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The ant genus *Tetramorium* Mayr (Hymenoptera: Formicidae) in the Malagasy region—taxonomy of the *T. bessonii*, *T. bonibony*, *T. dysalum*, *T. marginatum*, *T. tsingy*, and *T. weitzeckeri* species groups

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The ant genus *Tetramorium* Mayr (Hymenoptera: Formicidae) in the Malagasy region—taxonomy of the *T. bessonii, T. bonibony, T. dysalum, T. marginatum, T. tsingy,* and *T. weitzeckeri* species groups

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ABSTRACT

The taxonomy of the *T. bessonii*, *T. bonibony*, *T. dysalum*, *T. marginatum*, *T. tsingy*, and *T. weitzeckeri* species groups is revised. A total of 33 species is treated, of which 27 are newly described and one is raised to species status. The *T. weitzeckeri* group contains the single species *T. humbloti* Forel, which is of Afrotropical origin and the only representative of the group in the Malagasy region. The species *T. bessonii* Forel, *T. dysalum* Bolton, *T. marginatum* Forel, and *T. steinheili* Forel, which were originally members of the *T. weitzeckeri* group, are now placed in other groups. *Tetramorium bessonii* is the core species of the *T. bessonii* group, which also contains the four newly described species *T. artemis* sp. n., *T. malagasy* sp. n., *T. ryanphelanae* sp. n., *T. wardi* sp. n., and *T. orientale* Forel stat. n., which was a junior synonym of *T. bessonii* but is now raised to species rank. The *T. dysalum* group is a moderately-sized group with ten species, of which only *T. dysalum* and *T. steinheili* were previously known; the other eight species are all newly described. The newly described species in this group are: *T. ambatovy* sp. n., *T. macki* sp. n., *T. mallenseana* sp. n., *T. orc* sp. n., *T. robitika* sp. n.,

T. sargina sp. n., *T. yammer* sp. n., and *T. vohitra* sp. n. A lectotype and several paralectotypes of *T. steinheili* are designated. *Tetramorium marginatum* is the central species of the *T. marginatum* group, which also includes the five newly described species *T. valky* sp. n., *T. hector* sp. n., *T. norvigi* sp. n., *T. shamshir* sp. n., and *T. silvicola* sp. n. The *T. bonibony* and *T. tsingy* groups represent completely new groups that consist entirely of previously unknown, undescribed species. The first group holds the new species *T. bonibony* sp. n., *T. kali* sp. n., *T. sada* sp. n., *T. nosybe* sp. n., *T. olana* sp. n., *T. popell* sp. n., and *T. trafo* sp. n. and *T. vony* sp. n. The last group, the *T. tsingy* group, only contains the two species *T. tyrion* sp. n. and *T. tsingy* sp. n., both among the rarest *Tetramorium* species in Madagascar. All groups are fully revised with illustrated species-level identification keys, and all species are described/re-described and illustrated with high quality montage images. In addition, the current status of the Malagasy *Tetramorium* species groups is discussed and further modifications are proposed.

Keywords: Malagasy region; taxonomic revision; taxonomy; Tetramoriini; *Tetramorium*

INTRODUCTION

Madagascar is a unique place with an astonishing variety of landscapes and climates combined with extraordinarily diverse ecosystems. As one of earth's most important biodiversity hotspots, it harbours an incredibly rich fauna with an exceptionally high degree of endemism (Goodman & Benstead, 2003, 2005). The ant fauna of Madagascar has proven no exception, featuring more than 1,300 species of which more than 95% are endemics (Fisher, 2003, 2005; BLF, unpublished data). Despite being highly diverse and of extraordinary importance, Malagasy ants are only rarely used as a focal taxon in conservation ecology or biogeography studies (Fisher, 1997, 1999, 2000a). The primary reason for this oversight is approximately 60% of the Malagasy ant fauna consists of undescribed species (Fisher, 2003, 2005), a serious hindrance for the broader use of ants in such studies. Moreover, species of many genera cannot confidently be identified to species level due to the lack of taxonomic identification tools. As a consequence it is fairly difficult to obtain reliable data on the species composition of particular localities, species turnover between localities, or local endemism rates.

Several genera have already undergone a modern taxonomic revision, such as *Aptinoma* Fisher and *Ravavy* Fisher (Fisher, 2009), *Technomyrmex* Mayr (Bolton, 2007), *Metapone* Forel (Alpert, 2007), *Monomorium* Mayr (Heterick, 2006), *Paraparatrechina* Donisthorpe (LaPolla *et al*., 2010), *Pilotrochus* Brown (Brown, 1978; Bolton, 1984), *Pyramica* Roger (Bolton, 2000), *Strumigenys* Smith, F. (Fisher, 2000b), *Teratanер* Emery (Bolton, 1981), and *Anochetus* Mayr and *Odontomachus* Latreille (Fisher & Smith, 2008). Other genera have been partly revised, either on a subgenus or species group level as with *Tetraponera* Smith, F. (Ward, 2009) or *Crematogaster* Lund (Blaimer, 2010). The male-based taxonomy of Malagasy ants also has seen great improvements in recent years with the works of Yoshimura and Fisher (2007, 2009, 2011), which now allow the identification of male specimens to subfamily and genus level for Dolichoderinae, Ponerinae, and Proceratiinae. Despite all of these studies, more than 60% of all Malagasy species remain in need of a modern taxonomic revision. The hyper-diverse and ecologically important genera *Camponotus* Mayr, *Pheidole* Westwood, and *Tetramorium* Mayr, which comprise together more than 40% of the Malagasy ant species diversity, deserve particular taxonomic attention.

The ant genus *Tetramorium* in the Malagasy region was first revised by Bolton (1979), who recognised 36 species (29 endemics) from six species groups. Later, Bolton (1985) synonymised the genus *Triglyphothrix* Forel under *Tetramorium*, which added the tramp species *T. lanuginosum* Mayr from the *T. obesum* species group to the Malagasy *Tetramorium* fauna. In the last decade two more tramp species, this time belonging to the *T. bicarinatum* group, were reported from Mauritius and Reunion (Blard *et al*., 2003; Roberts & McGlynn, 2004). This accounts for 39 species known from the region until 2011. Recently, Hita Garcia & Fisher (2011) revised the taxonomy of four smaller species groups with 12-segmented antennae: the *T. bicarinatum*, *T. obesum*, *T. sericeiventre*, and *T. tosii* groups. Within the *T. sericeiventre* group, *T. mahafaly* Hita Garcia & Fisher was newly described, but *T. quadrispinosum* Emery was proposed as junior synonym of *T. sericeiventre* Emery, which left the species count at 39. Hita Garcia and Fisher (2011) also provided the foundation for an ongoing revision of the whole genus in the Malagasy region, which probably numbers more than 100 undescribed species. In addition, the taxonomy of *Tetramorium* in the region was discussed, the number of species groups was raised from nine to 14, all species groups were diagnosed, and a preliminary illustrated species group key was presented.

In this study we revise the taxonomy of the *T. bessonii*, *T. bonibony*, *T. dysalum*, *T. marginatum*, *T. tsingy*, and *T. weitzeckeri* species groups for the Malagasy zoogeographical region. These groups include all species formerly

placed in the *T. weitzeckeri* group; all of them except *T. humbloti* Forel are now members of the *T. bessonii*, *T. dysalum*, and *T. marginatum* groups. This revision also treats the *T. bonibony* and *T. tsingy* groups, both of which consist completely of newly described species. Generally, most species of the six revised groups display strongly reduced sculpture on the head, mesosoma, and waist segments, and/or an anteroposteriorly compressed petiolar node which is generally squamiform, triangular, cuneiform, high rounded nodiform, or rarely rectangular nodiform. All treated groups are fully revised with descriptions of 27 new species and re-descriptions of five valid taxa. We also provide illustrated species-level keys for all groups except the *T. weitzeckeri* group, which holds only one species, and all species descriptions are supplemented by high-quality, multifocused montage images. Furthermore, despite being intensively discussed and diagnosed in Hita Garcia and Fisher (2011), several modifications and changes of the Malagasy species groups are proposed on the basis of new findings from the ongoing revision of the whole genus in the 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.
MHNG	Muséum d'Histoire Naturelle de la Ville de Genève, Geneva, Switzerland
MCZ	Museum of Comparative Zoology, Cambridge, Massachusetts, U.S.A.
NHMB	Naturhistorisches Museum Basel, Basel, Switzerland

MATERIAL AND METHODS

The material examined in this study is based on ant inventories carried out in the Malagasy region from 1992 to 2010 which included more than 6,000 leaf litter samples, 4,000 pitfall traps, and 9,000 additional hand collecting events (see Fisher, 2005 for additional details).

All new type material and all imaged specimens can be uniquely identified with specimen-level codes affixed to each pin (e.g. CASENT0078328). In the presented descriptions we list all the specimen-level codes for the whole type series, if available. It should be noted, though, that the number of stated paratype workers does not necessarily match the number of listed specimen-level codes since several pins hold more than one specimen. Digital colour images were created using a JVC KY-F75 digital camera and Syncroscopy Auto-Montage software (version 5.0), or a Leica DFC 425 camera in combination with the Leica Application Suite software (version 3.8). All images presented herein are available online and can be seen on AntWeb (http://www.antweb.org). The measurements were taken with a Leica MZ 12.5 equipped with an orthogonal pair of micrometers at a magnification of 100x, rarely 80x. Measurements and indices are presented as minimum and maximum values with arithmetic means in parentheses. In addition, all measurements are expressed in mm to two decimal places. The measurements and indices used in this study follow Hita Garcia and Fisher (2011) except that we have included pronotal height (PH) and the two indices lateral mesosoma index (LMI) and dorsal mesosoma index (DMI). By measuring the height of the pronotum (PH) in addition to pronotal width (PW) and Weber's length (WL), we obtain more morphometric information about the shape of the mesosoma, which seems to be of particular importance for the identification of some species groups. The following measurements and indices 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. 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.
Scape length (SL):	maximum scape length excluding basal condyle and neck.
Eye length (EL):	maximum diameter of compound eye measured in oblique lateral view.

Pronotal height (PH):	maximum height of pronotum measured in lateral view.
Pronotal width (PW):	maximum width of pronotum measured in dorsal view.
Weber's length (WL):	diagonal length of mesosoma in lateral view from the posteroventral margin of propodeal lobe to the anterior-most point of pronotal slope, excluding the neck.
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.
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.
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.
Petiolar node width (PTW):	maximum width of dorsal face of petiolar node measured in dorsal view.
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.
Postpetiole length (PPL):	maximum length of postpetiole measured in dorsal view.
Postpetiole width (PPW):	maximum width of postpetiole measured in dorsal view.

Ocular index (OI):	EL / HW * 100
Cephalic index (CI):	HW / HL * 100
Scape index (SI):	SL / HW * 100
Lateral mesosoma index (LMI):	PH / WL * 100
Dorsal mesosoma index (DMI):	PW / WL * 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):	PPW / PW * 100
Lateral postpetiole index (LPpI):	PPL / PPH * 100
Dorsal postpetiole index (DPpI):	PPW / PPL * 100
Postpetiole index (PPI):	PPW / PTW * 100

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*., 2010). 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 and without a distinct peduncle-like structure. As a consequence, some information can be lost in the few species with a moderately or strongly anteroposteriorly compressed postpetiole. Even so, the postpetiole measurements as defined still permit better comparisons for most species.

Pubescence and pilosity are often of high diagnostic value within the genus *Tetramorium* (Bolton, 1976, 1977, 1979, 1980, 1985; Hita Garcia *et al*., 2010, Hita Garcia & Fisher, 2011). Especially the varying degree of inclination of pilosity is often important for the diagnosis of groups or species. In this context we use the terms "erect", "suberect", "subdecumbent", "decumbent", and "appressed" following Wilson (1955).

This study as well as the broader-scaled revision of the whole genus in the Malagasy region are primarily based on the worker caste. Males of this genus are comparatively rare and seldom associated with another caste. Their identification to species or even group level is often almost impossible. Currently, the only promising approach to disentangle this problem seems to be matching the DNA sequences of unidentified males with sequences from well-identified worker-based species. Queens are much more common, but again are very often found without any association to another caste. Based on species with known worker and queen castes, the queen caste appears to

possess less valuable diagnostic characters than the worker caste. Of particular importance appears to be the petiolar node, since the queens of several species groups show great similarities in node shape, while the workers display the wider variability that makes this character valuable for group diagnostics. The same is true for the mesosoma and head. Currently, specific diagnostic characters for the queen caste are not available. Again, a promising approach would be to use molecular data to match queens with worker-based species, and consequently find queen-specific morphological group- and species-level characters.

One modification in our descriptions in comparison to prior revisions (Bolton, 1979, 1980; Hita Garcia et al., 2010; Hita Garcia & Fisher, 2011) concerns the number of ommatidia in the longest row. We are reluctant to use this character in the species descriptions of this study because the number of ommatidia greatly depends on the body size of the measured specimen. Smaller specimens tend to have fewer but larger ommatidia than larger specimens, and the number of ommatidia is rarely of diagnostic value at the species level. The use of the ocular index (OI) has proved more suitable as supporting character for diagnostic decisions.

We do not provide distribution maps for the species treated in this publication. The Malagasy ant inventory is still in progress, and distribution ranges change continuously due to new material. Instead, the distribution data for each species is presented online at AntWeb. Continuously updated distribution maps can be seen in the regional pages for the Malagasy region (http://www.antweb.org/malagasy.jsp).

NOTES ON THE SPECIES GROUPS

Species groups for Malagasy *Tetramorium* were first established by Bolton (1976, 1979) in his revision of the regional fauna. He recognised five groups with 12-segmented and four groups with 11-segmented antennae. Recently, Hita Garcia and Fisher (2011) redefined the nine existing groups and created five new groups, for a total of 14 groups. All groups were diagnosed to provide a framework for the revision of all Malagasy *Tetramorium*, and a preliminary key to all species groups was provided. However, the examination of more material during the ongoing revision makes it necessary to modify or split some the groups recognised in Hita Garcia and Fisher (2011).

Within the species groups with 12-segmented antennae, the *T. bicarinatum*, *T. obesum*, *T. sericeiventre*, and *T. tosii* groups were recently revised (Hita Garcia & Fisher, 2011), leaving only the *T. simillimum* group, which was last revised by Bolton (1979, 1980). However, all five groups with 12-segmented antennae are well defined, easily recognisable, and, at present, do not require any modifications. The *T. simillimum* group is not treated in this study and will be revised separately in the future.

Several groups with 11-segmented antennae defined in Hita Garcia and Fisher (2011), such as the *T. bessonii*, *T. bonibony* (defined then as "New species group 1"), *T. dysalum*, *T. marginatum*, *T. severini*, and *T. weitzeckeri* groups, require only minor modifications. However, the examination of more material and re-evaluation of several morphological characters suggest that the *T. ranarum*, *T. schaufussii*, and *T. tortuosum* group definitions proposed by Hita Garcia and Fisher (2011) require more considerable revision.

The *T. schaufussii* group was defined by Bolton (1979) on the basis of the high rounded petiolar node shape. In Hita Garcia and Fisher (2011) the group was split into the *T. schaufussii* group composed of mostly smaller species with short- to medium-sized propodeal spines, and the *T. severini* group containing a single, much larger species with long to extremely long propodeal spines. The species *T. naganum* Bolton was kept as a member of the *T. schaufussii* group, although its propodeal spines are medium-sized to long, and thus much longer than those of all other species remaining in the group. Closer examination of *T. naganum* and a few allied, undescribed species led us to the conclusion that they belong to neither the *T. schaufussii* nor the *T. severini* groups, but deserve to be placed in their own species group. Both the *T. schaufussii* and the *T. severini* groups display a comparatively low and long mesosoma in profile, a characteristic which is not seen in any other Malagasy species group with 11-segmented antennae. In contrast, the mesosoma of *T. naganum* and allies is stouter and comparatively higher, separating them from the *T. schaufussii* and the *T. severini* groups. In addition to this striking difference with the latter two groups, *T. naganum* and allies cannot be placed within any other species group, and we consider them a distinct group endemic to Madagascar. The new *T. naganum* group is based on the character combination of high rounded petiolar node, comparatively high and stout mesosoma, and appressed to subdecumbent pilosity on the first gastral tergite.

Another group that needs to be redefined is the *T. ranarum* group. During our revision we found that *T. plesiarum* Bolton and several undescribed species do not fit well within the group. *Tetramorium plesiarum* and allies all possess a distinct and sharply defined antennal scrobe, whereas the scrobe is at most shallowly developed in all other *T. ranarum* group members. This character seems to be of high diagnostic importance since it is absent in all other Malagasy species groups. For this reason, we consider *T. plesiarum* and allies to belong to a group distinct from the *T. ranarum* group.

The species belonging to the *T. tortuosum* group as defined by Bolton (1979) or Hita Garcia and Fisher (2011) were considered morphologically close and easy to separate from other Malagasy groups. However, the species *T. kelleri* Forel possesses a character combination that is quite unique within its group. The sculpture on the head and mesosoma is usually reticulate-rugose and not longitudinally rugose as in the other *T. tortuosum* group members. This character is very stable in the group and the differences in *T. kelleri* were the first indication that this species might not belong to the *T. tortuosum* group. In addition, the petiolar node of *T. kelleri* is shaped quite differently than those of other species in the group because it is elongate, clublike with a very long peduncle, and the anterodorsal and posterodorsal margins are comparatively rounded. The petiolar node shape in the other group members is usually rectangular nodiform with well-developed, usually sharp anterodorsal and posterodorsal margins, and the peduncle is generally much shorter than in *T. kelleri*. Furthermore, despite the dearth of knowledge about the biology of most Malagasy *Tetramorium*, the behavior of *T. kelleri* is very different from all other observed Malagasy species. The workers of this species are highly aggressive and territorial when disturbed during collections, whereas all other observed *Tetramorium* display much more passive and less aggressive behaviour (BLF, unpublished). On the basis of these arguments, we consider *T. kelleri* not to be a member of the *T. tortuosum* group, but to represent a group of its own.

The *T. tsingy* group, which is revised in this study, represents a new discovery. The two species of the group were previously unknown, since neither Bolton (1979) nor Hita Garcia and Fisher (2011) treated them. One explanation for the complete lack of knowledge about the group prior to this study might be its strongly limited distribution, which seems to be restricted to Tsingy de Bemaraha National Park and its surroundings in Western Madagascar. Furthermore, both species of the group are only known from one or two specimens, representing a remarkable rarity for Malagasy *Tetramorium*. However, the members of the group possess an interesting character combination rendering them easily recognisable. The considerable lack of sculpture on head, mesosoma and waist segments, short to minute propodeal teeth, well-developed propodeal lobes, and an unsculptured petiolar node which is longer than wide, are not seen in any other species group.

The new *T. kelleri*, *T. naganum*, and *T. plesiarum* species groups, as well as the existing *T. ranarum*, *T. schaufussii*, *T. simillimum*, and *T. tortuosum* groups, will be diagnosed, redefined, and revised in detail in future taxonomic treatments. We introduce them in this study in order to reference them in the diagnostic notes or discussions of the material treated herein, but we are reluctant to provide diagnoses at this moment since further changes or new discoveries within these groups are still possible.

SYNOPSIS OF SPECIES EXAMINED IN THIS STUDY

***Tetramorium bessonii* species group**
Tetramorium artemis **sp. n.**
Tetramorium bessonii Forel, 1891
Tetramorium malagasy **sp. n.**
Tetramorium orientale Forel, 1895a **stat. n.**
Tetramorium ryanphelanae **sp. n.**
Tetramorium wardi **sp. n.**

***Tetramorium bonibony* species group**
Tetramorium bonibony **sp. n.**
Tetramorium kali **sp. n.**
Tetramorium nosybe **sp. n.**
Tetramorium olana **sp. n.**

Tetramorium popell **sp. n.**
Tetramorium sada **sp. n.**
Tetramorium trafo **sp. n.**
Tetramorium vony **sp. n.**

***Tetramorium dysalum* species group**
Tetramorium ambatovy **sp. n.**
Tetramorium dysalum Bolton, 1979
Tetramorium macki **sp. n.**
Tetramorium mallenseana **sp. n.**
Tetramorium orc **sp. n.**
Tetramorium robitika **sp. n.**
Tetramorium sargina **sp. n.**
Tetramorium steinheili Forel, 1892
Tetramorium vohitra **sp. n.**
Tetramorium yammer **sp. n.**

***Tetramorium marginatum* species group**
Tetramorium hector **sp. n.**
Tetramorium marginatum Forel, 1895b
Tetramorium norvigi **sp. n.**
Tetramorium shamshir **sp. n.**
Tetramorium silvicola **sp. n.**
Tetramorium valky **sp. n.**

***Tetramorium tsingy* species group**
Tetramorium tsingy **sp. n.**
Tetramorium tyrion **sp. n.**

***Tetramorium weitzeckeri* species group**
Tetramorium humbloti Forel, 1891
= *Tetramorium* (*Xyphomyrmex*) *humbloti* var. *pembensis* Forel, 1907
= *Tetramorium* (*Xyphomyrmex*) *humbloti* var. *victoriensis* Forel, 1913

REVIEW OF SPECIES

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; mesosomal profile generally moderately rounded and convex, no distinct margination between lateral and dorsal mesosoma, instead sides of mesosoma smoothly rounding onto dorsum; mesosoma comparatively high (LMI 42–49); propodeal spines medium-sized to long, elongate-triangular to spinose; propodeal lobes only weakly developed, broadly triangular but usually very short; petiolar node either squamiform and anteroposteriorly compressed or rounded high nodiform, in profile always much higher than long, in dorsal view distinctly wider than long, anterior and posterior faces either parallel or almost so, anterodorsal angle either better developed than posterodorsal angle and dorsum tapering backwards posteriorly, or both angles at about same height; postpetiole weakly anteroposteriorly compressed and approximately rounded; mandibles generally sculptured; cephalic sculpture often reduced to a large extent; mesosoma usually unsculptured, in one species with superficial weak sculpture; waist segments and gaster

unsculptured, smooth, and shiny, sometimes weak to moderate foveolate ground sculpture present on petiole; 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

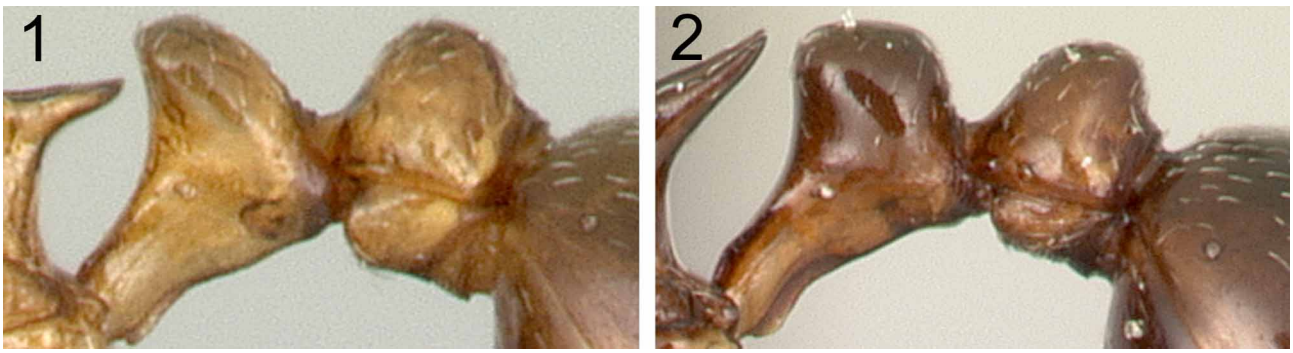
The species of this group are distributed throughout Madagascar but completely absent from the surrounding island systems. All prefer more arid habitats such as grasslands, spiny thicket or woodlands, and dry tropical or gallery forests. However, they can also be found in disturbed montane or littoral rain forest, but only very rarely. Furthermore, all species seem to live and forage on the ground and on low vegetation.

