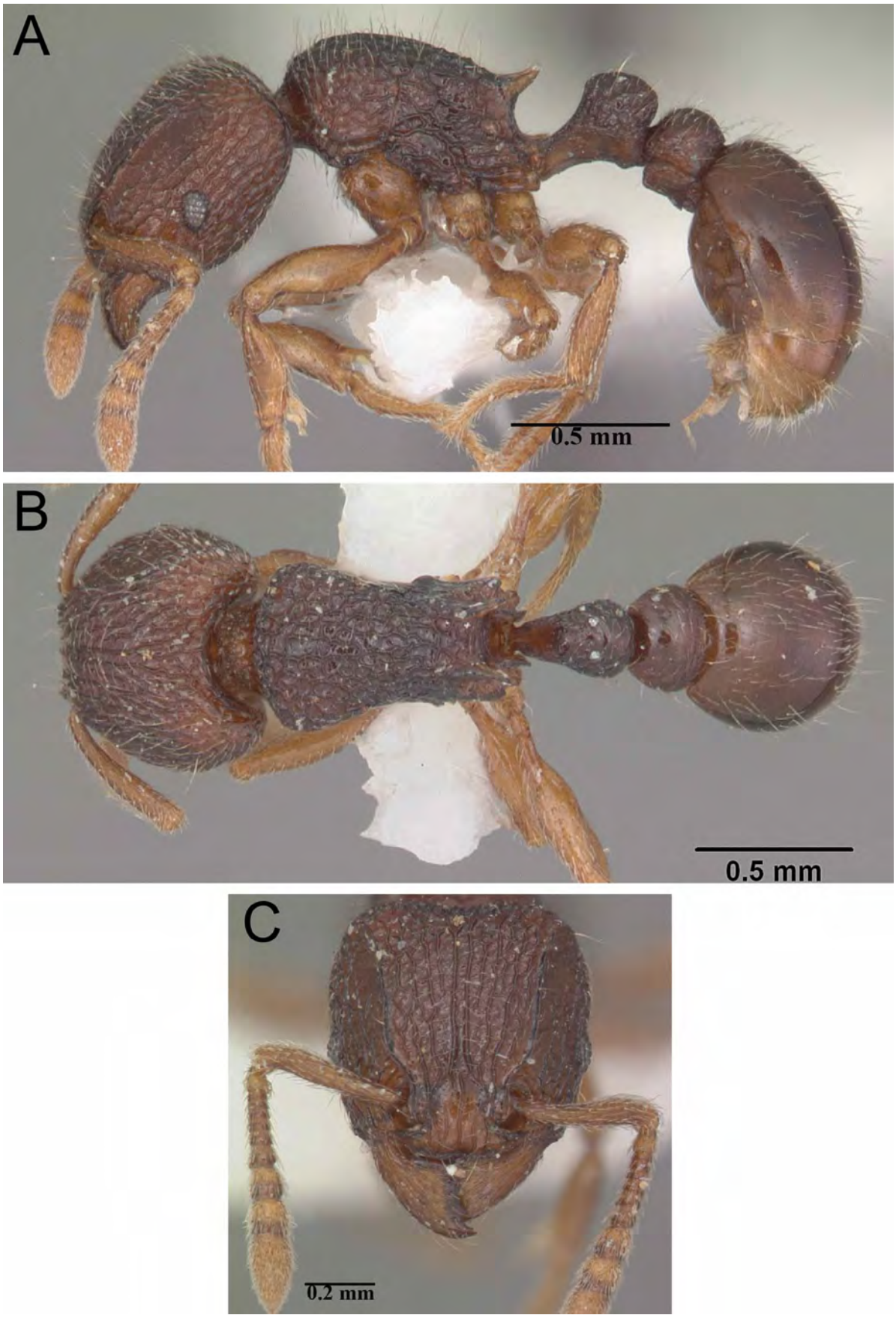


FIGURE 38. *Tetramorium ranarum* Forel, 1895—CASENT0102392 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