The group is well distinguished from others with 11-segmented antennae by the highly reduced sculpture on head, mesosoma, and waist segments, the distinctly rounded mesosoma without any distinct margination between sides and dorsum, the unsculptured waist segments, and a petiolar node that is always much higher and wider than long. The other two species groups with 11-segmented antennae and highly reduced sculpture, the *T. marginatum* and *T. tsingy* groups, cannot be mistaken for any member of the *T. bessonii* group. Both species of the *T. tsingy* group differ strongly in petiolar node shape since it is nodiform in profile and longer than wide in dorsal view, whereas it is always much wider than long in the *T. bessonii* group. The species of the *T. marginatum* group are not likely to be confused with the *T. bessonii* group since the mesosoma of the latter is only weakly or not marginate between lateral and dorsal mesosoma while the mesosoma of all of the *T. marginatum* group species is moderately to strongly marginate. Additionally, both groups differ strongly in pilosity. In the *T. marginatum* group pubescence is rare and not well-developed, and abundant, erect pilosity is typical on mesosoma, waist segments, and the first gastral tergite, whereas standing hairs are more of an exception in the *T. bessonii* group, in which all species possess appressed pubescence of varying length.

This species group is based on *T. bessonii*, which was the only known representative of the group prior to this study, and contains four newly described species, plus one now raised to species status. All six species are relatively similar to each other morphologically indicating a close relationship. For convenience they can be separated into three species with a strongly anteroposteriorly compressed petiolar node in which the dorsum tapers backwards posteriorly: *T. artemis*, *T. bessonii*, and *T. wardi*; and the remaining three species with a high nodiform petiolar node with approximately parallel anterior and posterior faces, and a much better developed petiolar dorsum: *T. malagasy*, *T. orientale*, and *T. ryanphelanae*.

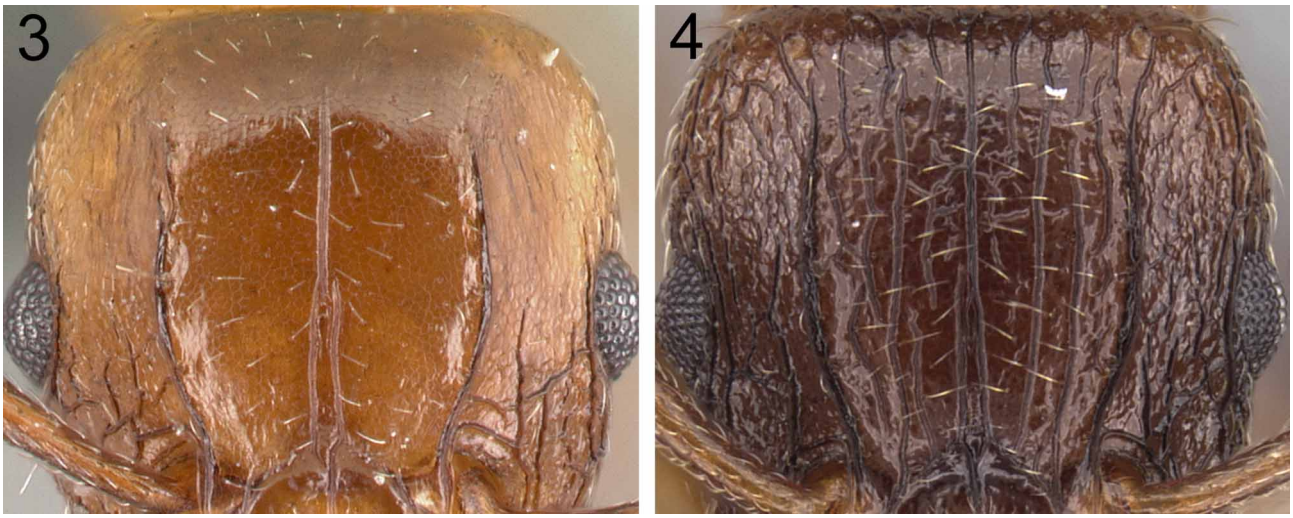
Key to the species of the *T. bessonii* group (workers)

1. Petiolar node strongly anteroposteriorly compressed, in profile squamiform, anterodorsal margin situated higher than posterodorsal, dorsum tapering backwards posteriorly and comparatively weakly developed, node in dorsal view strongly transverse (LPeI 26–39; DPeI 209–333) (Fig. 1) 2
- Petiolar node not strongly anteroposteriorly compressed, in profile high nodiform with well-developed dorsum and approximately parallel anterior and posterior faces, node in dorsal view wider than long but less transverse than above (LPeI 51–63; DPeI 133–165) (Fig. 2). 4



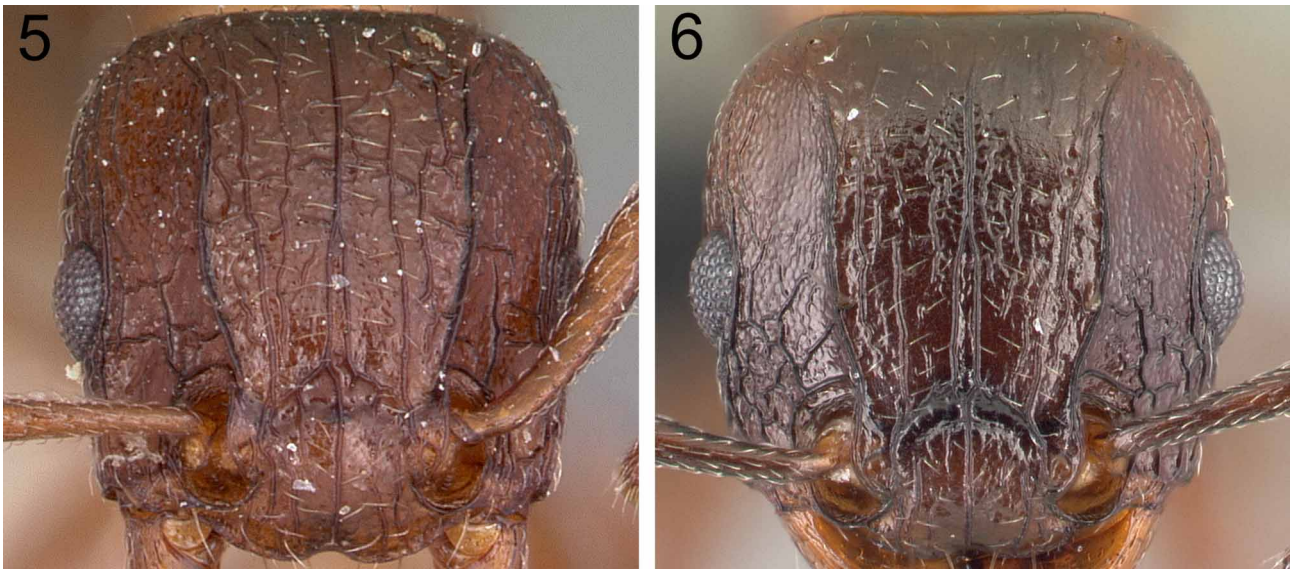
FIGURES 1 & 2. 1. Waist segments of *T. artemis* in profile showing the strongly anteroposteriorly compressed and squamiform petiolar node, which tapers distinctly backwards posteriorly—CASENT0481732 (Erin Prado 2010). **2.** Waist segments of *T. malagasy* in profile showing the high rounded nodiform petiolar node with anterodorsal and posterodorsal margins at about the same height—CASENT0449550 (Erin Prado 2010).

2. Cephalic dorsum between frontal carinae with just one strongly developed longitudinal median ruga that diverges at eye level into two rugae leading to posterior clypeal margin (Fig. 3) . . . . . *T. artemis*
- Cephalic dorsum between frontal carinae with one strongly developed longitudinal median ruga that diverges at eye level into two rugae leading to posterior clypeal margin and two to five more irregularly developed longitudinal rugae at each side (Fig. 4). 3



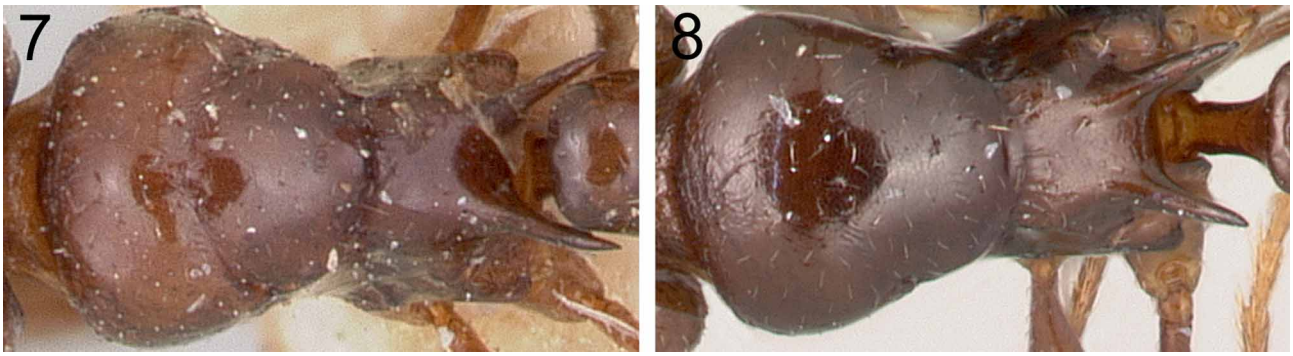
FIGURES 3 & 4. 3. Head of *T. artemis* in full-face view with one strongly developed median ruga between the frontal carinae—CASENT0481732 (Erin Prado 2010). **4.** Head of *T. bessonii* in full-face view with strongly developed longitudinal median ruga and two to five more irregularly developed longitudinal rugae at each side—CASENT0247550 (Estella Ortega 2012).

3. Head always distinctly longer than wide (CI 92–96); first gastral tergite with comparatively long appressed to decumbent pubescence (Fig. 5). . . . . *T. bessonii*
- Head approximately as long as wide (CI 98–101); first gastral tergite with very short, appressed pubescence (Fig. 6). *T. wardi*



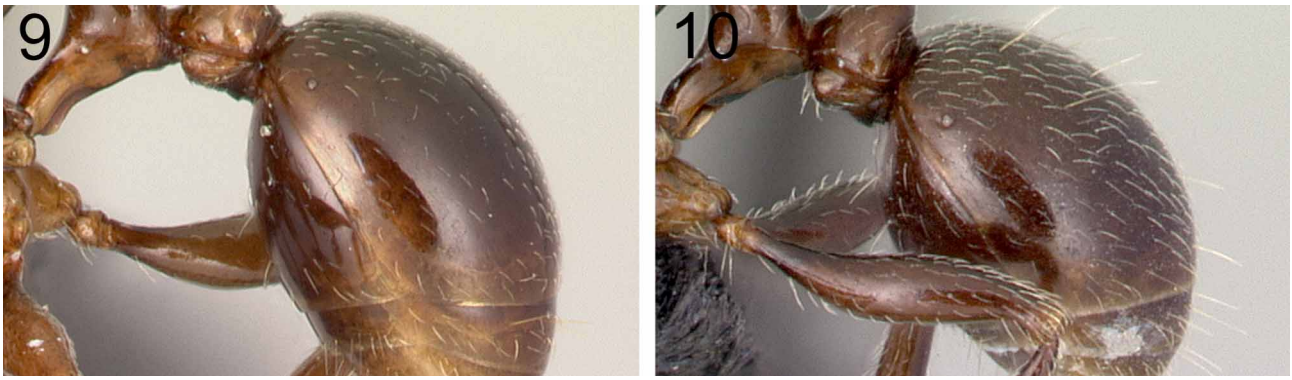
FIGURES 5 & 6. 5. Head of *T. bessonii* in full-face view, head shape distinctly longer than wide—CASENT0101298 (April Nobile 2006). **6.** Head of *T. wardi* in full-face view, head shape approximately as long as wide—CASENT0475483 (Erin Prado 2010).

4. Promesonotal suture well-developed and conspicuous (Fig. 7). . . . . *T. orientale*
- Promesonotal suture not developed (Fig 8). 5



FIGURES 7 & 8. 7. Mesosoma of *T. orientale* in dorsal view showing the well-developed and conspicuous promesonotal suture—CASENT0101744 (April Nobile 2006). **8.** Mesosoma of *T. malagasy* in dorsal view without a promesonotal suture—CASENT0449550 (Erin Prado 2010).

5. Antennal scapes comparatively shorter (SI 71–74); first gastral tergite with very short and strongly appressed pubescence, never with long, standing hairs (Fig. 9). . . . . *T. malagasy*
- Antennal scapes comparatively longer (SI 76–78); first gastral tergite with comparatively long, dense appressed pubescence, and generally with several long, standing hairs (Fig. 10). . . . . *T. ryanphelanae*



FIGURES 9 & 10. 9. Gaster of *T. malagasy* in lateral view with only very short and strongly appressed pubescence on the first gastral tergite—CASENT0449550 (Erin Prado 2010). **10.** Gaster of *T. ryanphelanae* in lateral view, first gastral tergite with comparatively long, dense appressed pubescence, and generally with several long, standing hairs—CASENT0454495 (Erin Prado 2010).

Tetramorium artemis Hita Garcia & Fisher sp. n.

(figs 1, 3, 11, 12, 13)

Holotype worker, MADAGASCAR, Toliara, Réserve Spéciale de Cap Sainte Marie, 14.9 km 261° W Marovato, 25.59444 S, 45.14683 E, 160 m, spiny forest/thicket, sifted litter (leaf mold, rotten wood), BLF5570, 13.–19.II.2002 (*Fisher, B.L. & C. Griswold*) (CASC: CASENT0481732) Paratypes, eight workers with same data as holotype (BMNH: CASENT0481734; CASC: CASENT0481723, CASENT0481729; CASENT0481731; CASENT0481750; CASENT0481752; CASENT0481756; MHNG: CASENT0481743).

Diagnosis

The following character combination separates *T. artemis* from the other species of the group: head approximately

as long as wide (CI 99–101); petiolar node squamiform and strongly anteroposteriorly compressed with anterodorsal angle situated higher than posterodorsal, dorsum tapering backwards posteriorly, in dorsal view strongly transverse (DPeI 232–250); and reduced cephalic sculpture between the frontal carinae with just one median longitudinal ruga.

Description

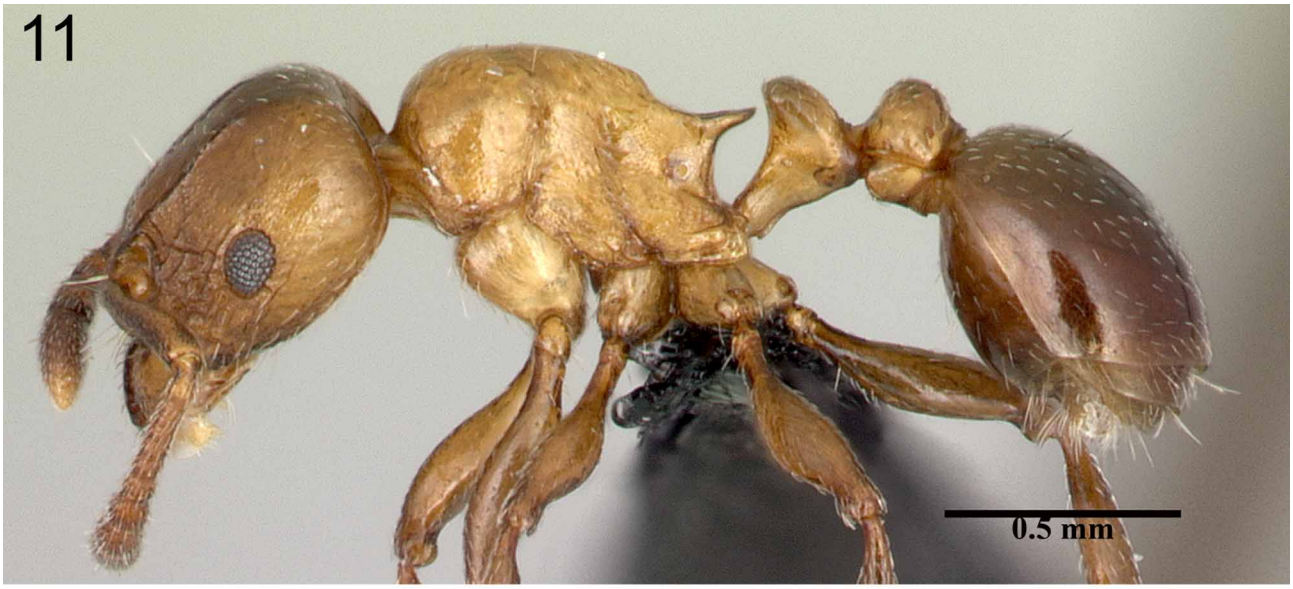
HL 0.67–0.72 (0.69); HW 0.66–0.71 (0.69); SL 0.47–0.51 (0.49); EL 0.14–0.16 (0.15); PH 0.37–0.43 (0.40); PW 0.48–0.52 (0.50); WL 0.82–0.89 (0.86); PSL 0.18–0.20 (0.19); PTL 0.10–0.11 (0.10); PTH 0.27–0.31 (0.29); PTW 0.24–0.26 (0.24); PPL 0.21–0.23 (0.22); PPH 0.27–0.32 (0.29); PPW 0.30–0.32 (0.31); CI 99–101 (100); SI 69–73 (71); OI 20–23 (21); LMI 44–48 (46); DMI 58–61 (59); PSLI 27–29 (28); PeNI 47–50 (48); LPeI 32–38 (35); DPeI 232–250 (240); PpNI 60–63 (62); LPpI 70–79 (75); DPpI 136–143 (140); PPI 122–131 (127) (nine measured).

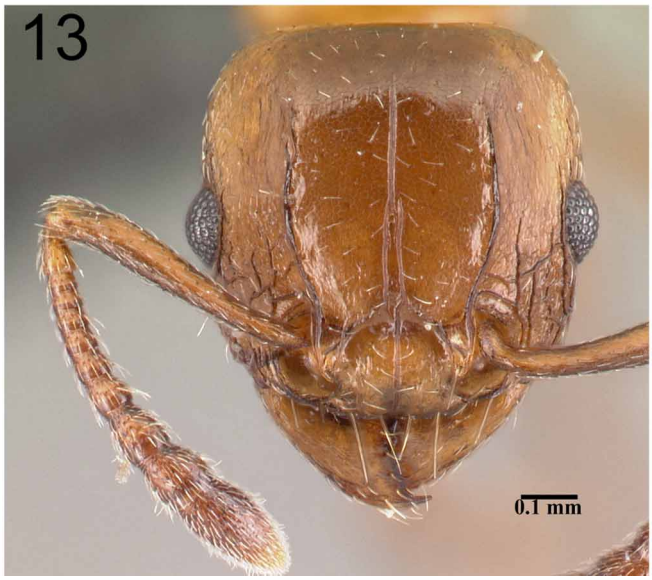
Head approximately as long as wide (CI 99–101). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, ending shortly behind level of posterior eye margin. Antennal scrobes faint to absent, posterior and ventral margins never differentiated. Antennal scapes comparatively short, not reaching posterior head margin (SI 69–73). Eyes comparatively small to moderate (OI 20–23). Mesosomal outline in profile convex, dorsum transversely rounded, dorsolateral margin only weakly developed, promesonotal suture and metanotal groove absent; mesosoma comparatively stout and high (LMI 44–48). Propodeal spines elongate-triangular, long, and acute (PSLI 27–29). Propodeal lobes reduced, very small, and bluntly triangular. Petiolar node strongly squamiform and anteroposteriorly compressed, anterior and posterior faces not parallel, anterodorsal margin higher situated and better developed than weaker posterodorsal margin, dorsum tapering backwards posteriorly; node in dorsal view transverse, between 2.3 to 3.5 times wider than long (DPeI 232–250), in lateral view distinctly more than 2.5 times higher than long (LPeI 32–38). Postpetiole in profile rounded and weakly anteroposteriorly compressed, approximately 1.3 to 1.4 times higher than long (LPpI 70–79), in dorsal view approximately 1.3 to 1.4 times wider than long (DPpI 136–143). Postpetiole in profile more voluminous than petiolar node, in dorsal view approximately 1.2 to 1.3 times wider than petiolar node (PPI 122–131). Mandibles distinctly longitudinally striate; clypeus always with strong median longitudinal ruga and one weaker ruga at each side; remainder of head mostly unsculptured, cephalic dorsum between frontal carinae only with one well-developed longitudinal median ruga, median ruga diverging approximately at eye level into two rugae running to posterior clypeal margin, remainder unsculptured, median ruga of same length as frontal carinae; head laterally and ventrally mostly unsculptured, anteriorly approximately at malar area irregularly rugose. Head with faint punctate ground sculpture. Mesosoma, waist segments, and gaster unsculptured and smooth, only moderately shining due to faint ground sculpture. Head generally with several fine, long, erect hairs, and more numerous appressed to decumbent widely spaced pubescence; mesosoma usually with one pair of standing hairs on promesonotum and very sparse, short, and inconspicuous pubescence; waist segments and first gastral tergite without any pilosity, only with very short, widely spaced, strongly appressed pubescence. Head, antennae, legs, and gaster of brown colour, mesosoma and waist segments of lighter brown.

Notes

At present, the new species is only known from the type locality, the Cap Saint Marie, where it was sampled from sifted litter in a spiny forest/thicket habitat at an elevation of 160 m.

Within the species group, the identification of *Tetramorium artemis* is straightforward and comparatively easy. It can be well separated from *T. malagasy*, *T. orientale*, and *T. ryanphelanae* since the latter three all display a high nodiform and much less anteroposteriorly compressed petiolar node in comparison to the squamiform node of *T. artemis*. The remaining two species, *T. bessonii* and *T. wardi*, have approximately the same node shape as *T. artemis*, but can be easily distinguished from the latter. The head of *T. bessonii* is distinctly longer than wide (CI 92–96) while the head of *T. artemis* is approximately as long as wide (99–101). In addition, *T. bessonii* shows comparatively long appressed to decumbent pubescence on the first gastral tergite, which contrasts with the very short, strongly appressed pubescence of *T. artemis*. *Tetramorium wardi* shares most characters with *T. artemis*, but differs in cephalic sculpture and petiolar node shape. In *T. wardi* the cephalic sculpture between the frontal carinae consists of a strong median ruga and several irregular rugae between the median ruga and the frontal carinae. In *T. artemis* though, only one median ruga is developed between the frontal carinae. Also, the petiolar node of *T. wardi* (DPeI 267–333) is more compressed and transverse than in *T. artemis* (DPeI 232–250).





FIGURES 11–13. *T. artemis*, holotype—CASENT0481732 (Erin Prado 2010). 11. Body in profile. 12. Body in dorsal view. 13. Head in full-face view.

Etymology
This new species is named after the goddess "Artemis" from Old Greek mythology, which was the goddess of the hunt, wilderness, and animals. The name is a noun in apposition, and thus invariant.

Material examined
MADAGASCAR: Toliara, Réserve Spéciale de Cap Sainte Marie, 14.9 km 261° W Marovato, 25.59444 S, 45.14683 E, 160 m, spiny forest/thicket, 13.–19.II.2002 (*Fisher, B.L. & C. Griswold*).

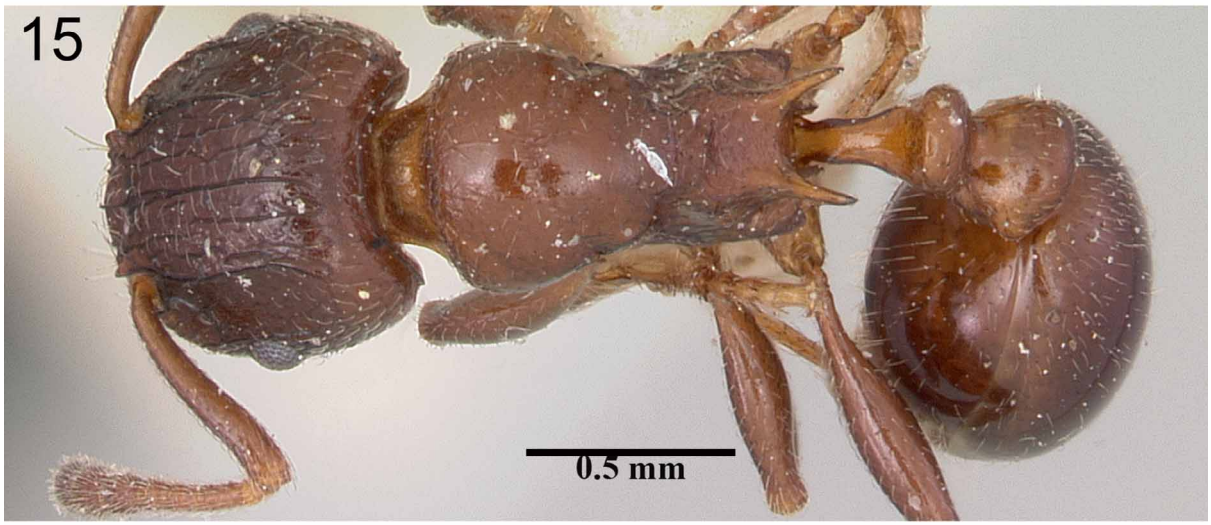
Tetramorium bessonii Forel, 1891
(figs 4, 5, 14, 15, 16)

Tetramorium (Xiphomyrmex) bessonii Forel, 1891:156. Syntype workers, MADAGASCAR, Fianarantsoa, Pays des Betsileo (*Besson*) (BMNH: CASENT0102347; MHNG: CASENT0101277, CASENT0101278, CASENT0101297, CASENT0101298; NMHB: CASENT0101145) [examined]. [Combination in *Xiphomyrmex* by Wheeler, W.M. 1922:1031; in *Tetramorium* by Bolton, 1979:141].

Diagnosis
Tetramorium bessonii can be easily distinguished from other species of the group by the following character set: head distinctly longer than wide (CI 92–96); petiolar node squamiform and strongly anteroposteriorly compressed with anterodorsal margin situated higher than posterodorsal margin, dorsum tapering backwards posteriorly, in dorsal view strongly transverse (DPeI 209–270).

Description
HL 0.61–0.88 (0.81); HW 0.58–0.83 (0.76); SL 0.44–0.62 (0.58); EL 0.14–0.19 (0.17); PH 0.38–0.49 (0.45); PW 0.47–0.63 (0.58); WL 0.83–1.11 (1.03); PSL 0.17–0.26 (0.23); PTL 0.10–0.14 (0.12); PTH 0.29–0.38 (0.34); PTW 0.23–0.30 (0.27); PPL 0.21–0.29 (0.26); PPH 0.27–0.37 (0.32); PPW 0.27–0.38 (0.35); CI 92–96 (94); SI 73–78 (76); OI 21–23 (23); LMI 54–60 (57); DMI 54–60 (57); PSLI 27–30 (28); PeNI 42–50 (47); LPeI 29–39 (34); DPeI 209–270 (237); PpNI 57–64 (60); LPpI 77–84 (80); DPpI 123–146 (135); PPI 117–135 (127) (15 measured).

Head distinctly longer than wide (CI 92–96). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, ending shortly before posterior head margin. Antennal scrobes faint and weakly developed, posterior and ventral margins never differentiated. Antennal scapes relatively short, not reaching posterior head margin (SI 73–78). Eyes small to moderate (OI 21–23). Mesosomal outline in profile convex, dorsally transversely rounded, weakly to moderately marginate from lateral to dorsal mesosoma, promesonotal suture generally absent, sometimes present but shallow, metanotal groove weakly developed to absent; mesosoma comparatively stout and high (LMI 54–60). Propodeal spines elongate-triangular to spinose, long, and acute (PSLI 27–30); propodeal lobes very small and broadly triangular. Petiolar node strongly squamiform and anteroposteriorly compressed, anterior and posterior faces not parallel, anterodorsal margin higher situated and better developed than weaker posterodorsal margin, dorsum tapering backwards posteriorly; node in dorsal view transverse, between 2.1 to 2.7 times wider than long (DPeI 209–270), in lateral view more than 2.5 times higher than long (LPeI 29–39). Postpetiole in profile rounded and weakly anteroposteriorly compressed, approximately 1.2 to 1.3 times higher than long (LPpI 77–84), in dorsal view approximately 1.3 to 1.4 times wider than long (DPpI 123–146). Postpetiole in profile more voluminous than petiolar node, in dorsal view approximately 1.2 to 1.3 times wider than petiolar node (PPI 117–135). Mandibles generally striate, sometimes weakly sculptured; clypeus always with strong median longitudinal ruga and one or two weaker rugae at each side; cephalic dorsum between frontal carinae with one well-developed longitudinal median ruga and several irregular longitudinal rugae laterally, median ruga diverging approximately at eye level into two rugae running to posterior clypeal margin, rugae fading out shortly before posterior head margin, median ruga of same length as frontal carinae; scrobal area, lateral and ventral head mostly with irregular longitudinal rugulae. Head with faint punctate ground sculpture. Mesosomal dorsum generally unsculptured, rarely with faint traces of rugulae anteriorly, lateral mesosoma anteriorly almost unsculptured, posteriorly irregularly, longitudinally rugulose. Waist segments and gaster unsculptured and smooth. Mesosoma, waist segments, and first gastral tergite moderately shining due to faint punctate or foveolate ground sculpture. All dorsal surfaces of body generally with numerous fine, long, decumbent



FIGURES 14–16. *T. bessonii*, syntype—CASENT0101277 (April Nobile 2006). 14. Body in profile. 15. Body in dorsal view. 16. Head in full-face view.

to erect hairs, and comparatively long appressed to subdecumbent pubescence. Colouration mostly of uniform brownish colour, sometimes gaster darker, often head, legs, and gaster much darker brown than mesosoma and waist segments.

Notes

Tetramorium bessonii is a fairly common species in many arid environments in Madagascar. It can be found in the southeastern and southwestern portions of the island, though it seems completely absent from the southern tip. From these southern localities northwards it is also commonly encountered on the High Plateau, especially in the area around Antananarivo and Moramanga. In the northern part of Madagascar, however, *T. bessonii* seems to be comparatively rare since it is only known from few localities. It was mostly sampled from anthropogenically modified and grassland habitats followed by spiny forests, thickets, and tropical dry forests, while it was only seldom found in montane or littoral rainforests. The preferred foraging microhabitat is very likely the ground and lower vegetation, and nests are constructed directly in the ground or under rocks.

Within the species group, *T. bessonii* is morphologically closer to *T. artemis* and *T. wardi* due to approximately the same petiolar node shape, which is squamiform and strongly anteroposteriorly compressed with a highly transverse dorsum. This character separates these three species from the remaining group members, *T. malagasy*, *T. orientale*, and *T. ryanphelanae*, which possess a high nodiform petiolar node with a far less transverse dorsum. However, *T. bessonii* can be clearly distinguished from *T. artemis* and *T. wardi*. The latter both have a head shape that is approximately as long as wide (CI 98–101), whereas the head of *T. bessonii* is distinctly longer than wide (CI 92–96). Also, *T. artemis* and *T. wardi* have relatively short, appressed pubescence on the first gastral tergite, whereas the pubescence is distinctly longer and appressed to decumbent in *T. bessonii*. Another character that separates the latter species from *T. artemis* is the sculpture on the cephalic dorsum between the frontal carinae. In *T. bessonii* one can see a single median ruga and several additional rugae laterally, whereas *T. artemis* possesses only one median ruga. The sculpture on the cephalic dorsum of *T. wardi* is similar to that observed in *T. bessonii*, although it is somewhat less developed. Nevertheless, these species cannot be confused due to the key characters mentioned above.

Material examined

MADAGASCAR: no locality data (*Besson*); Antananarivo, 18° 55' S, 47° 32' E, 1300 m, 31.I.1993 (*P.S. Ward*); Antananarivo, Alasora, 18.96245 S, 47.58925 E, 1434 m, grassland, 4.V.2007 (*B.L. Fisher et al.*); Antananarivo, Alasora, 18.96245 S, 47.58925 E, 1326 m, urban/garden, 4.V.2007 (*B.L. Fisher et al.*); Antananarivo, Ambohimanga, 18.76125 S, 47.56447 E, 1361 m, roadside, 26.IV.2007 (*B.L. Fisher et al.*); Antananarivo, Ambatolampy, 19.387 S, 47.4285 E, 1580 m, urban/garden, 30.I.2007 (*B.L. Fisher*); Antananarivo, Ambatolaona, 18.928 S, 47.88283 E, 1382 m, urban/garden, 19.II.2007 (*B.L. Fisher et al.*); Antananarivo, 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, 18.47333 S, 47.96 E, 1300 m, montane rainforest, 5.-13.XII.2000 (*B.L. Fisher, C. Griswold et al.*); Antananarivo, Ankazobe, 18.31617 S, 47.11583 E, 1241 m, urban/garden, 9.II.2007 (*B.L. Fisher*); Antananarivo, Antsahadinta, 19.0128 S, 47.40668 E, 1403 m, urban/garden, 8.V.2007 (*B.L. Fisher et al.*); Antananarivo, 10 km NE Antananarivo, Lac Alarobie, 18° 45' 32.6" S, 47° 33' 45.1" E, 1360 m, 10.III.1991 (*G.D. Alpert*); Antananarivo, Antsirabe, 19.866 S, 47.0355 E, 1550 m, urban/garden, 5.II.2007 (*B.L. Fisher et al.*); Antananarivo, Ilafy, 18.85415 S, 47.56575 E, 1385 m, urban/garden, 26.IV.2007 (*B.L. Fisher et al.*); Antananarivo, Mandoto, 19.57967 S, 46.28967 E, 870 m, urban/garden, 31.I.2007 (*B.L. Fisher et al.*); Antananarivo, Kaloy, 18.59568 S, 47.65333 E, 1338 m, grassland, 27.IV.2007 (*B.L. Fisher et al.*); Antsiranana, Ankobahoba, 32.3 km N Ambanja, 13.39166 S, 48.48249 E, 41 m, disturbed littoral rainforest, 12.IV.2008 (*B.L. Fisher et al.*); Antsiranana, Bekonazy, 5 km W, baobab forest, 23.III.1968 (*W.L. Brown*); Fianarantsoa, no locality data (*Besson*); Fianarantsoa, Pays de Betsileo (*Besson*); Fianarantsoa, Ambalavao, 21.83267 S, 46.93867 E, 1020 m, urban/garden, 13.XII.2006 (*B.L. Fisher et al.*); Fianarantsoa, 28 km. SSW Ambositra, Ankazomivady, 20.775 S, 47.16833 E, 1670 m, grassland, 9.-13.I.1998 (*B.L. Fisher*); Fianarantsoa, Imerina (*Sikora*); Fianarantsoa, Ihosy, 22.40317 S, 46.12917 E, 735 m, urban/garden, 12.XII.2006 (*B.L. Fisher*); Fianarantsoa, Parc National d'Isalo, Ambovo Springs, 29.3 km 4° N Ranohira, 22.29833 S, 45.35167 E, 990 m, Uapaca woodland, 9.-14.II.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, stream area, 900 m E of Isalo National Park Interpretive Center, 22.62667 S, 45.35817 E, 750 m, open area near stream, 22.I.–2.II.2003 (*R. Harin'Hala*); Mahajanga, Parc National Tsingy de Bemaraha, 10.6 km ESE 123° Antsalova, 18.70944 S, 44.71817 E, 150 m, tropical dry forest, 16.–20.XI.2001 (*B.L.*

Fisher et al.); Mahajanga, Réserve forestière Beanka, 50.2 km E Maintirano, 18.02649 S, 44.05051 E, 250 m, tropical dry forest, 19.–23.X.2009 (*B.L. Fisher et al.*); Mahajanga, Réserve forestière Beanka, 50.2 km E Maintirano, 17.88756 S, 44.47265 E, 153 m, tropical dry forest, 31.X.2009 (*B.L. Fisher et al.*); Mahajanga, Réserve forestière Beanka, 50.7 km E Maintirano, 17.88021 S, 44.46877 E, 140 m, tropical dry forest, 28.X.–1.XI.2009 (*B.L. Fisher et al.*); Majunga, Mampikony, 16.09323 S, 47.64278 E, 49 m, urban/garden, 20.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.85813 S, 48.28488 E, 1040 m, grassland, 4.–8.III.2007 (*B.L. Fisher et al.*); Toamasina, Moramanga, 18.94417 S, 48.23067 E, 922 m, urban/garden, 14.II.2007 (*B.L. Fisher et al.*); Toliara, Amboasary, 25.03883 S, 46.3835 E, 25 m, urban/garden, 9.XII.2006 (*B.L. Fisher*); Toliara, Berenty, Ambosary, 13.VIII.1984 (*J.M. Wilson*); Toliara, 18 km NNW Betroka, 23° 9' 48" S, 45° 58' 7" E, 825 m, savanna, 24.XI.1994 (*M.A. Ivie & D.A. Pollock*); Toliara, Ejeda, 24.3505 S, 44.516 E, 250 m, urban/garden, 10.XII.2006 (*B.L. Fisher*); Toliara, Forêt de Beroboka, 5.9 km 131° SE Ankidranoka, 22.23306 S, 43.36633 E, 80 m, tropical dry forest, 12.-16.III.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Forêt de Mahavelo, Isantoria River, 24.75833 S, 46.15717 E, 110 m, spiny forest/thicket, 28.I.–1.II.2002 (*B.L. Fisher & C. Griswold*); Toliara, Forêt de Tsinjoriaky, 6.2 km 84° E Tsifota, 22.80222 S, 43.42067 E, 70 m, spiny forest/thicket, 6.-10.III.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Forêt Vohidava 89.2 km N Amboasary, 24.239 S, 46.28233 E, 850 m, tropical dry forest, 8.XII.2006 (*B.L. Fisher et al.*); Toliara, Ivahona, 23.45591 S, 46.17376 E, 820 m, village/park/garden, 12.II.2009 (*B.L. Fisher et al.*); Toliara, Malaimbandy, 20.34317 S, 45.59567 E, 180 m, urban/garden, 2.II.2007 (*B.L. Fisher*); Toliara, 48 km ENE Morondava, 20° 04' S, 44° 39' E, 30 m, tropical dry forest, 5.I.1991 (*D.M. Olson*); Toliara, Parc National d'Andohahela, Forêt de Manantalinjo, 33.6 km 63° ENE Amboasary, 7.6 km 99° E Hazofotsy, 24.81694 S, 46.61 E, 150 m, spiny forest/thicket, 12.–16.I.2002 (*B.L. Fisher & C. Griswold*); Toliara, Parc National d'Andohahela, Forêt d'Ambohibory, 1.7 km 61° ENE Tsimelahy, 36.1 km 308° NW Tolagnaro, 24.93 S, 46.6455 E, 300 m, tropical dry forest, 16.–20.I.2002 (*B.L. Fisher & C. Griswold*); Toliara, Parc National de Tsimanampetsotsa, Forêt de Bemanateza, 20.7 km 81° E Efoetse, 23.0 km 131° SE Beheloka, 23.99222 S, 43.88067 E, 90 m, spiny forest/thicket, 22.–26.III.2002 (*B.L. Fisher et al.*); Toliara, Réserve Berenty, 25° 01' S, 46° 18' E, 25 m, tropical dry forest, 9.II.1993 (*P.S. Ward*); Toliara, Res. Beza Mahafaly, Parcel 1, 23° 39' S, 44° 38' E, 130 m, tropical dry forest, 13.XI.1993 (*P.S. Ward*); Toliara, Réserve Spéciale Kalambatritra, Ambinanitelo, 23.45707 S, 46.4473 E, 1300 m, grassland, 8.II.2009 (*B.L. Fisher et al.*); Toliara, Réserve Spéciale Kalambatritra, Ambinanitelo, 23.45373 S, 46.45773 E, 1345 m, grassland, 11.II.2009 (*B.L. Fisher et al.*); Toliara, Réserve Spéciale Kalambatritra, 23.4185 S, 46.4583 E, 1365 m, grassland, 8.II.2009 (*B.L. Fisher et al.*); Toliara, Sakaraha, 22.91233 S, 44.53283 E, 470 m, urban/garden, 11.XI.2006 (*B.L. Fisher*); Toliara, southern Isoky-Vohimena Forest, 59 km NE Sakaraha, 22.46667 S, 44.85 E, 730 m, tropical dry forest, 21.I.1996 (*B.L. Fisher*); Tulear Prov., Tulear, near road, Zombitse National Park, 22.8405 S, 44.73117 E, 825 m, spiny deciduous forest, 28.II.–6.III.2002 (*R. Harin'Hala*).

Tetramorium malagasy **Hita Garcia & Fisher sp. n.**
(figs 2, 8, 9, 17, 18, 19)

Holotype worker, MADAGASCAR, Toliara, Forêt de Mite, 20.7 km 29° WNW Tongobory, 23.52417 S, 44.12133 E, 75 m, gallery forest, ex rotten log, BLF5905, 27.II.-3.III.2002 (*B.L. Fisher et al.*) (CASC: CASENT0449550). Paratypes, eight workers with same data as holotype (BMNH: CASENT0449549; CASC: CASENT0449540; CASENT0449541; CASENT0449542; CASENT0449543; CASENT0449544; CASENT0449545; CASENT0449547; CASENT0449548); 27 workers with same data as holotype but collection code BLF5850 (CASC: CASENT0018397; CASENT0018732; CASENT0018738; CASENT0018740; CASENT0018748; CASENT0019010; CASENT0019013; CASENT0019016; CASENT0019018; CASENT0019024;CASENT0019027; CASENT0019028; CASENT0019031; CASENT0019036; CASENT0019038; CASENT0019051;CASENT0019040; CASENT0019044; CASENT0019053; CASENT0019056; CASENT0019057; CASENT0019061; CASENT0019064; CASENT0019066; CASENT0019076; MCZ: CASENT0018734; NHMB: CASENT0018736); and four workers with same data as holotype but collection code BLF5961 (CASC: CASENT0004095; CASENT0004098; CASENT0004104; MHNG: CASENT0004141).

FIGURES 17–19. *T. malagasy*, holotype—CASENT0449550 (Erin Prado 2010). 17. Body in profile. 18. Body in dorsal view. 19. Head in full-face view.