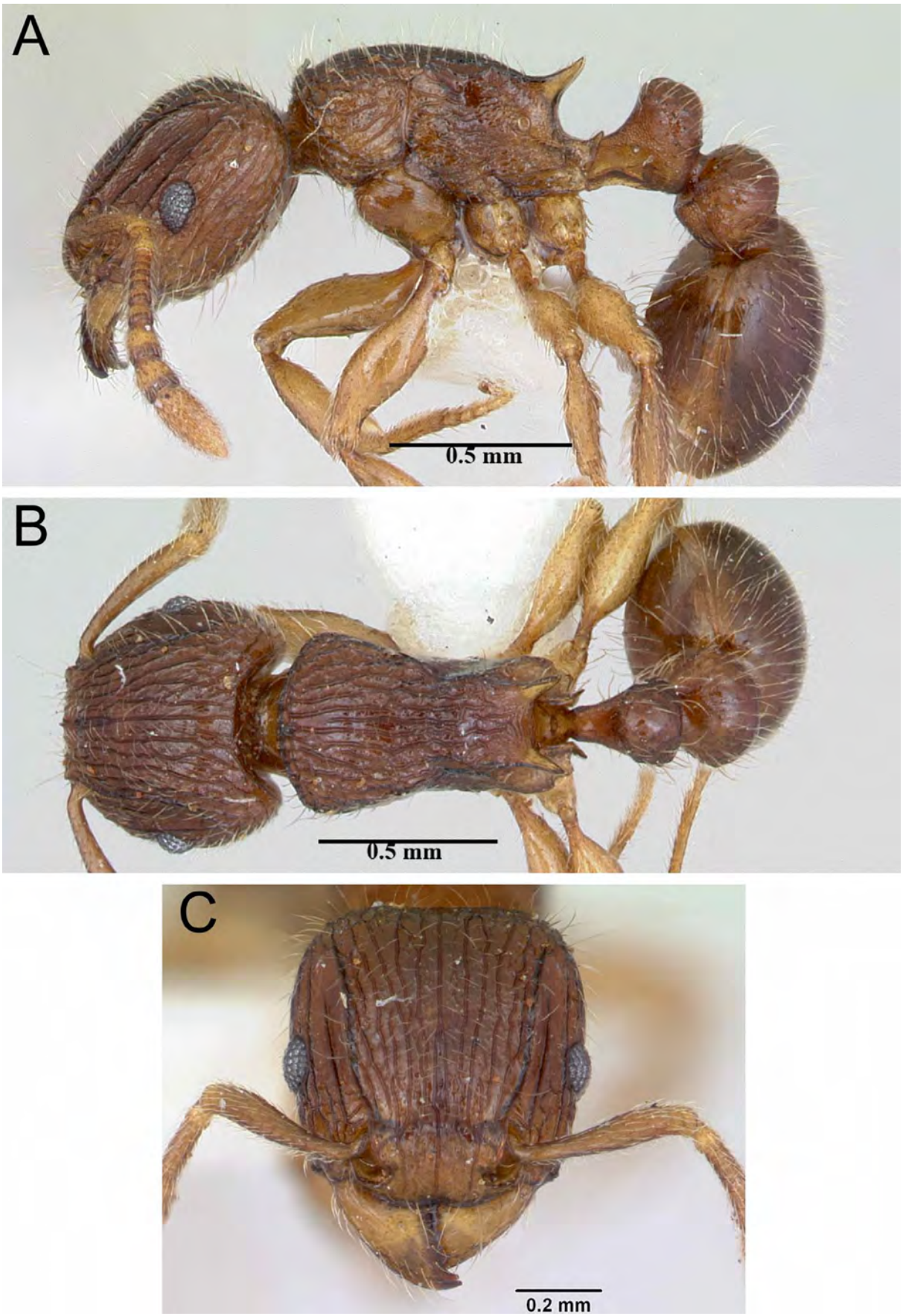


FIGURE 39. *Tetramorium plesiarum* Bolton, 1979—CASENT0172831 (April Nobile 2007). A. body in profile. B. body in dorsal view. C. head in full-face view.