Diagnosis

The following combination of characters distinguishes *T. malagasy* from the other species group members: short antennal scapes (SI 71–74); PSLI 33–37; absence of promesonotal suture; petiolar node in profile high nodiform, anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles at about same height, dorsum well-developed and not tapering backwards posteriorly; standing hairs absent from waist segments and first gastral tergite; and pubescence on first gastral tergite very short and appressed.

Description

HL 0.76–0.85 (0.82); HW 0.76–0.87 (0.82); SL 0.56–0.62 (0.60); EL 0.16–0.20 (0.18); PH 0.43–0.49 (0.46); PW 0.56–0.63 (0.60); WL 1.01–1.13 (1.07); PSL 0.25–0.31 (0.28); PTL 0.17–0.20 (0.19); PTH 0.31–0.34 (0.33); PTW 0.27–0.32 (0.29); PPL 0.22–0.25 (0.24); PPH 0.30–0.36 (0.33); PPW 0.32–0.37 (0.35); CI 100–102 (101); SI 71–74 (73); OI 20–24 (22); DMI 54–58 (56); LMI 42–45 (43); PSLI 33–37 (34); PeNI 45–51 (48); LPeI 51–63 (57); DPeI 147–165 (155); PpNI 52–61 (57); LPpI 68–75 (72); DPpI 138–152 (145); PPI 112–129 (120) (15 measured).

Head generally wider than long (CI 100–102). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, becoming weaker shortly after level of posterior eye margin and fading out shortly before posterior head margin. Antennal scrobes faint to absent, posterior and ventral margins never differentiated. Antennal scapes short, not reaching posterior head margin (SI 71–74). Eyes small to moderate (OI 20–24). Mesosomal outline in profile convex, dorsally transversely rounded, weakly to moderately marginate from lateral to dorsal mesosoma; promesonotal suture absent, metanotal groove weak but present; mesosoma comparatively stout (LMI 42–45). Propodeal spines long, spinose, and acute (PSLI 33–37). Propodeal lobes very small and broadly triangular. Petiolar node high nodiform, anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; node in dorsal view not strongly transverse, between 1.4 to 1.7 times wider than long (DPeI 147–165), in lateral view between 1.6 to 2 times higher than long (LPeI 51–63). Postpetiole in profile rounded and weakly anteroposteriorly compressed, approximately 1.3 to 1.5 times higher than long (LPpI 68–75), in dorsal view between 1.3 to 1.6 wider than long (DPpI 138–152). Postpetiole in profile less voluminous than petiolar node, in dorsal view approximately 1.1 to 1.3 times wider than petiolar node (PPI 112–129). Mandibles distinctly longitudinally striate; clypeus always with strong median longitudinal ruga and one or two weaker rugulae at each side; cephalic dorsum between frontal carinae only with one well-developed longitudinal median ruga, median ruga diverging approximately at eye level into two rugae running to posterior clypeal margin, area between median ruga and frontal carinae often unsculptured or with traces of weak rugulae, median ruga of same length as frontal carinae; scrobal area, lateral and ventral head with irregular longitudinal rugulae, anteriorly more reticulate-rugose and posteriorly more weakly developed. Ground sculpture generally weak, but present. Mesosoma, waist segments, and gaster unsculptured and smooth. Ground sculpture on whole body generally faint. Head with several long, standing hairs, mesosoma often without any pilosity, mesonotum sometimes with one pair of hairs, waist segments and first gastral tergite always without any standing hairs; whole body with widely spaced short, appressed pubescence. Whole body of uniform brownish colour.

Notes

The new species is widely distributed in Madagascar, and seems to prefer deciduous forest habitats, such as tropical dry forest, gallery forest, spiny forest or thicket, whereas it is much rarer in humid forests. It occurs in many localities at the western coast from the Mahafaly Plateau north to Namoroka, and several more in the southwest from Beza-Mahafaly through Sakaraha and Zombitse to Vohibasia, Analalava, and Isalo. *Tetramorium malagasy* is also present in the southeast around Mahavelo and Berenty, and several forests in the east north to Moramanga. However, it seems to be comparatively rare north of Moramanga in the east and Namoroka in the west since it was only sampled from three localities in the northwest (Anabohazo, Ambilanivy, Ambato).

Tetramorium malagasy cannot be confused with the three species *T. artemis*, *T. bessonii*, and *T. wardi* since they all display a squamiform, anteroposteriorly compressed petiolar node with an anterodorsal margin that is situated higher than the posterodorsal margin, causing the dorsum to taper backwards posteriorly. This shape contrasts with the petiolar node of *T. malagasy*, which is high nodiform with anterior and posterior faces approximately parallel and anterodorsal and posterodorsal angles at about the same height. The two remaining species, *T. orientale* and *T. ryanphelanae*, share the same node shape with *T. malagasy*, and are all morphologically

close to each other. However, *T. orientale* possesses a well-developed and conspicuous promesonotal suture that separates it from the other two species. This is the only character that separates *T. orientale* from *T. malagasy*, and it is possible that both are in fact conspecific. Yet the promesonotal suture is completely absent in all the examined *T. malagasy* material, and we currently consider these ants to belong to two different species.

Tetramorium ryanphelanae and *T. malagasy* share the same general habitus and almost similar morphometric ranges, but *T. ryanphelanae* is a much hairier species than *T. malagasy.* The latter lacks standing hairs on waist segments and first gastral tergite, and shows a short, appressed pubescence on the first gastral tergite, whereas in *T. ryanphelanae* standing hairs are usually present on the waist segments and first gastral tergite in combination with a comparatively long, appressed pubescence. Another difference, although not very pronounced, is the propodeal spine length, which is slightly longer in *T. malagasy* (PSLI 33–37) than in *T. ryanphelanae* (PSLI 28–33). Furthermore, the antennal scapes of the latter species are comparatively longer (SI 76–78) than in *T. malagasy* (SI 71–74).

In addition, the distribution ranges of both species are exclusive. *Tetramorium malagasy* can be mainly found in the west, south, and east, and is only known from the three north-western localities mentioned above, whereas *T. ryanphelanae seems* to be restricted to the northern-most part of Madagascar. The northern-most record of *T. malagasy* at Ambato is still moderately far from the known distribution range of *T. ryanphelanae*. Nevertheless, the allopatric distribution of the two species could also be interpreted to mean that these ants are geographic variations of the same species. However, pilosity and pubescence, especially on the first gastral tergite, is generally a very useful character for species discrimination within *Tetramorium* since it differs very little within a species while there are often great differences between species. Consequently, especially on the basis of very different pilosity patterns and additional small but distinct differences in scape and propodeal spine lengths, we consider both sufficiently discrete from one another to justify their species status.

Etymology

The new species is dedicated to Madagascar, its people and language. The species epithet is a noun in apposition and thus invariant.

Material examined

MADAGASCAR: Antananarivo, 10 km NE Antananarivo, Lac Alarobie, 18° 45' 32.6" S, 47° 33' 45.1" E, 1360 m, 10.III.1991 (*G.D. Alpert*); Antananarivo, Antsahadinta, 19.0128 S, 47.40668 E, 1403 m, urban garden, 6.V.2007 (*B.L. Fisher et al.*); Antananarivo, Iharanandriana, 19.15823 S, 47.49702 E, 1513 m, Uapaca woodland, 9.V.2007 (*B.L. Fisher et al.*); Antsiranana, Ampasindava, Forêt d'Ambilanivy, 3.9 km 181° S Ambaliha, 13.79861 S, 48.16167 E, 600 m, rainforest, 4.-9.III.2001 (*B.L. Fisher et al.*); Antsiranana, Forêt Ambato, 26.6 km 33° Ambanja, 13.4645 S, 48.55167 E, 150 m, rainforest, 8.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt d'Anabohazo, 21.6 km 247° WSW Maromandia, 14.30889 S, 47.91433 E, 120 m, tropical dry forest, 11.-16.III.2001 (*B.L. Fisher et al.*); Fianarantsoa, Forêt d'Analalava, 29.6 km 280° W Ranohira, 22.59167 S, 45.12833 E, 700 m, tropical dry forest, 1.-5.II.2003 (*B.L. Fisher et al.*); Fianarantsoa, Forêt d'Atsirakambiaty, 7.6 km 285° WNW Itremo, 20.59333 S, 46.56333 E, 1550 m, montane rainforest, 22.-26.I.2003 (*B.L. Fisher et al.*); Fianarantsoa, P.N. Isalo, 9 km NNW Ranohira, 22 29 S, 45 23 E, 800 m, rainforest, 16.II.1993 (*P.S. Ward*); Fianarantsoa, 900 m E of Isalo National Park Interpretive Center, 22.62667 S, 45.35817 E, 750 m, open area near stream, 22.-29.XI.2002 (*R. Harin'Hala*); Fianarantsoa, 1 km E of Isalo National Park Interpretive Center, 22.62667 S, 45.35817 E, 885 m, dry wash, 15.X.-9.XI.2001 (*M.E. Erwin, F.D. Parker & R. Harin'Hala*); Fianarantsoa, 1 km E of Isalo National Park Interpretive Center, 22.62667 S, 45.35817 E, 885 m, dry wash, 29.XII.2001-5.I.2002 (*R. Harin'Hala*); Fianarantsoa, 1 km E of Isalo National Park Interpretive Center, 22.62667 S, 45.35817 E, 885 m, dry wash, 15.-29.IV.2002 (*R. Harin'Hala*); Fianarantsoa, 1 km E of Isalo National Park Interpretive Center, 22.62667 S, 45.35817 E, 885 m, dry wash, 5.-17.III.2003 (*R. Harin'Hala*); Fianarantsoa, P.N. Ranomafana, Tolongoina-Ampasimpotsy 1/2, 21.47993 S, 47.55707 E, 577 m, 10.IV.2003 (*V.C. Clark*); Fianarantsoa, Parc National d'Isalo, 9.1 km 354° N Ranohira, 22.48167 S, 45.46167 E, 725 m, gallery forest, 27.-31.I.2003 (*B.L. Fisher et al.*); Fianarantsoa, Réserve Forestière d'Agnalazaha, Mahabo, 42.9 km 215° Farafangana, 23.19383 S, 47.723 E, 20 m, littoral rainforest, 19.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Tsaranoro, 32.8 km 229° Ambalavao, 22.08483 S, 46.77633 E, 950 m, rainforest, 14.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Tsaranoro, 32.8 km 230° Ambalavao, 22.08317 S, 46.774 E, 975 m, savannah woodland, 14.IV.2006 (*B.L. Fisher et al.*); Mahajanga, Forêt de Tsimembo, 11.0 km 346° NNW Soatana,

18.99528 S, 44.4435 E, 50 m, tropical dry forest, 21.-25.XI.2001 (*B.L. Fisher et al.*); Mahajanga, Parc National de Namoroka, 17.8 km 329° WNW Vilanandro, 16.37667 S, 45.32667 E, 100 m, tropical dry forest, 8.-12.XI.2002 (*B.L. Fisher et al.*); Mahajanga, Parc National de Namoroka, 16.9 km 317° NW Vilanandro, 16.40667 S, 45.31 E, 100 m, tropical dry forest, 12.-16.XI.2002 (*B.L. Fisher et al.*); Mahajanga, Parc National Tsingy de Bemaraha, 10.6 km ESE 123° Antsalova, 18.70944 S, 44.71817 E, 150 m, tropical dry forest on Tsingy, 16.-20.XI.2001 (*B.L. Fisher et al.*); Mahajanga, Réserve forestière Beanka, 50.2 km E Maintirano, 18.02649 S, 44.05051 E, 250 m, tropical dry forest on tsingy, 19-23.X.2009 (*B.L. Fisher et al.*); Mahajanga, Réserve forestière Beanka, 50.2 km E Maintirano, 17.88756 S, 44.47265 E, 153 m, tropical dry forest on tsingy, 31.X.2009 (*B.L. Fisher et al.*); Mahajanga, Réserve forestière Beanka, 50.7 km E Maintirano, 17.88021 S, 44.46877 E, 140 m, tropical dry forest on tsingy, 28.X.-1.XI.2009 (*B.L. Fisher et al.*); Mahajanga, Réserve Spéciale de Bemarivo, 23.8 km 223° SW Besalampy, 16.925 S, 44.36833 E, 30 m, tropical dry forest, 19.-23.XI.2002 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.84773 S, 48.29568 E, 1000 m, montane rainforest, 5.–8.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.85813 S, 48.28488 E, 1040 m, montane rainforest, 5.–8.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.85813 S, 48.28488 E, 1040 m, grassland, 5.–8.III.2007 (*B.L. Fisher et al.*); Toamasina, Forêt Ambatovy, 14.3 km 57° Moramanga, 18.85083 S, 48.32 E, 1075 m, montane shrubland, on rock, 18.XII.2004 (*B.L. Fisher*); Toliara, Beza-Mahafaly, 27 km E Betioky, 23.65 S, 44.63333 E, 135 m, tropical dry forest, 23.IV.1997 (*B.L. Fisher*); Toliara, Forêt de Beroboka, 5.9 km 131° SE Ankidranoka, 22.23306 S, 43.36633 E, 80 m, tropical dry forest, 12.–16.III.2002 (*B.L. Fisher et al.*); Toliara, Forêt de Mahavelo, Isantoria River, 5.5 km 37° NE Ifotaka, 24.75361 S, 46.1515 E, 115 m, spiny forest/thicket, 31.I.2002 (*B.L. Fisher et al.*); Toliara, Forêt de Mite, 20.7 km 29° WNW Tongobory, 23.52417 S, 44.12133 E, 75 m, gallery forest, 27.II.–3.III.2002 (*B.L. Fisher et al.*); Toliara, Forêt Vohidava 88.9 km N Amboasary, 24.24067 S, 46.28783 E, 500 m, spiny forest/dry forest transition, 7.–9.XII.2006 (*B.L. Fisher et al.*); Toliara, Mahafaly Plateau, 6.2 km 74° ENE Itampolo, 24.65361 S, 43.99667 E, 80 m, spiny forest/thicket, 21.–25.II.2002 (*B.L. Fisher et al.*); Toliara, Manatantely, 8.9km NW Tolagnaro, 24.9815 S, 46.92567 E, 100 m, rainforest, 27.–28.XI.2006 (*B.L. Fisher et al.*); Toliara, Parc National d'Andohahela, Forêt d'Ambohibory, 1.7 km 61° ENE Tsimelahy, 36.1 km 308° NW Tolagnaro, 24.93 S, 46.6455 E, 300 m, tropical dry forest, 16.–20.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, 80 m, tropical dry forest, 6.–10.XII.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, tropical dry forest, 5.–9.II.2003 (*B.L. Fisher et al.*); Toliara, Parc National de Zombitse, 17.7 km 98° E Sakaraha, 22.88833 S, 44.70167 E, 760 m, tropical dry forest, 8.II.2003 (*B.L. Fisher et al.*); Toliara, Ranobe, 23.03918 S, 43.61153 E, 30 m, spiny forest/thicket, 25.–28.IV.2003 (Frontier Project); Toliara, Res. Beza Mahafaly, Parcel 1, 23° 39' S, 44° 38' E, 130 m, tropical dry forest, 13.II.1993 (*P.S. Ward*); Toliara, Res. Beza Mahafaly, Parcel 1, 23° 39' 30" S, 44° 37' 44" E, 160 m, tropical dry forest, 13.II.1993 (*E. Rajeriarison, G.D. Alpert et al.*); Toliara, Réserve Privé Berenty, Forêt de Malaza, Mandraré River, 8.6 km 314° NW Amboasary, 25.00778 S, 46.306 E, 40 m, gallery forest, 6.II.2002 (*B.L. Fisher et al.*); Toliara, 15 km E Sakaraha, 22° 54 S, 44° 41' E, 760 m, tropical dry forest, 15.II.1993 (*P.S. Ward*); Toliara, southern Isoky-Vohimena Forest, 59 km NE Sakaraha, 22.46667 S, 44.85 E, 730 m, tropical dry forest, 21.I.1996 (*B.L. Fisher*); Toliara, Vohibasia Forest, 59 km NE Sakaraha, 22.46667 S, 44.85 E, 780 m, tropical dry forest, 13.I.1996 (*B.L. Fisher*).

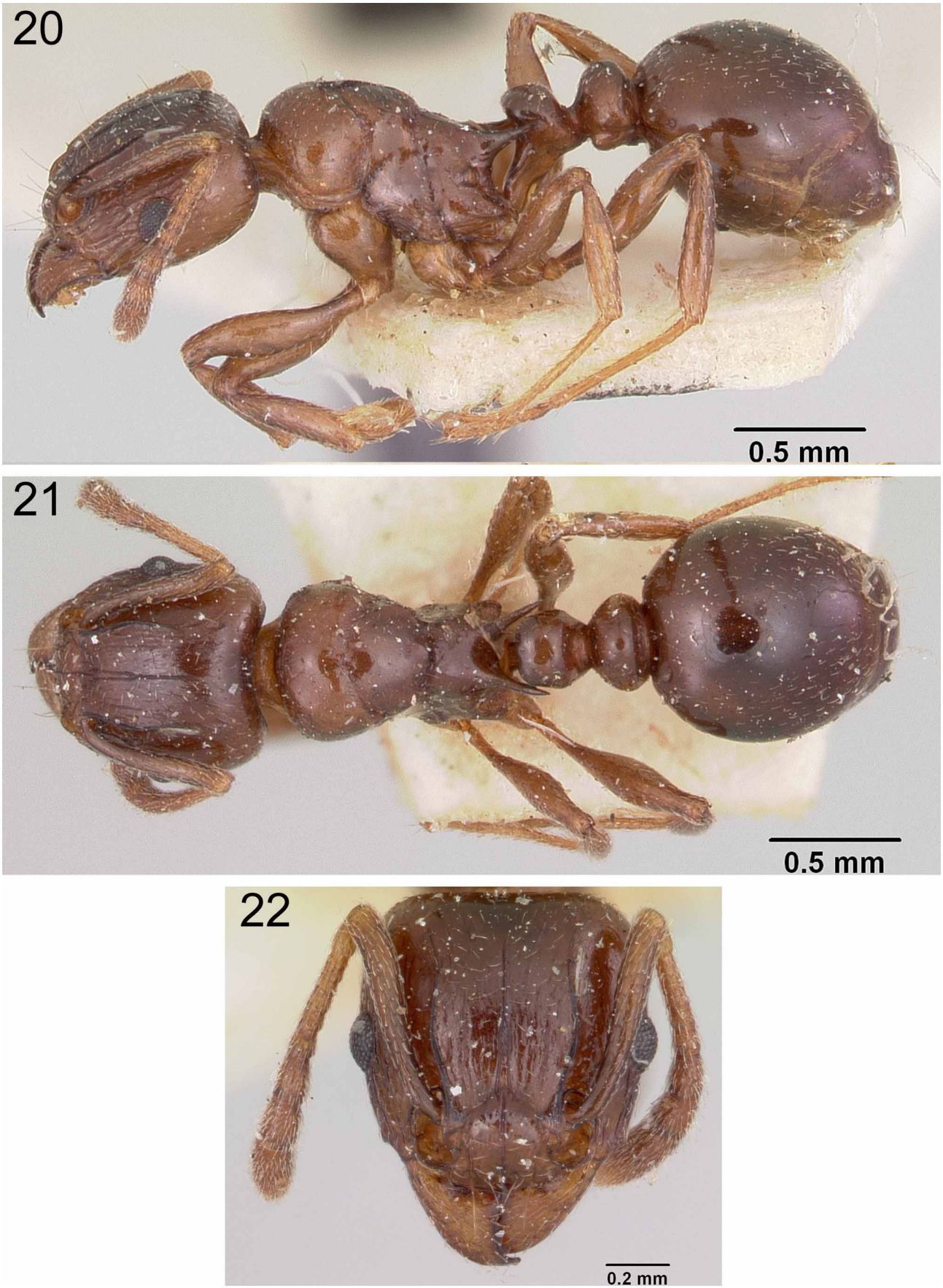
Tetramorium orientale **Forel, 1895a stat. n.**

(figs 7, 20, 21, 22)

Tetramorium (Xiphomyrmex) bessonii var. *orientale* Forel, 1895a:247. Holotype worker, MADAGASCAR, Fianarantsoa, Imerina (*Sikora*) (MHNG: CASENT0101744) [examined]. [Synonymy with *T. bessonii* by Bolton, 1979:141].

Diagnosis

Tetramorium orientale is easily recognisable within its species group due to the character combination of: well-developed, conspicuous promesonotal suture; high nodiform petiolar node in profile with approximately parallel anterior and posterior faces, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; absence of standing hairs on waist segments and first gastral tergite, and very short, appressed pubescence on first gastral tergite.



FIGURES 20–22. *T. orientale*, holotype—CASENT0101744 (April Nobile 2006). 20. Body in profile. 21. Body in dorsal view. 22. Head in full-face view.

Description

HL 0.82; HW 0.84; SL 0.62; EL 0.18; PH 0.48; PW 0.63; WL 1.06; PSL 0.28; PTL 0.19; PTH 0.34; PTW 0.30; PPL 0.25; PPH 0.35; PPW 0.39; CI 102; SI 74; OI 21; DMI 59; LMI 45; PSLI 34; PeNI 47; LPeI 57; DPeI 155; PpNI 62; LPpI 71; DPpI 156; PPI 132 (one measured).

Head wider than long (CI 102). Anterior clypeal margin with distinct median impression. Frontal carinae well developed, ending shortly between posterior eye margin and posterior head margin. Antennal scrobes faint to absent, posterior and ventral margins not differentiated. Antennal scapes short, not reaching posterior head margin (SI 74). Eyes small to moderate (OI 21). Mesosomal outline in profile convex, dorsally transversely rounded, weakly marginate from lateral to dorsal mesosoma, promesonotal suture present, metanotal groove weakly developed; mesosoma comparatively stout and high (LMI 45). Propodeal spines long, spinose, and acute (PSLI 34). Propodeal lobes very small and broadly triangular. Petiolar node high nodiform, anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; node in dorsal view not strongly transverse, approximately 1.5 to 1.6 times wider than long (DPeI 155), in lateral view 1.8 times higher than long (LPeI 57). Postpetiole in profile rounded and weakly anteroposteriorly compressed, 1.4 times higher than long (LPpI 71), in dorsal view approximately approximately 1.5 to 1.6 times wider than long (DPpI 156). Postpetiole in profile approximately as voluminous as petiolar node, in dorsal view 1.3 times wider than petiolar node (PPI 132). Mandibles striate; clypeus with strong median longitudinal rugae and one weaker ruga at each side; cephalic dorsum between frontal carinae with one well-developed longitudinal median ruga and traces of short rugulae laterally, median ruga of same length as frontal carinae and diverging approximately at eye level into two rugae running to posterior clypeal margin; scrobal area unsculptured, lateral and ventral head anteriorly with irregular longitudinal rugulae, posteriorly with almost unsculptured; ground sculpture on head faint to absent. Mesosoma, waist segments, and gaster unsculptured, smooth, and shining. Head with several pairs of standing hairs, mesosoma with only one pair on pronotal dorsum, waist segments and first gastral tergite without any pilosity; all dorsal surfaces of body with widely-spaced, very short, and appressed pubescence. Body uniformly brown.

Notes

This species is only known from the type locality. Unfortunately, the information from the type label data is very limited. The locality given is "Imerina", which can mean a wide area on the Central Plateau of Madagascar. This very broad geographical reference does not allow an exact determination of the type locality.

Tetramorium orientale was originally described as subspecies of *T. bessonii* (Forel, 1895a), and later synonymised under the same species (Bolton, 1979). This synonymisation is understandable considering the geographically limited material available at the time. Bolton (1979) only revised *T. bessonii* since none of the other species group members were known, and the only specimen of *T. orientale* was most likely a rare variation of *T. bessonii*. However, our study shows that *T. orientale* is not conspecific with *T. bessonii* since both differ in several aspects that provide sufficient evidence to raise *T. orientale* to species status. The petiolar node shape, which is strongly anteroposteriorly compressed with the anterodorsal margin situated higher than the posterodorsal in *T. bessonii*, is less compressed, more high nodiform with antero- and posterodorsal margins at about the same height in *T. orientale*. Furthermore, the cephalic sculpture consisting of several rugae between the frontal carinae always present in *T. bessonii* is reduced to a single median ruga in *T. orientale*. Another character that separates both species is head shape. The head of *T. bessonii* is always distinctly longer than wide (CI 92–96) while it is wider than long in *T. orientale* (CI 102).

Within the species group, *T. orientale* is morphologically closer to *T. malagasy* and *T. ryanphelanae*. All three have the high nodiform petiolar node in profile in common, which differs from the strongly anteroposteriorly compressed node seen in *T. artemis*, *T. bessonii*, and *T. wardi*. However, *T. orientale* displays much shorter pubescence and a lack of standing hairs on waist segments and first gastral tergite in comparison to *T. ryanphelanae*, making these species unlikely to be confused. *Tetramorium malagasy*, however, is very similar to *T. orientale*, and it is possible that both are indeed the same species. The only character separating them is the well-developed and conspicuous promesonotal suture, which is present in *T. orientale*, and the lack of it in *T. malagasy*. A single morphological character might seem to be a weak argument, but our decision is based on the examination of a large number of *T. malagasy* specimens from numerous localities throughout Madagascar, and, as pointed out above, not a single one showed the noticeable promesonotal suture seen in *T. orientale*. Unfortunately, the

unknown type locality of *T. orientale* makes it difficult to obtain fresh specimens. Furthermore, since it is only known from the holotype, which is more than 100 years old, it is not possible to recover genetic material that could be used to test this ant's conspecificity with *T. malagasy.* For all of these reasons, we consider both to be distinct species, although we cannot rule out the possibility that the single specimen of *T. orientale* is an aberrant form of *T. malagasy.*

Material examined
MADAGASCAR: Imerina (*Sikora*).

Tetramorium ryanphelanae **Hita Garcia & Fisher sp. n.**
(figs 10, 23, 24, 25)

Holotype worker, MADAGASCAR, Antsiranana, Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, 12.90889 S, 49.10983 E, 80 m, sifted litter, tropical dry forest, BLF2972, 10.–16.II.2001 (*B.L. Fisher et al.*) (CASC: CASENT0454495). Paratypes nine workers with same data as holotype (CASC: CASENT0454488; CASENT0454492; CASENT0454498; CASENT0454506; CASENT0454508; CASENT0454510; CASENT0454512; CASENT0454514; CASENT0454515); seven workers with same data as holotype but from ground nest and collection code BLF2992 (CASC: CASENT0427964; CASENT0427965; CASENT0427966); and 31 workers from Antsiranana, Réserve Spéciale de l'Ankarana, 13.6 km 192° SSW Anivorano Nord, 12.86361 S, 49.22583 E, 210 m, sifted litter, tropical dry forest, collection codes BLF3010 and BLF3012, 16.–21.II.2001 (*B.L. Fisher et al.*) (BMNH: CASENT0441698; CASC: CASENT0401616; CASENT0401617; CASENT0401618; CASENT0401619; CASENT0401620; CASENT0401621; CASENT0441560; CASENT0441565; CASENT0441566; CASENT0441567; CASENT0441576; CASENT0441577; CASENT0441578; CASENT0441579; CASENT0441582; CASENT0441586; CASENT0441588; CASENT0441619; CASENT0441621; CASENT0441624; CASENT0441624; CASENT0441655; CASENT0448303; CASENT0448311; CASENT0448345; CASENT0448347; CASENT0448367; CASENT0448373; MCZ: CASENT0441569; MHNG: CASENT0448330; NHMB: CASENT0441581).

Diagnosis
The following character combination renders *T. ryanphelanae* recognisable within the *T. bessonii* group: short antennal scapes (SI 76–78); PSLI 28–33; absence of promesonotal suture; high nodiform petiolar node in profile with approximately parallel anterior and posterior faces, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; presence of standing hairs on waist segments and first gastral tergite; and relatively long, appressed to decumbent pubescence on first gastral tergite.

Description
HL 0.68–0.88 (0.81); HW 0.70–0.90 (0.83); SL 0.54–0.68 (0.63); EL 0.15–0.21 (0.18); PH 0.41–0.56 (0.49); PW 0.53–0.68 (0.62); WL 0.91–1.22 (1.09); PSL 0.21–0.28 (0.25); PTL 0.17–0.23 (0.20); PTH 0.31–0.37 (0.34); PTW 0.25–0.32 (0.28); PPL 0.22–0.27 (0.25); PPH 0.29–0.37 (0.33); PPW 0.31–0.42 (0.36); CI 101–104 (102); SI 76–78 (77); OI 20–23 (22); DMI 56–59 (57); LMI 43–47 (45); PSLI 28–33 (30); PeNI 41–50 (46); LPeI 52–62 (59); DPeI 133–150 (142); PpNI 52–62 (58); LPpI 70–80 (74); DPpI 135–155 (146); PPI 122–132 (126) (15 measured).

Head wider than long (CI 101–104). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, becoming weaker and fading out shortly after level of posterior eye margin. Antennal scrobes faint to absent, posterior and ventral margins never differentiated. Antennal scapes short, not reaching posterior head margin (SI 76–78). Eyes small to moderate (OI 20–23). Mesosomal outline in profile convex, dorsally transversely rounded, weakly to moderately marginate from lateral to dorsal mesosoma, promesonotal suture and metanotal groove absent; mesosoma comparatively stout (LMI 43–47). Propodeal spines elongate-triangular to spinose, long, and acute (PSLI 28–33). Propodeal lobes very small and broadly triangular. Petiolar node in profile high nodiform, anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; node in dorsal view not strongly transverse, between 1.3 to 1.5 times wider than long (DPeI 133–150), in lateral view between 1.6 to 1.9 times higher than long (LPeI 52–62).

Postpetiole in profile rounded and weakly anteroposteriorly compressed, approximately 1.2 to 1.4 times higher than long (LPpI 70–80), in dorsal view between 1.3 to 1.6 wider than long (DPpI 135–155). Postpetiole in profile a bit less voluminous than petiolar node, in dorsal view approximately 1.2 to 1.3 times wider than petiolar node (PPI 122–132). Mandibles distinctly longitudinally striate; clypeus always with strong median longitudinal ruga and generally one weaker ruga at each side; remainder of head mostly unsculptured, cephalic dorsum between frontal carinae only with one well-developed longitudinal median ruga, remainder unsculptured, median ruga of same length as frontal carinae and diverging approximately at eye level into two rugae running to posterior clypeal margin; scrobal area, lateral and ventral head mostly unsculptured. Ground sculpture faint. Mesosoma, waist segments, and gaster unsculptured and smooth. Ground sculpture on whole body faint to absent. All dorsal surfaces of body generally with long, erect pilosity in combination with comparatively long appressed pubescence. Body colouration uniformly brown.

Notes

The distribution of the new species seems to be restricted to the northernmost tip of Madagascar, where it is generally found in tropical dry forests at elevations of 60 m to 425 m. The southernmost localities are Foret d'Andavakoera and Foret de Binara, while the northernmost are Montagne des Français and Foret d'Orangea.

Due to its high nodiform petiolar node with anterodorsal and posterodorsal margins at approximately the same height, *T. ryanphelanae* cannot be misidentified with the three species that possess a much stronger anteroposteriorly compressed petiolar node in which the dorsum tapers backwards posteriorly (*T. artemis*, *T. bessonii*, *T. wardi*). The remaining two species are morphologically much closer to *T. ryanphelanae*, but can be clearly separated from each other. *Tetramorium orientale*, which is only known from the holotype, displays a distinct promesonotal suture, whereas this character is absent in *T. malagasy* and *T. ryanphelanae*. The distinction between these two morphologically comparatively similar species relies on antennal scape and propodeal spine lengths and gastral pilosity and pubescence. First, *T. malagasy* has comparatively shorter antennal scapes (SI 71–74) and longer propodeal spines (PSLI 33–37) than *T. ryanphelanae* (SI 76–78; PSLI 28–33). More importantly though, *T. malagasy* has only very short and strongly appressed pubescence on the first gastral tergite while in *T. ryanphelanae* the gastral pubescence is comparatively long and appressed, and combined with few long erect hairs. Additional information about the differentiation between both species is provided above in the species description of *T. malagasy.* Caution is demanded in some specimens, which do not possess standing hairs on the first gastral tergite, since they could be misidentified as *T. malagasy.* However, this can be avoided by comparing antennal scape and propodeal spine lengths.

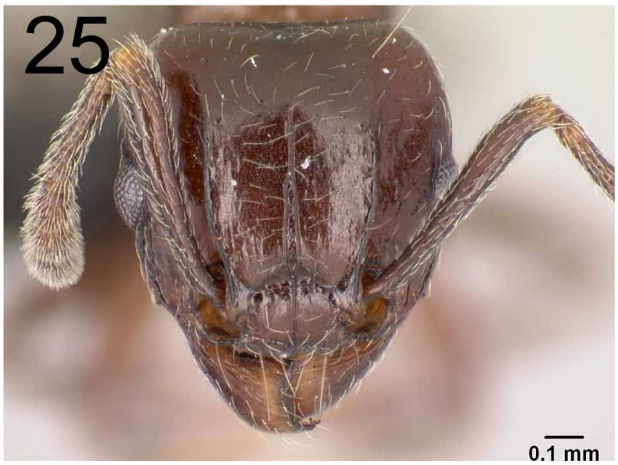
Etymology

The new species is named in honor of Ryan Phelan for her support to discover and identify life on earth.

Material examined

MADAGASCAR: Antsiranana, Forêt d' Andavakoera, 21.4km 75° ENE Ambilobe, 4.6km 356° N Betsiaka, 13.11833 S, 49.23 E, 425 m, rainforest, 15.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt de Binara, 7.5 km 230° SW Daraina, 13.255 S, 49.61667 E, 375 m, tropical dry forest, 2.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt d'Orangea, 3.6 km 128° SE Remena, 12.25889 S, 49.37467 E, 90 m, littoral rainforest, 22.–28.II.2001 (*B.L. Fisher et al.*); Antsiranana, Montagne des Français, 7.2 km 142° SE Antsiranana (=Diego Suarez), 12.32278 S, 49.33817 E, 180 m, tropical dry forest, 22.–25.II.2001 (*G.D. Alpert*); Antsiranana, Réserve Analamerana, 16.7 km 123° Anivorano-Nord, 12.80467 S, 49.37383 E, 225 m, tropical dry forest, 3.XII.2004 (*B.L. Fisher*); Antsiranana, Réserve Analamerana, 28.4 km 99° Anivorano-Nord, 12.74667 S, 49.49483 E, 60 m, tropical dry forest, 5.XII.2004 (*B.L. Fisher*); Antsiranana, Réserve Spéciale d'Ambre, 3.5 km 235° SW Sakaramy, 12.46889 S, 49.24217 E, 325 m, tropical dry forest, 26.I.2001 (*B.L. Fisher et al.*); Antsiranana, Réserve Spéciale de l'Ankarana, 7 km SE Matsaborimanga, 12° 54' S, 49° 07' E, 150 m, rainforest & tropical dry forest, 27.–28.XI.1990 (P.S. Ward); Antsiranana, Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, 12.90889 S, 49.10983 E, 80 m, sifted litter, tropical dry forest, 10.–16.II.2001 (*B.L. Fisher et al.*); Antsiranana, Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, 12.90889 S, 49.10983 E, 80 m, tropical dry forest, 12.II.2001 (*G.D. Alpert*); Antsiranana, Réserve Spéciale de l'Ankarana, 13.6 km 192° SSW Anivorano Nord, 12.86361 S, 49.22583 E, 210 m, tropical dry forest, 16.–21.II.2001 (*B.L. Fisher et al.*); Antsiranana, Réserve Spéciale de l'Ankarana, 13.6 km

192° SSW Anivorano Nord, 12.86361 S, 49.22583 E, 210 m, tropical dry forest, 19.–20.II.2001 (*G.D. Alpert*); Antsiranana, Diego Surez, above Sakaramy, 500 m, 12.II.1972 (*W.L. & D.E. Brown*).



FIGURES 23–25. *T. ryanphelanae*, holotype—CASENT0454495 (Erin Prado 2010). 23. Body in profile. 24. Body in dorsal view. 25. Head in full-face view.

***Tetramorium wardi* Hita Garcia & Fisher sp. n.**
(figs 6, 26, 27, 28)

Holotype worker, MADAGASCAR, Toliara, Forêt de Mahavelo, Isantoria River, 5.5 km 37° NE Ifotaka, 24.75361 S, 46.1515 E, 115 m, spiny forest/thicket, BLF5278, 31.I.2002 (*B.L. Fisher et al.*) (CASC: CASENT0475483). Paratypes, 18 workers with same data as holotype (BMNH: CASENT0475485; CASC: CASENT0475339; CASENT0475344; CASENT0475340; CASENT0475345; CASENT0475349; CASENT0475352; CASENT0475368; CASENT0475379; CASENT0475380; CASENT0475432; CASENT0475433; CASENT0475461; CASENT0475481; CASENT0475484; CASENT0475485; CASENT0475487; MCZ: CASENT0475462; NHMB: CASENT0475386); and 27 workers from Toliara, Forêt de Mahavelo, Isantoria River, 24.75833 S, 46.15717 E, 110 m, spiny forest/thicket, collection codes BLF5238, BLF5281 & BLF5288, 28.I.–1.II.2002 (*B.L. Fisher et al.*) (CASENT0192249; CASENT0192251; CASENT0192252; CASENT0192256; CASENT0442862; CASENT0442863; CASENT0442864; CASENT0442865; CASENT0442867; CASENT0442868; CASENT0447647; CASENT0447648; CASENT0447649; CASENT0447650; CASENT0447651; CASENT0447652; MHNG: CASENT0442866).

Diagnosis
Tetramorium wardi can be clearly distinguished from the other members of the group by: head approximately as long as wide (CI 98–101); node squamiform and strongly anteroposteriorly compressed with anterodorsal margin situated higher than posterodorsal margin, dorsum tapering backwards posteriorly, in dorsal view strongly transverse (DPeI 267–333); and cephalic dorsum between frontal carinae with one strong median ruga and several weaker, irregular rugae at each side.

Description
HL 0.69–85 (76); HW 0.68–0.85 (076); SL 0.48–0.60 (0.54); EL 0.16–0.19 (0.18); PH 0.39–0.51 (0.45); PW 0.50–0.66 (0.59); WL 0.84–1.06 (0.98); PSL 0.19–0.26 (0.22); PTL 0.09–0.12 (0.10); PTH 0.30–0.39 (0.34); PTW 0.27–0.333 (0.31); PPL 0.21–0.26 (0.24); PPH 0.30–0.38 (0.35); PPW 26–35 (30); CI 98–101 (100); SI 68–74 (71); OI 22–24 (23); DMI 57–63 (61); LMI 43–49 (47); PSLI 27–31 (29); PeNI 48–54 (52); LPeI 26–35 (30); DPeI 267–333 (297); PpNI 63–71 (66); LPpI 63–71 (68); DPpI 158–174 (165); PPI 121–134 (128) (15 measured).

Head approximately as long as wide (CI 98–101). Anterior clypeal margin with distinct median impression. Frontal carinae well developed, ending shortly before posterior head margin. Antennal scrobes faint to absent, posterior and ventral margins never differentiated. Antennal scapes short, not reaching posterior head margin (SI 68–74). Eyes small to moderate (OI 22–24). Mesosomal outline in profile convex, dorsally transversely rounded, weakly to moderately marginate from lateral to dorsal mesosoma, promesonotal suture absent, metanotal groove weakly developed to absent; mesosoma comparatively stout (LMI 43–49). Propodeal spines elongate-triangular, long, and acute (PSLI 27–31). Propodeal lobes very small and broadly triangular. Petiolar node strongly squamiform and anteroposteriorly compressed, anterior and posterior faces not parallel, anterodorsal margin higher situated and better developed than weaker posterodorsal margin, dorsum tapering backwards posteriorly; node in dorsal view transverse, between 2.6 to 3.3 times wider than long (DPeI 267–333), in lateral view approximately 2.9 to 3.9 times higher than long (LPeI 26–35). Postpetiole in profile rounded and weakly anteroposteriorly compressed, approximately 1.4 to 1.5 times higher than long (LPpI 63–71), in dorsal view between 1.5 to 1.7 times wider than long (DPpI 158–174). Postpetiole in profile more voluminous than petiolar node, in dorsal view approximately 1.2 to 1.3 times wider than petiolar node (PPI 121–134). Mandibles striate; clypeus always with strong median longitudinal ruga and one or two weaker rugae at each side; cephalic dorsum between frontal carinae with one well-developed longitudinal median ruga and several irregular longitudinal rugae laterally, rugae becoming weaker shortly after level of posterior eye margin fading out well before posterior head margin, median ruga of same length as frontal carinae and diverging approximately at eye level into two rugae running to posterior clypeal margin; lateral and ventral head mostly with irregular longitudinal rugulae, malar area reticulate-rugose; head with faint punctate ground sculpture. Mesosoma, waist segments, and gaster unsculptured, smooth and shiny; ground sculpture on mesosomal dorsum, waist segments, and gaster faint to absent, lateral mesosoma with moderate punctate ground sculpture ventrally and posteriorly. Head with few standing hairs, mesosoma, waist segments, and first gastral tergite without any standing hairs; head, mesosoma, petiole, postpetiole, and gaster with

widely spaced very short pubescence. Colouration mostly of uniform brownish colour, often head, legs, and gaster of much darker brown than mesosoma and waist segments.

Notes

The distribution of *T. wardi* appears to be restricted to the southwest and southeast of Madagascar, where it is generally found in spiny forest, thicket, or tropical dry forest habitats.

Within the *T. bessonii* group, *T. wardi* can be grouped together with *T. artemis* and *T. bessonii* due to a shared petiolar node shape that distinguishes them from *T. malagasy*, *T. orientale*, and *T. ryanphelanae*. The petiolar node of the latter three is high nodiform with approximately parallel anterior and posterior faces and anterodorsal and posterodorsal angles at about the same height, whereas the node of the first mentioned is strongly anteroposteriorly compressed and squamiform with an anterodorsal angle situated higher than the posterodorsal, and a dorsal face tapering backwards posteriorly. *Tetramorium wardi* can be easily distinguished from *T. bessonii* on the basis of head shape and gastral pubescence. The latter species has a head approximately as long as wide (CI 98–101) and very short, appressed pubescence on the first gastral tergite, which contrasts with a longer head (CI 92–96) and distinctly longer, appressed to decumbent pubescence in *T. bessonii*. *Tetramorium artemis*, which is only known from Cap Saint Marie, is morphologically fairly similar to *T. wardi*, although both can be clearly separated. The petiolar node of *T. wardi* is stronger anteroposteriorly compressed and transverse (DPeI 267–333) than in *T. artemis* (DPeI 232–250). A better observable difference is the cephalic sculpture between the frontal carinae since it consists of one median ruga with several irregular rugae laterally in *T. wardi*, whereas *T. artemis* displays only one median ruga.

Etymology

The new species is dedicated to Phil S. Ward from Davis, California, U.S.A. We want to honour his lifetime of dedication and significant contributions to ant systematics.