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae variably developed, ending about halfway between posterior eye margin and posterior head margin, often curving down ventrally and forming posterior margin, and sometimes even ventral margins, of antennal scrobes; anterior face of mesosoma only weakly developed; margination between lateral and dorsal mesosoma weak; propodeal spines short to medium-sized, triangular to elongate-triangular; propodeal lobes triangular and short; petiolar node rectangular nodiform with usually well-defined angles, in profile roughly as high as or weakly higher than long, in dorsal view typically as wide as long, often antero- and posterodorsal angles well-developed and about same height, sometimes anterodorsal angle better developed and higher situated than less angulate, more rounded posterodorsal angle, in the latter case dorsum usually tapering weakly backwards posteriorly; postpetiole usually roughly rounded; mandibles usually sculptured; cephalic sculpturation distinct and predominantly longitudinally rugose; mesosoma and waist segments with distinct sculpturation, postpetiole sometimes with weak sculpturation only; gaster almost always unsculptured, smooth, and shiny; dorsal surfaces of head, mesosoma, waist segments, and first gastral tergite generally with abundant, short to medium-sized, appressed to erect hairs, pilosity on first gastral tergite sometimes reduced; sting appendage spatulate.

Comments

This is another endemic species group only found in the Malagasy region that holds 7 valid and more than 25 tentatively undescribed species.

This group is relatively unique within all groups with 11-segmented antennae since it displays a character set of comparatively small body size, shorter frontal carinae, often well-developed antennal scrobes, small propodeal spines, and especially a rectangular nodiform petiolar node. This character combination makes is fairly hard to be misidentified with another Malagasy species group. However, at first glance, it might be confused with some species of the *T. tortuosum* group due to the shared rectangular nodiform petiolar node shape, but the members of the *T. tortuosum* group are all much larger species with long frontal carinae and long to very long propodeal spines.

Tetramorium simillimum species group

Diagnosis

Twelve-segmented antennae; anterior clypeal margin entire and convex; frontal carinae variable; anterior face of mesosoma well developed with distinct anterodorsal angle separating anterior face from dorsum; margination between lateral and dorsal mesosoma usually weak; propodeal spines triangular and short to absent; propodeal lobes broad, triangular and short, more voluminous and larger than propodeal spines; petiolar node in profile nodiform, in profile higher than long, in dorsal view weakly wider than long to as wide as long, anterodorsal and posterodorsal angles well-developed and of about same height; postpetiole in profile roughly rounded; mandibles smooth to weakly and finely sculptured; cephalic sculpturation distinct and predominantly longitudinally rugose; mesosoma and waist segments with distinct sculpturation; base of first gastral tergite often weakly sculptured, rest unsculptured and smooth; all dorsal surfaces of head, mesosoma, waist segments, and first gastral tergite with sparse to abundant short, stout, and blunt standing hairs, never short, dense, and appressed; sting appendage triangular.

Comments

This is a group encountered in most zoogeographical regions, although its primary distribution is surely in the Afrotropics. It has spread to other regions thanks to two comparatively successful tramp species, *T. caldarium* (Roger, 1857) and *T. simillimum*. These species are widely distributed throughout the tropics and subtropics, and occur also in temperate zones where they are restricted to hothouses, zoos, and permanently heated buildings (Bolton, 1980). Both are also fairly common in the Malagasy region. Another group member, *T. delagoense* Forel, 1894, is shared between the Afrotropical and the Malagasy region, while the two other described species recorded from the Malagasy region, *T. anodontion* and *T. scytalum* Bolton, 1979, are endemics. In addition to these 5 valid species, there are 2 potentially new species from this region.