Material examined

MADAGASCAR: Fianarantsoa, Forêt d'Analalava, 29.6 km 280° W Ranohira, 22.59167 S, 45.12833 E, 700 m, tropical dry forest, 1.–5.II.2003 (*B.L. Fisher et al.*); Toliara, Beza-Mahafaly, 27 km E Betioky, 23.65 S, 44.63333 E, 135 m, tropical dry forest, 23.IV.1997 (*B.L. Fisher*); Toliara, Forêt de Beroboka, 5.9 km 131° SE Ankidranoka, 22.23306 S, 43.36633 E, 80 m, tropical dry forest, 12.–16.III.2002 (*B.L. Fisher et al.*); Toliara, Forêt de Mahavelo, Isantoria River, 24.75833 S, 46.15717 E, 110 m, spiny forest/thicket, 28.I.–1.II.2002 (*B.L. Fisher et al.*); Toliara, Forêt de Mahavelo, Isantoria River, 5.5 km 37° NE Ifotaka, 24.75361 S, 46.1515 E, 115 m, spiny forest/thicket, 31.I.2002 (*B.L. Fisher et al.*); Toliara, Forêt de Tsinjoriaky, 6.2 km 84° E Tsifota, 22.80222 S, 43.42067 E, 70 m, spiny forest/thicket, 6.–10.III.2002 (*B.L. Fisher et al.*); Toliara, Forêt Vohidava 88.9 km N Amboasary, 24.24067 S, 46.28783 E, 500 m, 6.–8.XII.2006 (*B.L. Fisher et al.*); Toliara, Mahafaly Plateau, 6.2 km 74° ENE Itampolo, 24.65361 S, 43.99667 E, 80 m, spiny forest/thicket, 21.–25.II.2002 (*B.L. Fisher et al.*); Toliara, Parc National d'Andohahela, Forêt de Manantalinjo, 33.6 km 63° ENE Amboasary, 7.6 km 99° E Hazofotsy, 24.81694 S, 46.61 E, 150 m, spiny forest/thicket, 12.–16.I.2002 (*B.L. Fisher et al.*); Toliara, Parc National d'Andohahela, Forêt d'Ambohibory, 1.7 km 61° ENE Tsimelahy, 36.1 km 308° NW Tolagnaro, 24.93 S, 46.6455 E, 300 m, tropical dry forest, 16.–20.I.2002 (*B.L. Fisher et al.*); Toliara, Parc National de Tsimanampetsotsa, 6.7 km 130° SE Efoetse, 23.0 km 175° S Beheloka, 24.10056 S, 43.76 E, 25 m, spiny forest/thicket, 18.–22.III.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, 24.04722 S, 43.75317 E, 40 m, spiny forest/thicket, 18.–22.III.2002 (*B.L. Fisher et al.*); Toliara, Parc National de Tsimanampetsotsa, Forêt de Bemanateza, 20.7 km 81° E Efoetse, 23.0 km 131° SE Beheloka, 23.99222 S, 43.88067 E, 90 m, spiny forest/thicket, 22.–26.III.2002 (*B.L. Fisher et al.*); Toliara, Parc National de Zombitse, 19.8 km 84° E Sakaraha, 22.84333 S, 44.71 E, 770 m, tropical dry forest, 5.–9.II.2003 (*B.L. Fisher et al.*); Toliara, Ranobe, 23.0342 S, 43.61185 E, 30 m, spiny forest/thicket, 5.–9.II.2003 (*Frontier Project*); Toliara, Ranobe, 23.04067 S, 43.60973 E, 20 m, degraded gallery forest, 17.–21.V.2003 (*Frontier Wilderness Project*); Toliara, Sept Lacs, 23.52472 S, 44.15917 E, 160 m, spiny thicket gallery forest transition, 10.III.2002 (*Frontier Project*); Toliara, southern Isoky-Vohimena Forest, 59 km NE Sakaraha, 22.46667 S, 44.85 E, 730 m, tropical dry forest, 21.I.1996 (*B.L. Fisher*); Toliara, Vohibasia Forest, 59 km NE Sakaraha 22.46667 S, 44.85 E, 780 m, tropical dry forest, 13.I.1996 (*B.L. Fisher*).

FIGURES 26–28. *T. wardi*, holotype—CASENT0475483 (Erin Prado 2010). 26. Body in profile. 27. Body in dorsal view. 28. Head in full-face view.

Tetramorium bonibony species group

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae usually moderately developed; anterior face of pronotum usually well-developed with distinct anterodorsal margin separating anterior face from dorsum, sometimes with anterodorsal margin shaped into a distinct protuberance; margination between lateral and dorsal mesosoma weakly to moderately developed; mesosoma comparatively high (LMI 40–51); 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 margin often better developed and higher situated than posterodorsal, dorsum then tapering backwards posteriorly; postpetiole approximately rounded; mandibles sculptured; cephalic sculpture distinct, between frontal carinae predominantly longitudinally rugose, posterior head and mesosoma with well-developed reticulate-rugose sculpture; petiole, postpetiole, and gaster usually unsculptured, smooth, and shiny, rarely weak sculpture present on waist segments; 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 distribution of the *T. bonibony* species group is restricted to Madagascar, Nosy Be, and Nosy Mangabe, and the group members always live in forest habitats.

The development of the anterodorsal pronotum is comparatively variable among species in the group. It ranges from a weakly developed anterior face and anterodorsal margin (in *T. kali*), through a well-developed anterior face and anterodorsal margin (*T. vony*, *T. sada*, *T. nosybe*, and *T. olana*), to a well-developed anterior face and a distinct anterodorsal median protuberance (*T. bonibony*, *T. popell*, and *T. trafo*). Despite being often unreliable and variable within some species, colouration seems to be quite useful as diagnostic character for the *T. bonibony* group. There is almost no variation in colouration within each of the species recognised here. Of the eight group members, one is dark brown, two are bicoloured (yellow and dark brown), and five are yellowish. We do not justify species delimitation based on colour alone, as we also provide morphological or ecological evidence in the species descriptions below. Still, colour is an easy means to distinguish the different members of this group.

The group is easily differentiable from all other 11-segmented species groups. The presence of a distinct protuberance on the pronotum distinguishes the three species *T. bonibony*, *T. popell*, and *T. trafo* directly from all other Malagasy *Tetramorium*. The remaining group members, except *T. kali*, cannot be confused with another group due the combination of a well-developed anterior pronotal face, reticulate-rugose sculpture on the posterior head and dorsal mesosoma, and triangular cuneiform petiolar node. Although *T. kali* lacks a well-developed anterior face and anterodorsal margin of the pronotum, it can be discriminated easily from the other groups. It possesses a unique character set of long propodeal spines, a cuneiform and unsculptured petiolar node, and distinct reticulate-rugose sculpture on posterior head and dorsal mesosoma.

Key to the species of the *T. bonibony* group (workers)

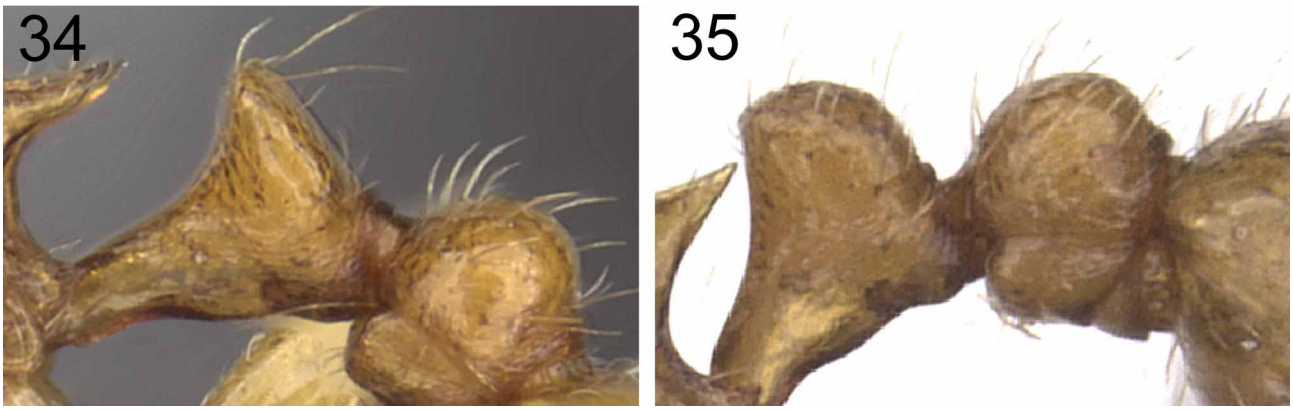
1. Mesosoma with distinct anterodorsal median protuberance on pronotum (Fig. 29). 2
- Mesosoma usually with well-developed anterior face of pronotum, but always without distinct anterodorsal median protuberance on pronotum (Figs. 30, 31). 4

FIGURES 29–31. 29. Mesosoma of *T. trafo* in profile with distinct pronotal protuberance—CASENT0404115 (William Ericson 2011). **30.** Mesosoma of *T. sada* in profile without distinct pronotal protuberance—CASENT0443274 (William Ericson 2011). **31.** Mesosoma of *T. kali* in profile without distinct pronotal protuberance—CASENT0235221 (William Ericson 2011).

2. Bicoloured species with brown to dark brown head and mesosoma and yellow to light brown waist segments and gaster; propodeal spines very long (PSLI 37–44) (Fig. 32). . . . . *T. bonibony*
- Uniformly coloured species; propodeal spines medium-sized to long (PSLI 26–31) (Fig. 33). 3

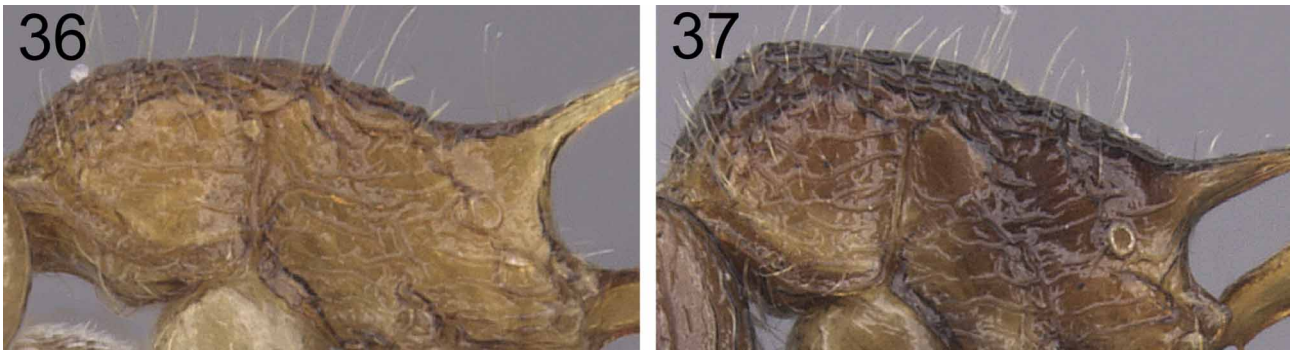
FIGURES 32 & 33. 32. Body of *T. bonibony* in profile with distinct bicolouration—CASENT0486252 (William Ericson 2011). **33.** Body of *T. trafo* in profile with uniform colouration—CASENT0404115 (William Ericson 2011).

3. Petiolar node in profile distinctly triangular cuneiform and strongly anteroposteriorly compressed dorsally; in dorsal view highly transverse (LPeI 18–27; DPeI 400–590) (Fig. 34). . . . . *T. popell*
- Petiolar node in profile less strongly triangular, generally slightly cuneiform and only weakly anteroposteriorly compressed dorsally; in dorsal view less transverse than above (LPeI 48–54; DPeI 161–188) (Fig. 35).. . . . . *T. trafo*



FIGURES 34 & 35. 34. Waist segments of *T. popell* in profile with strongly triangular petiolar node—CASENT0016867 (Estella Ortega 2012). **35.** Waist segments of *T. trafo* in profile with less strongly triangular petiolar node—CASENT0404115 (William Ericson 2011).

4. Antennal scape comparatively longer (SI 76–82); anterior mesosoma without well-developed anterior face of pronotum (Fig. 36) . . . . . *T. kali*
- Antennal scape comparatively shorter (SI 65–73); anterior mesosoma with well-developed anterior face (Fig. 37).. 5



FIGURES 36 & 37. 36. Mesosoma of *T. kali* in profile without well-developed anterior face of pronotum—CASENT0235221 (William Ericson 2011). **37.** Mesosoma of *T. sada* in profile with well-developed anterior face of pronotum—CASENT0443274 (William Ericson 2011).

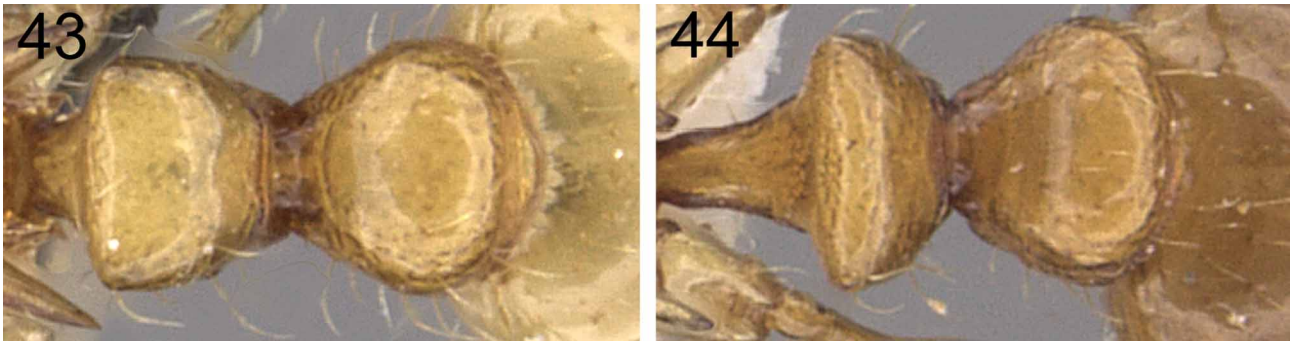
5. Bicoloured species with brown to dark brown head and mesosoma and yellowish to brownish waist segments and gaster (Fig. 38) . . . . . *T. sada*
- Uniformly coloured species (Figs. 39, 40). 6

FIGURES 38–40. 38. Body of *T. sada* in profile with conspicuous bicolouration—CASENT0443274 (William Ericson 2011). **39.** Body of *T. nosybe* in profile with uniform dark brown colouration—CASENT0422207 (William Ericson 2011). **40.** Body of *T. vony* in profile with uniform yellow colouration—CASENT0404272 (William Ericson 2011).

6. Body colouration brown to dark brown (Fig. 41). . . . . *T. nosybe*
- Body colouration yellow to light brown (Fig. 42). 7

FIGURES 41 & 42. 41. Body of *T. nosybe* in profile with uniform dark brown colouration—CASENT0422207 (William Ericson 2011). **42.** Body of *T. vony* in profile with uniform yellow colouration—CASENT0404272 (William Ericson 2011).

7. Petiolar node cuneiform, in profile less anteroposteriorly compressed dorsally, in dorsal view less transverse (LPeL 45–50; DPeL 183–200) (Fig. 43). . . . . *T. olana*
- Petiolar node triangular cuneiform, in profile strongly anteroposteriorly compressed dorsally, in dorsal view highly transverse (LPeL 31–40; DPeL 245–333, generally around 300) (Fig. 44). . . . . *T. vony*



FIGURES 43 & 44. 43. Waist segments of *T. olana* in dorsal view with significantly less transverse petiolar node—CASENT0044485 (William Ericson 2011). **44.** Waist segments of *T. vony* in dorsal view with highly transverse petiolar node—CASENT0404272 (William Ericson 2011).

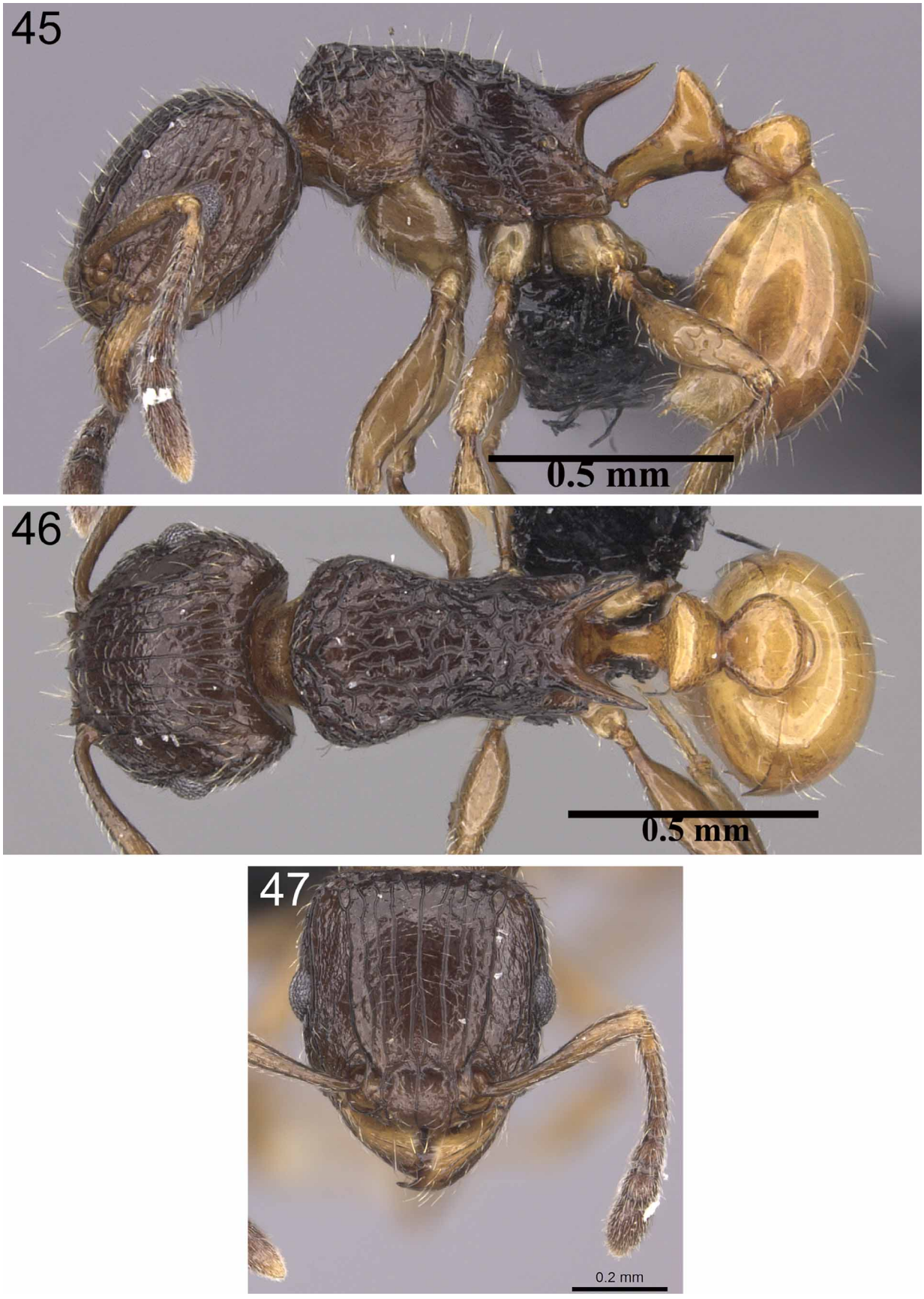
Tetramorium bonibony **Hita Garcia & Fisher sp. n.**
(figs 32, 45, 46, 47)

Holotype worker, MADAGASCAR, Mahajanga, Forêt de Tsimembo, 11.0 km 346° NNW Soatana, 18.99528 S, 44.4435 E, 50 m, tropical dry forest, sifted litter (leaf mold, rotten wood), collection code BLF4508, 21.–25.XI.2001 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT0486252). Paratypes, eight workers with same data as holotype (CASC: CASENT0486219; CASENT0486227; CASENT0486254; CASENT0486260; CASENT0486292; CASENT0486294; CASENT0486305; CASENT0486316); 12 workers from MADAGASCAR, Mahajanga, Forêt de Tsimembo, 8.7 km 336° NNW Soatana, 19.02139 S, 44.44067 E, 20 m, tropical dry forest, ex rotten log, collection code BLF4573, 21.–25.XI.2001 (*B.L. Fisher, C. Griswold et al.*) (BMNH: CASENT0442016; CASC: CASENT0442008; CASENT0442010; CASENT0442011; CASENT0442013; CASENT0442014; CASENT0442017; CASENT0442018; CASENT0442019; MCZ: CASENT0442009; MHNG: CASENT0442012; NHMB: CASENT0442015).

Diagnosis
The following character combination distinguishes *T. bonibony* from the other group members: mesosoma with well-developed anterior face and anterodorsal median protuberance on pronotum; petiolar node triangular cuneiform, strongly anteroposteriorly compressed dorsally, and highly transverse in dorsal view (LPeI 24–27; DPeI 364–414); postpetiole as wide as to weakly wider than petiolar node (PPI 100–106); distinctly bicoloured with brown head and mesosoma and yellow waist segments and gaster.

Description
HL 0.66–0.72 (0.69); HW 0.65–0.71 (0.69); SL 0.48–0.51 (0.49); EL 0.14–0.16 (0.15); PH 0.40–0.45 (0.43); PW 0.49–0.54 (0.51); WL 0.84–0.93 (0.89); PSL 0.25–0.31 (0.28); PTL 0.07–0.09 (0.07); PTH 0.26–0.33 (0.29); PTW 0.26–0.31 (0.29); PPL 0.17–0.21 (0.19); PPH 0.26–0.32 (0.29); PPW 0.27–0.32 (0.29); CI 98–100 (99); SI 69–74 (72); OI 21–22 (21); DMI 57–60 (58); LMI 48–49 (48); PSLI 37–44 (40); PeNI 50–60 (55); LPeI 24–27 (26); DPeI 364–414 (384); PpNI 53–60 (56); LPpI 63–69 (67); DPpI 142–156 (150); PPI 100–106 (101) (10 measured).

Head slightly longer than wide to as long as wide (CI 98–100). Anterior clypeal margin with median impression. Frontal carinae well-developed, ending between posterior eye margin and posterior head margin, usually closer to the latter. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 69–74). Eyes comparatively small to moderate (OI 21–22). Pronotum with well-developed anterior face and distinct anterodorsal protuberance, mesosoma moderately marginate from sides to dorsum; promesonotal suture and metanotal groove absent; mesosoma very high, compact, and stout (LMI 48–49). Propodeal spines very long, spinose, and acute (PSLI 37–44); propodeal lobes small and triangular. Petiolar node in profile triangular cuneiform, strongly anteroposteriorly compressed dorsally, approximately 3.6 to 4.2 times higher than long (LPeI 24–27), anterior and posterior faces not parallel; node in dorsal view strongly transverse and thin, between 3.6 to 4.2 times wider than long (DPeI 364–414). Postpetiole in profile approximately rounded, approximately 1.4 to 1.6 times higher than long (LPpI 63–69), in dorsal view approximately 1.4 to 1.6 times wider than long (DPpI 142–156). Postpetiole in profile more voluminous than petiolar node, in dorsal view as wide as petiolar node or weakly wider (PPI 100–106). Mandibles striate; clypeus with one distinct median longitudinal ruga and one or two weaker rugae at each side; cephalic dorsum between frontal carinae anteriorly and centrally longitudinally rugose, posteriorly reticulate-rugose, dorsum with six to nine longitudinal rugae, rugae ending close to posterior head margin but often broken or with cross-meshes, always with one well-developed longitudinal median ruga, median ruga running from posterior head margin to posterior clypeal margin, approximately at eye level diverging into two rugae leading to posterior clypeal margin; lateral and ventral head mainly reticulate-rugose to longitudinally rugose. Ground sculpture on head weakly to moderately reticulate-punctate. Mesosoma laterally mostly reticulate-rugose to irregularly longitudinally rugose; dorsal mesosoma completely reticulate-rugose. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, moderately long, fine, and erect pilosity. Body bicoloured, head and mesosoma brown to dark brown, waist segments and gaster yellow, appendages usually brown.



FIGURES 45–47. *T. bonibony*, holotype—CASENT0486252 (William Ericson 2011). 45. Body in profile. 46. Body in dorsal view. 47. Head in full-face view.

Notes

Tetramorium bonibony is mainly distributed in western Madagascar in a strip close to the coast from Kirindy north to Anabohazo. All of these localities are situated at very low elevations from 20 to 140 m. It was also found southwest of this main distribution in the Makay Mts., where it was sampled at altitudes of 475 to 525 m. The species was found to live predominantly in tropical dry forests or gallery forests, and mainly collected from the leaf litter.

Tetramorium bonibony can be easily distinguished within the group. The presence of a distinct median protuberance on the anterodorsal pronotum places it close to *T. popell* and *T. trafo*. However, *T. popell* and *T. trafo* are both of uniform yellowish to brownish colour, whereas *T. bonibony* is noticeably bicoloured. *Tetramorium sada* is also bicoloured, and could be confused with *T. bonibony* at first glance. Closer examination, however, shows that *T. sada* lacks the anterodorsal pronotal protuberance which is present and well developed in *T. bonibony.* In addition, the latter species usually has longer antennal scapes (SI 69–74) than T. *sada* (SI 65–70), and the postpetiole is narrower than the petiolar node in dorsal view (PPI 89–95), in contrast to a postpetiole which is as wide as to wider than the petiolar node (PPI 100–106) in *T. bonibony.* Both species have strongly overlapping distribution ranges, and occur in sympatry in several localities, such as Bemarivo and Namoroka. Nevertheless, in these localities they can be recognised by the characters outlined above, and we are very confident about their respective species identities.

Etymology

The species epithet is Malagasy and means "bump". It refers to the distinct and conspicuous protuberance on the anterodorsal pronotum. The species name is a noun in apposition and thus invariant.

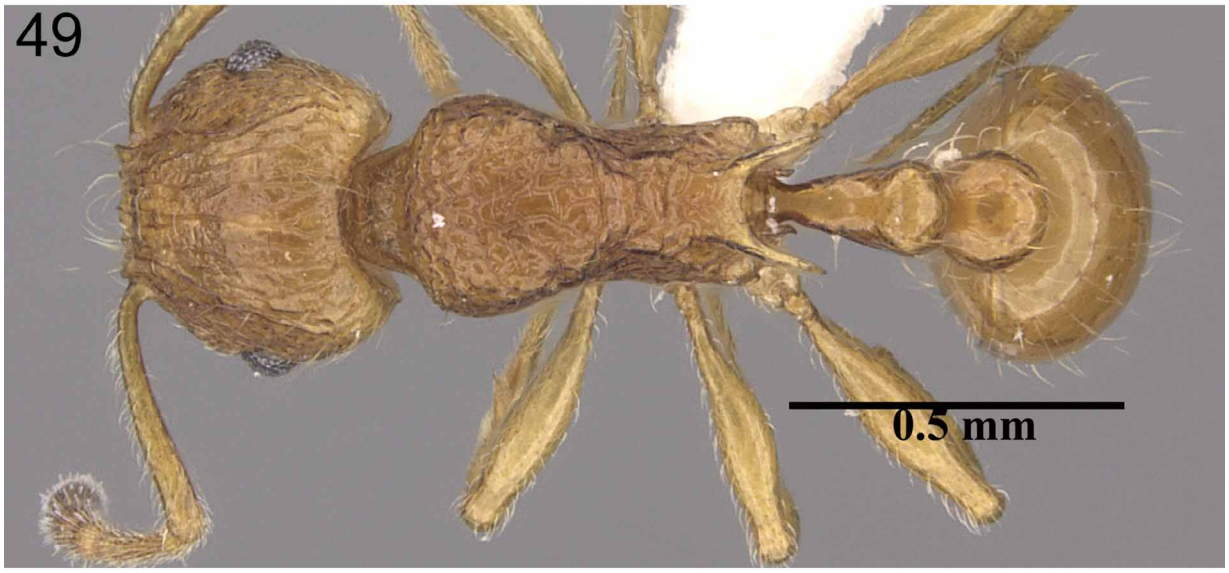
Material examined

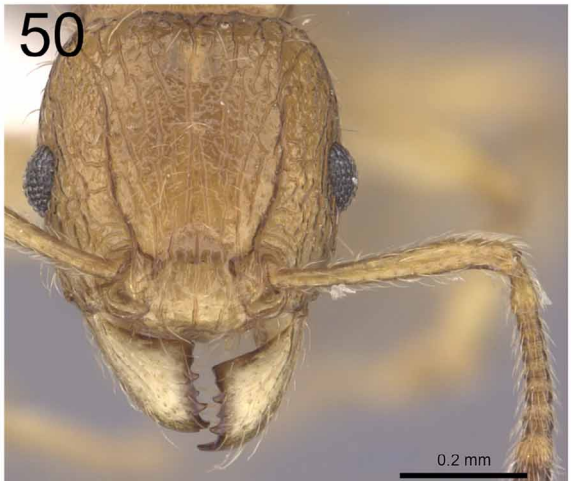
MADAGASCAR: Antsiranana, Forêt d'Anabohazo, 21.6 km 247° WSW Maromandia, 14.30889 S, 47.91433 E, 120 m, tropical dry forest, 11.–16.III.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Forêt de Tsimembo, 11.0 km 346° NNW Soatana, 18.99528 S, 44.4435 E, 50 m, tropical dry forest, 21.–25.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Forêt de Tsimembo, 8.7 km 336° NNW Soatana, 19.02139 S, 44.44067 E, 20 m, tropical dry forest, 21.–25.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Parc National de Namoroka, 9.8 km 300° WNW Vilanandro, 16.46667 S, 45.35 E, 140 m, tropical dry forest, 4.–8.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Parc National de Namoroka, 17.8 km 329° WNW Vilanandro, 16.37667 S, 45.32667 E, 100 m, tropical dry forest, 8.–12.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Parc National de Namoroka, 16.9 km 317° NW Vilanandro, 16.40667 S, 45.31 E, 100 m, tropical dry forest, 12.–16.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Réserve Spéciale de Bemarivo, 23.8 km 223° SW Besalampy, 16.925 S, 44.36833 E, 30 m, tropical dry forest, 19.–23.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Toliara, Forêt de Kirindy, 15.5 km 64° ENE Marofandilia, 20.045 S, 44.66222 E, 100 m, tropical dry forest, 28.XI.–3.XII.2001 (*B.L. Fisher, C. Griswold et al.*); Toliara, Kirindy, 47.3 km NE Morondava, 20.07125 S, 44.6655 E, 60 m, tropical dry forest, 7.VI.2007 (*B.L. Fisher*); Toliara, Makay Mts., 21.2098 S, 45.3418 E, 525 m, gallery forest, 27.XI.–2.XII.2010 (*B.L. Fisher et al.*).

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

(figs 31, 36, 48, 49, 50)

Holotype worker, MADAGASCAR, Antsiranana, R.S. Manongarivo, 14.5 km 220° SW Antanambao, 13.99833 S, 48.42833 E, 1175 m, montane rainforest, sifted litter (leaf mold, rotten wood), collection code BLF1938, 20.X.1998 (*B.L. Fisher*) (CASC: CASENT0235221). Paratypes, six workers with same data as holotype (CASC: CASENT0198971; CASENT0198972; CASENT0198973; CASENT0247544; CASENT0247545; MHNG: CASENT0247546); and three workers from Antsiranana, R.S. Manongarivo, 10.8 km 229° SW Antanambao, 13.96167 S, 48.43333 E, 400 m, rainforest, sifted litter (leaf mold, rotten wood), collection code BLF1996, 8.XI.1998 (*B.L. Fisher*) (BMNH: CASENT0227990; CASC: CASENT0198974; CASENT0198975).





FIGURES 48–50. *T. kali*, holotype—CASENT0235221 (William Ericson 2011). 48. Body in profile. 49. Body in dorsal view. 50. Head in full-face view.

Diagnosis

Tetramorium kali is easily recognisable within the group due to the following character combination: moderately long antennal scapes (SI 76–82); lack of well–developed anterior face or anterodorsal protuberance on pronotum; body of yellow to light brown colour.

Description

HL 0.59–0.73 (0.67); HW 0.56–0.69 (0.63); SL 0.44–0.56 (0.50); EL 0.14–0.17 (0.15); PH 0.33–0.38 (0.35); PW 0.42–0.50 (0.46); WL 0.76–0.94 (0.85); PSL 0.22–0.30 (0.26); PTL 0.12–0.16 (0.14); PTH 0.23–0.30 (0.27); PTW 0.17–0.24 (0.21); PPL 0.19–0.23 (0.21); PPH 0.24–0.31 (0.27); PPW 0.22–0.29 (0.26); CI 92–95 (94); SI 76–82 (78); OI 23–24 (24); DMI 53–55 (54); LMI 40–43 (42); PSLI 37–41 (39); PeNI 41–48 (46); LPeI 50–57 (54); DPeI 136–160 (150); PpNI 53–57 (56); LPpI 72–80 (77); DPpI 119–131 (122); PPI 117–129 (122) (10 measured).

Head longer than wide (CI 92–95). Anterior clypeal margin with median impression. Frontal carinae weakly to moderately developed, fading out at or shortly after posterior eye margin. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 76–82). Eyes of moderate size (OI 23–24). Mesosomal outline in profile flat, anterior face of pronotum only weakly developed, mesosoma only weakly marginate from lateral to dorsal mesosoma; promesonotal suture absent, metanotal groove absent to weakly developed; mesosoma comparatively high, compact, and stout (LMI 40–435). Propodeal spines long, spinose, and acute (PSLI 37–41); propodeal lobes small and triangular. Petiolar node in profile cuneiform, weakly anteroposteriorly compressed dorsally, approximately 1.7 to 2.0 times higher than long (LPeI 50–57), anterior and posterior faces not parallel, anterodorsal margin situated higher than posterodorsal, dorsum moderately tapering backwards posteriorly; node in dorsal view between 1.3 to 1.6 times wider than long (DPeI 136–160). Postpetiole in profile approximately rounded, approximately 1.2 to 1.4 times higher than long (LPpI 72–80), in dorsal view approximately 1.2 to 1.3 times wider than long (DPpI 119–131). Postpetiole in profile approximately as voluminous as petiolar node, in dorsal view approximately 1.1 to 1.3 times wider than petiolar node (PPI 117–129). Mandibles striate; clypeus with few longitudinal, often irregular rugae or rugulae, median ruga sometimes developed; cephalic dorsum between frontal carinae anteriorly and centrally longitudinally rugose and posteriorly reticulate-rugose, dorsum with five to nine longitudinal rugae, rugae ending at posterior head margin but often broken or with cross-meshes, always with one well-developed longitudinal median ruga, median ruga running from posterior head margin to posterior clypeal margin, approximately at eye level diverging into two rugae leading to posterior clypeal margin; lateral and ventral head mainly reticulate-rugose to longitudinally rugose. Ground sculpture on head weakly to moderately reticulate-punctate. Mesosoma laterally mostly irregularly longitudinally rugose; dorsal mesosoma anteriorly strongly reticulate-rugose, posteriorly reticulate-rugose to longitudinally rugose. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, long, fine, and erect pilosity. Body of uniform yellow to light brown colour.

Notes

The new species is only known from the three localities Manongarivo, Montagne d'Ambre, and Marotandrano, which are all widely separated from each other. Furthermore, *T. kali* seems to prefer rainforests or montane rainforests, and ranges from 400 to 1175 m elevation. Also, it seems to be relatively rare since the available material consists of less than 15 specimens.

As mentioned in the diagnosis above, *T. kali* is easily recognisable within the group since it is the only species without a well-developed anterior face or an anterodorsal protuberance on the pronotum. In addition, it displays the longest antennal scapes encountered in the group (SI 76–82), whereas all other species have much shorter scapes (SI 65–74).

Etymology

The new species is named in honor of Kali Ressi for the support of Adeo and Cindy Ressi to discover and identify life on earth.

Material examined

MADAGASCAR: Antsiranana, Parc National Montagne d'Ambre, 3.6 km 235° SW Joffreville, 12.53444 S, 49.1795 E, 925 m, montane rainforest, 20.–26.I.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, R.S.

Manongarivo, 14.5 km 220° SW Antanambao, 13.96833 S, 48.42833 E, 1175 m, montane rainforest, 20.X.1998 (*B.L. Fisher*); Antsiranana, R.S. Manongarivo, 10.8 km 229° SW Antanambao, 13.96167 S, 48.43333 E, 400 m, rainforest, 8.XI.1998 (*B.L. Fisher*); Mahajanga, Réserve Spéciale Marotandrano, Marotandrano 48.3 km S Mandritsara, 16.28322 S, 48.81443 E, 865 m, transition humid forest, 7.XII.2007 (*B.L. Fisher et al.*).

Tetramorium nosybe Hita Garcia & Fisher sp. n.

(figs 39, 41, 51, 52, 53)

Holotype worker, MADAGASCAR, Antsiranana, Nosy Be, Réserve Naturelle Intégrale de Lokobe, 6.3 km 112° ESE Hellville, 13.41933 S, 48.33117 E, 30 m, rainforest, beating low vegetation, collection code BLF3426, 19.–24.III.2001 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT0422207). Paratypes, five workers with same data as holotype (CASC: CASENT0404427; CASENT0404429; CASENT0404430); four workers with same data as holotype except sampled from sifted litter and collection code BLF3422 (CASC: CASENT0466777; CASENT0467021; CASENT0467100; CASENT0467118); eight workers with same data as holotype except sampled ex rotten stick on ground and collection code BLF3495 (BMNH: CASENT0428029; CASC: CASENT0427995; CASENT0427996; CASENT0428028; CASENT0428080); and two workers with same data as holotype except sampled from low vegetation and collection code BLF3518 (CASC: CASENT0428020; MHNG: CASENT0428021).

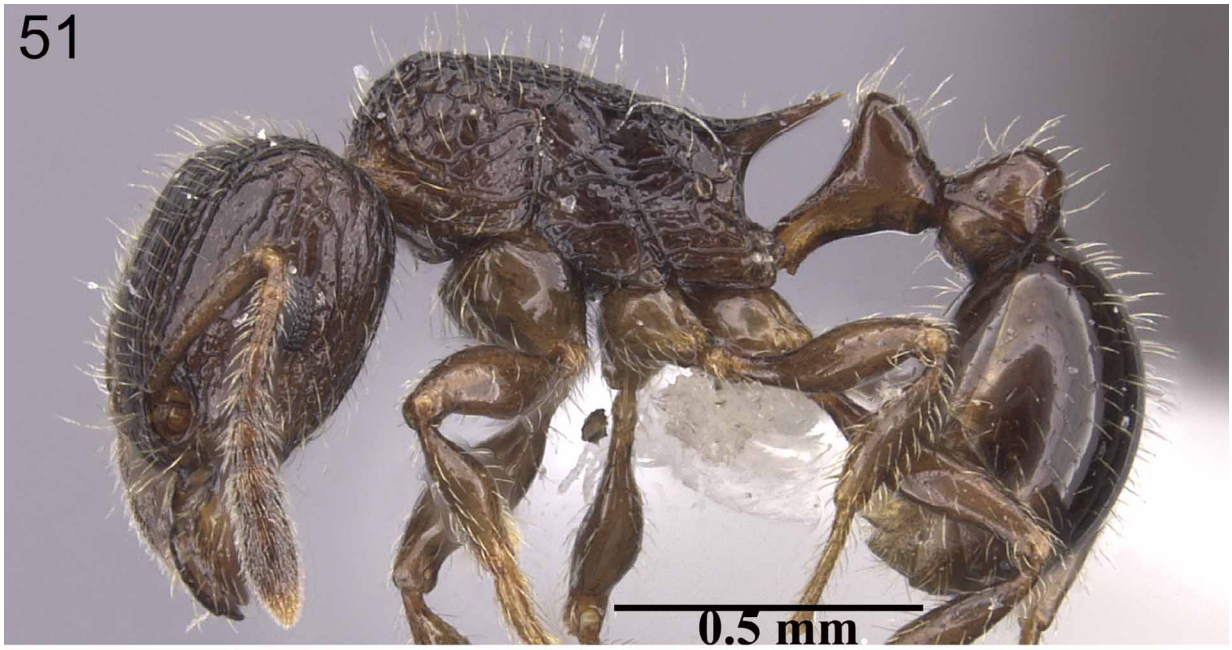
Diagnosis

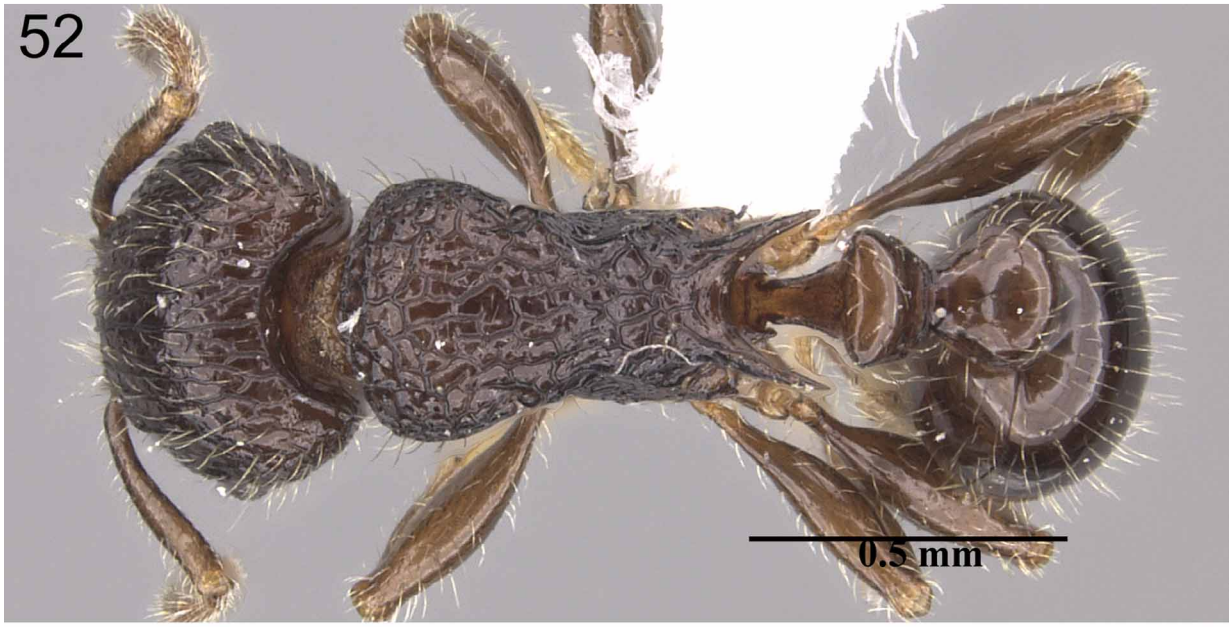
Tetramorium nosybe can be recognised within the *T. bonibony* group by the following character combination: anterior face of pronotum well developed but without a distinct anterodorsal protuberance; petiolar node triangular cuneiform, strongly anteroposteriorly compressed dorsally, and strongly transverse in dorsal view (LPeI 38–43; DPeI 232–279); body of uniform brown colour.

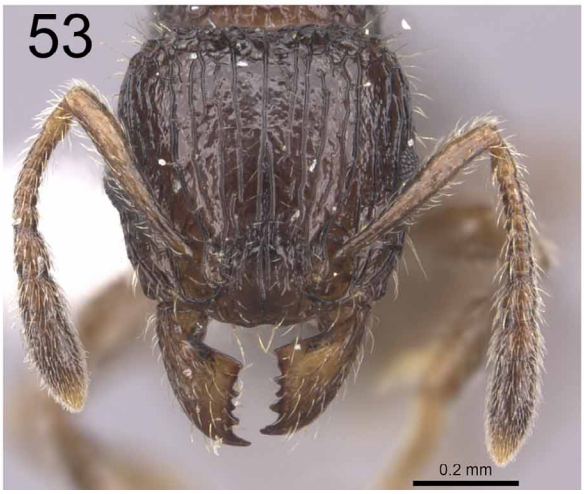
Description

HL 0.71–0.78 (0.76); HW 0.71–0.78 (0.76); SL 0.50–0.54 (0.53); EL 0.15–0.18 (0.16); PH 0.42–0.49 (0.46); PW 0.53–0.61 (0.57); WL 0.91–1.01 (0.96); PSL 0.28–0.33 (0.31); PTL 0.11–0.15 (0.13); PTH 0.29–0.34 (0.31); PTW 0.29–0.35 (0.32); PPL 0.22–0.25 (0.23); PPH 0.30–0.35 (0.33); PPW 0.29–0.35 (0.33); CI 99–101 (100); SI 68–71 (69); OI 21–23 (22); DMI 58–60 (59); LMI 46–50 (48); PSLI 39–44 (41); PeNI 54–58 (57); LPeI 38–43 (41); DPeI 232–279 (251); PpNI 54–59 (57); LPpI 68–73 (70); DPpI 132–146 (141); PPI 100–105 (102) (10 measured).