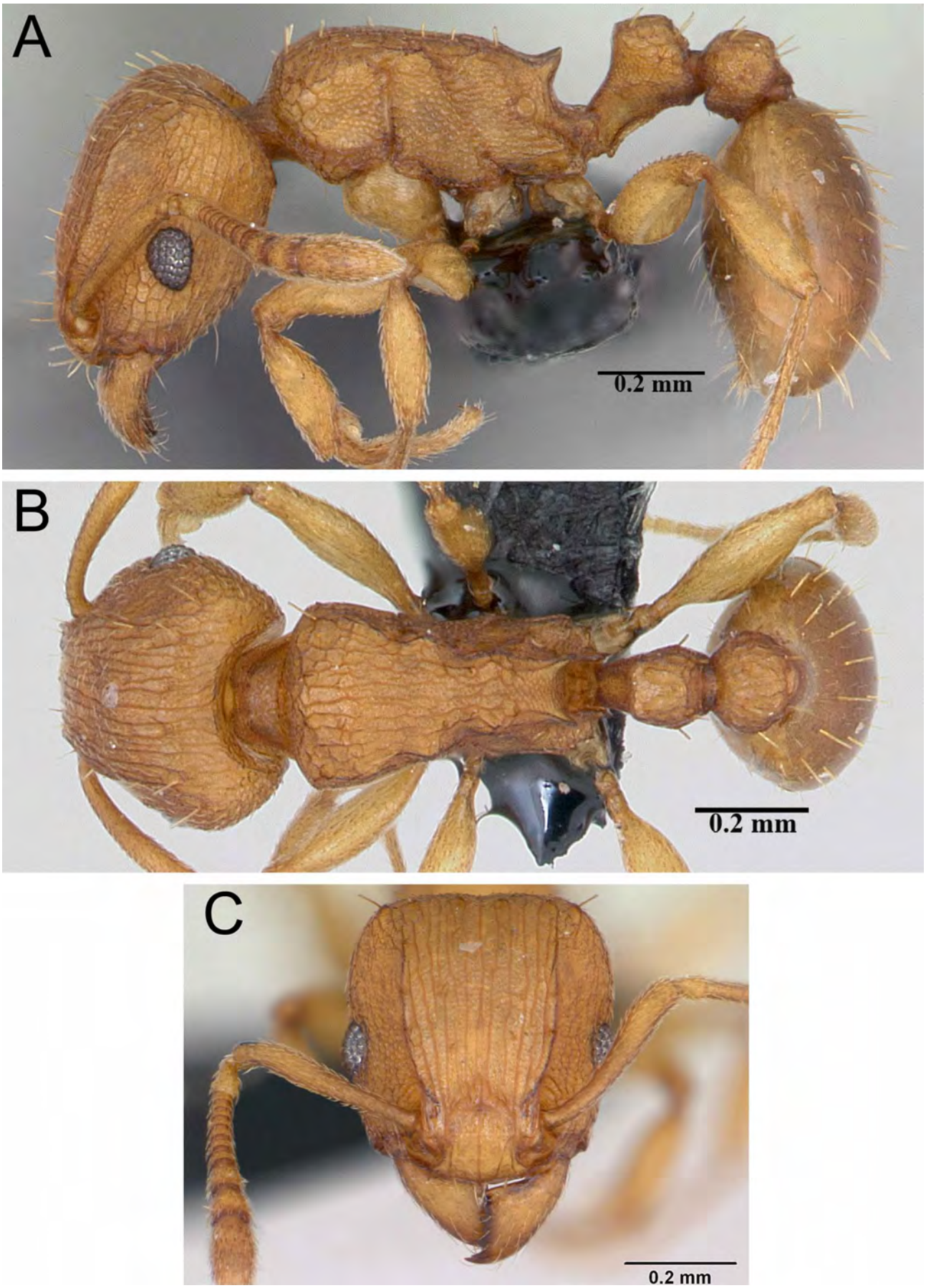


FIGURE 40. *Tetramorium simillimum* Forel, 1894—CASENT0135001 (April Nobile 2007). A. body in profile. B. body in dorsal view. C. head in full-face view.

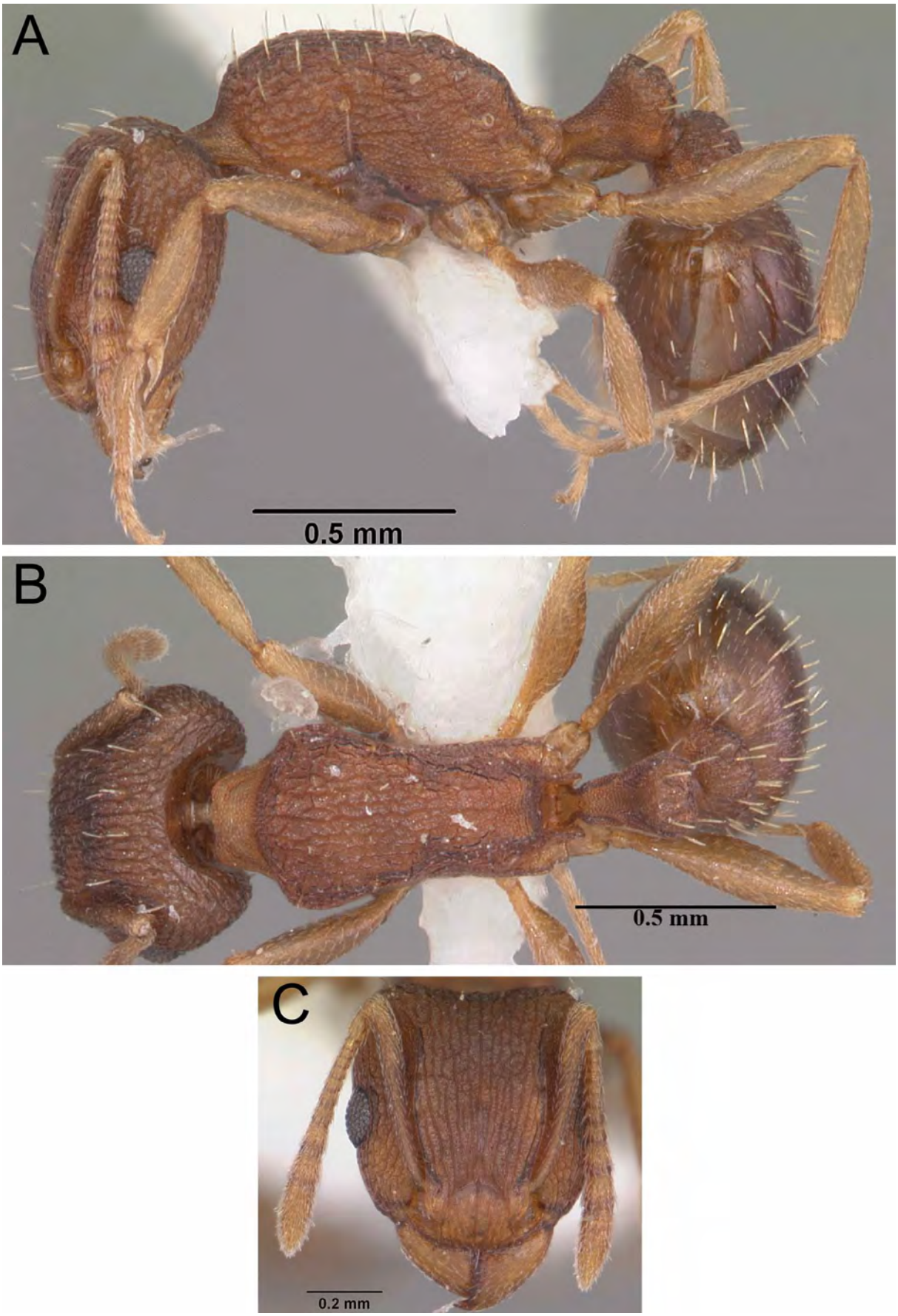


FIGURE 41. *Tetramorium anodontion* Bolton, 1979—CASENT0102334 (April Nobile 2005). A. body in profile. B. body in dorsal view. C. head in full-face view.

Within the species groups with 12-segmented antennae, the *T. simillimum* group can be identified without any difficulties. It cannot be confused with the *T. bicarinatum* group due to the impressed anterior clypeal margin of the latter, which is entire in the *T. simillimum* group. In addition, the absent or short propodeal spines separate it from the two species of the *T. tosii* group, and the lack of a raised lateral clypeal portion of the clypeus clearly separates it from the *T. sericeiventre* group.

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