Head as long as wide (CI 99–101). Anterior clypeal margin with median impression. Frontal carinae moderately developed, fading out shortly before posterior head margin. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 68–71). Eyes small to moderate (OI 21–23). Mesosoma with well-developed anterior face of pronotum, but without a distinct anterodorsal median protuberance on pronotum, mesosoma weakly to moderately marginate from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent; mesosoma comparatively high, compact, and stout (LMI 46–50). Propodeal spines very long, spinose, and acute (PSLI 39–44); propodeal lobes small and triangular. Petiolar node in profile triangular cuneiform, strongly anteroposteriorly compressed dorsally, approximately 2.3 to 2.6 times higher than long (LPeI 38–43), anterior and posterior faces not parallel, node in dorsal view distinctly transverse and comparatively thin, between 2.3 to 2.8 times wider than long (DPeI 232–279). Postpetiole in profile approximately rounded, approximately 1.3 to 1.5 times higher than long (LPpI 68–73), in dorsal view approximately 1.3 to 1.5 times wider than long (DPpI 132–146). Postpetiole in profile more voluminous than petiolar node, in dorsal view as wide as petiolar node to slightly wider (PPI 100–105). Mandibles striate; clypeus with one distinct median longitudinal ruga and one or two often weaker rugae at each side; cephalic dorsum between frontal carinae anteriorly and centrally longitudinally rugose and posteriorly reticulate-rugose, dorsum with five to nine longitudinal rugae, rugae ending close to posterior head margin but often broken or with cross-meshes, always with one well-developed longitudinal median ruga, median ruga running from posterior head margin to posterior clypeal margin, approximately at eye level diverging into two rugae leading to posterior clypeal margin; lateral and ventral head mainly reticulate-rugose to longitudinally rugose. Ground sculpture on head weakly to moderately reticulate-punctate. Lateral mesosoma reticulate-rugose to irregularly longitudinally rugose; dorsal mesosoma anteriorly







FIGURES 51–53. *T. nosybe*, holotype—CASENT0422207 (William Ericson 2011). 51. Body in profile. 52. Body in dorsal view. 53. Head in full-face view.

strongly reticulate-rugose, posteriorly reticulate-rugose to longitudinally rugose. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, long, fine, and erect pilosity. Body of uniform dark brown colour.

Notes

The new species is mainly found on the island of Nosy Be, but a few specimens were sampled from two localities in western Madagascar. These localities, Ampasindava and Manongarivo, are less than 100 km away from Nosy Be. In addition, *T. nosybe* was only collected from rainforest habitats at elevations from 30 to 600 m, and seems to live in leaf litter, on the ground, or in lower vegetation.

Tetramorium nosybe is the only species within the group with a uniform dark brown colouration, and is thus easily recognisable. However, colour is not always a reliable character. Even so, it should not be confused with the three species with a conspicuous protuberance on the pronotum, *T. bonibony*, *T. popell*, and *T. trafo*. Also, it can be distinguished from *T. kali* and *T. olana* since they possess a less dorsally anteroposteriorly compressed petiolar node (DPeI 136–200). Again, not considering the colour, *T. vony* (yellow colouration) and *T. sada* (dark brown and yellow bicolouration) are superficially close to *T. nosybe*. *Tetramorium sada*, however, has a more transverse and broader petiolar node in dorsal view (DPeI 400–463; PPI 89–95) than *T. nosybe* (DPeI 232–279; PPI 100–105), whereas the latter shares much of its morphometric range and general morphology with *T. vony*. As noted in the description of *T. vony* though, both differ in their respective habitat preferences, which together with the colouration supports their separation as different species.

Etymology

The name of the new species refers to the island of Nosy Be where the type series was collected. It is a noun in apposition, and thus invariant.

Material examined

MADAGASCAR: Antsiranana, Ampasindava, Forêt d'Ambilanivy, 3.9 km 181° S Ambaliha, 13.79861 S, 48.16167 E, 600 m, rainforest, 4.–9.III.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Nosy Be, Ambatoloaka, 13° 24' 59" S, 48° 18' 26" E, 100 m, lowland forest, 12.VIII.1992 (*G.D. Alpert*); Antsiranana, Nosy Be, 4km ESE Andoany (=Hellville), 13.41667 S, 48.3 E, 200 m, rainforest, 1.–2.V.1989 (*P.S. Ward*); Antsiranana, Nosy Be, Rés. Lokobe, 24° 59' S, 46° 18' E, 0–400 m, humid forest, 29.VIII.1989 (*D.M. Olson*); Antsiranana, Nosy Be, Lokobe Forest, 13° 24' 59" S, 48° 18' 26" E, 50 m, lowland forest, 11.VIII.1992 (*G.D. Alpert*); Antsiranana, Nosy Be, Réserve Naturelle Intégrale de Lokobe, 6.3 km 112° ESE Hellville, 13.41933 S, 48.33117 E, 30 m, rainforest, 19.–24.III.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Nosy Be, 3 km E Marodokana, 13° 27' 52.2" S, 48° 18' 48.3" E, 50 m, 18.II.1992 (*G.D. Alpert*); Antsiranana, R.S. Manongarivo, 10.8 km 229° SW Antanambao, 13.96167 S, 48.43333 E, 400 m, rainforest, 8.XI.2008 (*B.L. Fisher*).

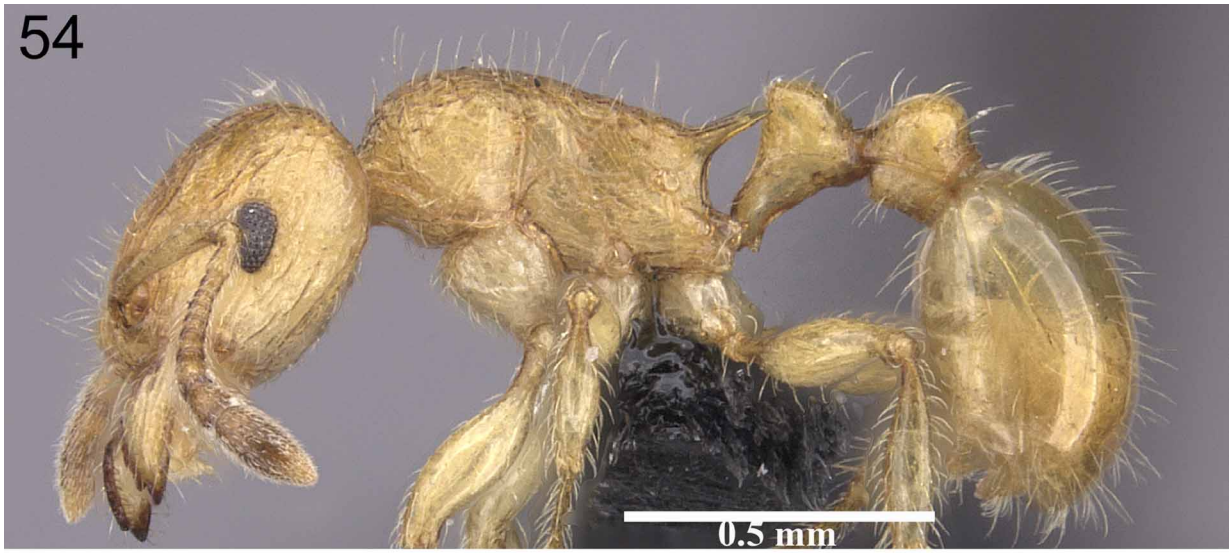
Tetramorium olana Hita Garcia & Fisher sp. n.

(figs 43, 54, 55, 56)

Holotype worker, MADAGASCAR, Antsiranana, Forêt d' Andavakoera, 21.4 km 75° ENE Ambilobe, 4.6 km 356° N Betsiaka, 13.1183 S, 49.23 E, 425 m, rainforest, sifted litter (leaf mold, rotten wood), collection code BLF10260, 15.XII.2003 (*B.L. Fisher*) (CASC: CASENT0044485). Paratypes, 12 workers with same data as holotype (BMNH: CASENT0044353; CASC: CASENT0044342; CASENT0044359; CASENT0044381; CASENT0044399; CASENT0044402; CASENT0044407; CASENT0044477; CASENT0044484; CASENT0044503; MHNG: CASENT0044458).

Diagnosis

Tetramorium olana is distinguishable from the remainder of the species group by the following character combination: mesosoma with well-developed anterior face of pronotum, but without distinct anterodorsal median protuberance; petiolar node cuneiform and not strongly anteroposteriorly compressed dorsally (LPeI 45–50; DPeI 183–200); body of uniformly yellow to light brown colour.



FIGURES 54–56. *T. olana*, holotype—CASENT0044485 (William Ericson 2011). 54. Body in profile. 55. Body in dorsal view. 56. Head in full-face view.

Description

HL 0.56–0.65 (0.62); HW 0.54–0.63 (0.61); SL 0.39–0.45 (0.43); EL 0.12–0.15 (0.14); PH 0.33–0.36 (0.34); PW 0.38–0.46 (0.43); WL 0.71–0.82 (0.77); PSL 0.21–0.23 (0.22); PTL 0.10–0.13 (0.11); PTH 0.22–0.26 (0.24); PTW 0.19–0.24 (0.22); PPL 0.17–0.23 (0.21); PPH 0.22–0.27 (0.25); PPW 0.21–0.26 (0.24); CI 96–100 (98); SI 69–73 (70); OI 22–24 (23); DMI 54–58 (56); LMI 43–46 (44); PSLI 33–37 (35); PeNI 49–52 (51); LPeI 45–50 (47); DPeI 183–200 (192); PpNI 54–56 (56); LPpI 77–88 (83); DPpI 111–124 (115); PPI 106–115 (109) (11 measured).

Head weakly longer than wide to as long as wide (CI 96–100). Anterior clypeal margin with median impression. Frontal carinae weakly to moderately developed, fading out between posterior eye margin and posterior head margin. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 69–73). Eyes of moderate size (OI 22–24). Mesosoma with well-developed anterior face but without distinct anterodorsal median protuberance on pronotum, margination from lateral to dorsal mesosoma weak to moderate; promesonotal suture and metanotal groove absent; mesosoma comparatively high, compact, and stout (LMI 43–46). Propodeal spines long to very long, spinose, and acute (PSLI 33–37); propodeal lobes small and triangular. Petiolar node in profile cuneiform, weakly anteroposteriorly compressed dorsally, approximately 2 to 2.2 times higher than long (LPeI 45–50), anterior and posterior faces not parallel, anterodorsal margin situated higher than posterodorsal, dorsum moderately tapering backwards posteriorly; node in dorsal view between 1.8 to 2 times wider than long (DPeI 183–200). Postpetiole in profile approximately rounded, approximately 1.1 to 1.3 times higher than long (LPpI 77–88), in dorsal view approximately 1.1 to 1.3 times wider than long (DPpI 111–124). Postpetiole in profile appearing somewhat more voluminous than petiolar node, in dorsal view weakly wider than petiolar node (PPI 106–115). Mandibles striate; clypeus with distinct median longitudinal ruga and one or two weaker and often shorter rugae laterally; cephalic dorsum between frontal carinae with five to nine longitudinal rugae, rugae ending at posterior head margin but often broken or with cross-meshes, close to posterior head margin reticulate-rugose, always with one well-developed longitudinal median ruga, median ruga running from posterior head margin to posterior clypeal margin, approximately at eye level diverging into two rugae leading to posterior clypeal margin; lateral and ventral head mainly reticulate-rugose to longitudinally rugose. Ground sculpture on head weakly to moderately developed. Mesosoma anterodorsally strongly reticulate-rugose, posteriorly and laterally reticulate-rugose to irregularly longitudinally rugose. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, long, fine, and erect pilosity. Body of uniform yellow to light brown colour.

Notes

The new species is only known to occur in three localities in the north and northwest of Madagascar: Manongarivo, Ampasindava, and Andavakoera. All three are rainforests situated at elevations between 400 to 600 m. The available collection data suggests that *T. olana* lives or forages in leaf litter or lower vegetation.

Within the species group, *T. olana* differs strikingly from *T. bonibony*, *T. popell*, and *T. trafo* since they possess a distinct anterodorsal median protuberance on the pronotum which is absent in *T. olana*. It can also not be easily confused with *T. kali*, although the general appearance and the similar petiolar node shape might be misleading. *Tetramorium olana* has a well-developed anterior pronotal face and shorter antennal scapes (SI 69–73) versus an almost absent anterior pronotal face and longer antennal scapes (SI 76–83). The remaining three species, *T. vony, T. sada*, and *T. nosybe*, all display a dorsally much more anteroposteriorly compressed petiolar node (LPeI 25–43; DPeI 232–462) while the node of *T. olana* is much less anteroposteriorly compressed (LPeI 45–50; DPeI 183–200). Due to its uniformly yellowish colour it is also unlikely to be confused with *T. sada*, which is dark brown and yellow, or *T. nosybe*, which is uniformly dark brown. However, *T. olana* and *T. vony* are both yellowish in colour, and are morphologically relatively similar. They differ mainly in the shape of the petiolar node and the habitats they live in (for further details see the description of *T. vony*).

Etymology

The name of the new species is Malagasy and means "problem". It refers to the initially difficult species delimitation of *T. olana*. The species epithet is a noun in apposition and thus invariant.

Material examined

MADAGASCAR: Antsiranana, Ampasindava, Forêt d'Ambilanivy, 3.9 km 181° S Ambaliha, 13.79861 S,

48.16167 E, 600 m, rainforest, 4.–9.III.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Forêt d' Andavakoera, 21.4 km 75° ENE Ambilobe, 4.6km 356° N Betsiaka, 13.11833 S, 49.23 E, 425 m, rainforest, 15.–16.XII.2003 (*B.L. Fisher*); Antsiranana, R.S. Manongarivo, 10.8 km 229° SW Antanambao, 13.96167 S, 48.43333 E, 400 m, rainforest, 8.XI.1998 (*B.L. Fisher*).

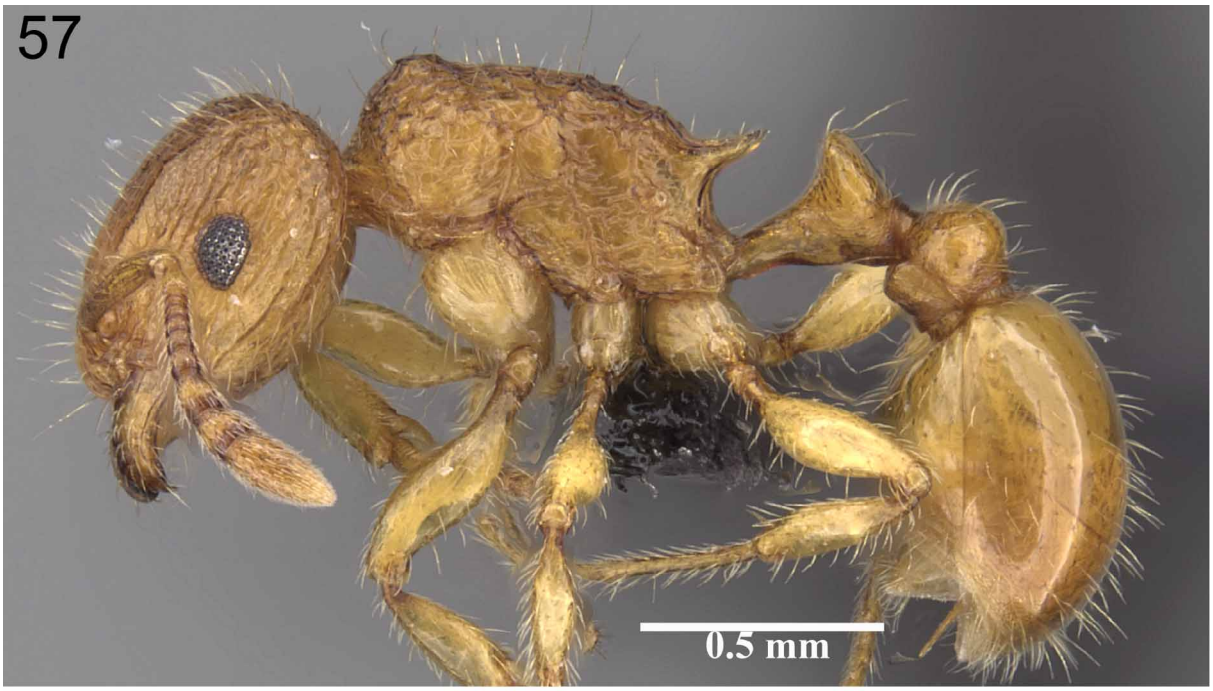
Tetramorium popell **Hita Garcia & Fisher sp. n.**
(figs 34, 57, 58, 59)

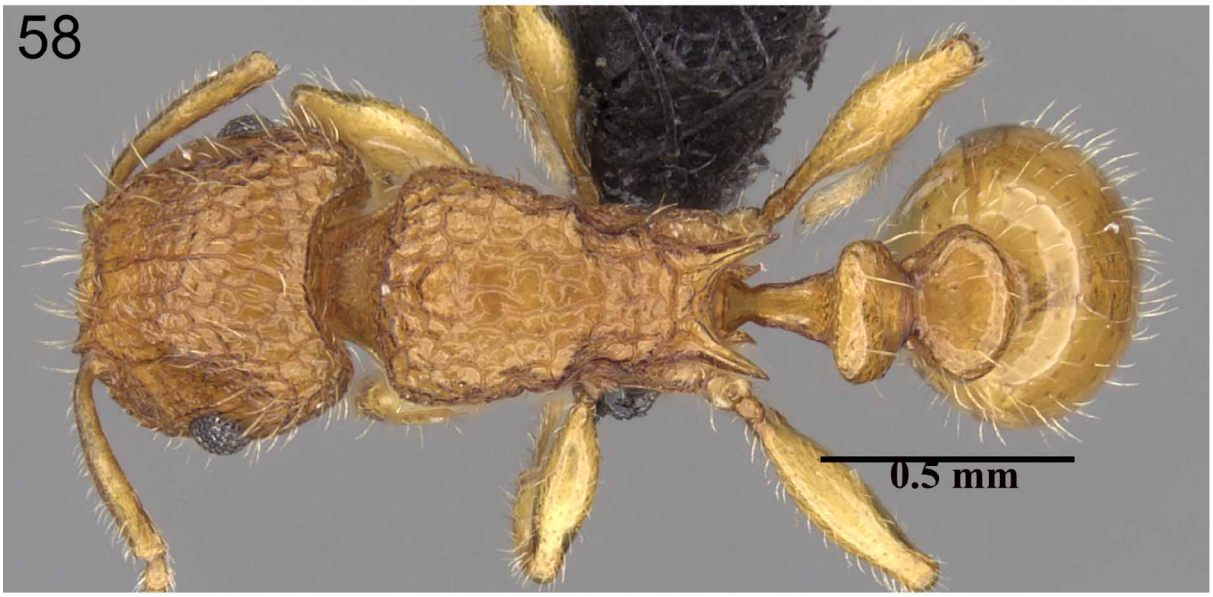
Holotype worker, MADAGASCAR, Toliara, Parc National d'Andohahela, Forêt d'Ambohibory, 1.7 km 61° ENE Tsimelahy, 36.1 km 308° NW Tolagnaro, 24.93 S, 46.6455 E, 300 m, tropical dry forest, sifted litter (leaf mold, rotten wood), collection code BLF4916, 16.–20.I.2002 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT0016867). Paratypes, 12 workers with same data as holotype (BMNH: CASENT0016870; CASC: CASENT0016841; CASENT0016842; CASENT0016848; CASENT0016850; CASENT0016790; CASENT0017669; CASENT0017671; CASENT0017691; MHNG: CASENT0017704; NHMB: CASENT0016845).

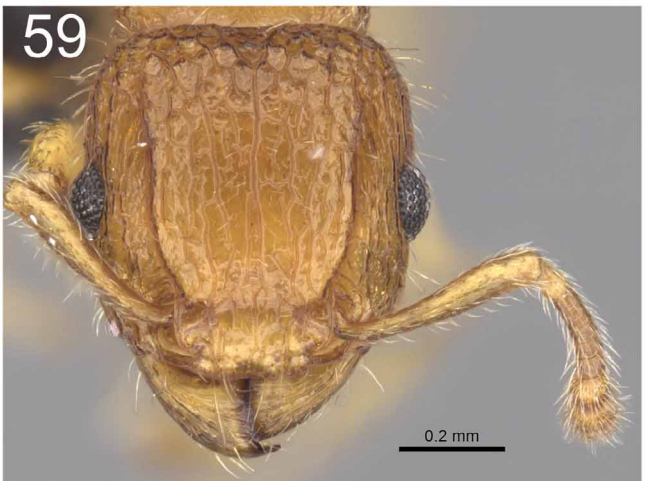
Diagnosis
The following combination of characters separates *T. popell* from the other species of the group: mesosoma with well-developed anterior face and distinct anterodorsal protuberance on pronotum; petiolar node in profile triangular cuneiform, distinctly anterodorsally compressed dorsally, and highly transverse in dorsal view (LPeI 18–27; DPeI 400–590); body of uniformly yellowish to brownish colour.

Description
HL 0.64–0.71 (0.67); HW 0.63–0.69 (0.65); SL 0.40–0.44 (0.41); EL 0.16–0.18 (0.16); PH 0.37–0.45 (0.41); PW 0.47–0.56 (0.50); WL 0.80–0.92 (0.85); PSL 0.17–0.22 (0.19); PTL 0.05–0.09 (0.07); PTH 0.26–0.32 (0.29); PTW 0.28–0.34 (0.30); PPL 0.18–0.22 (0.20); PPH 0.26–0.32 (0.29); PPW 0.29–0.36 (0.32); CI 95–99 (97); SI 62–64 (63); OI 25–26 (25); DMI 58–61 (59); LMI 46–51 (48); PSLI 26–31 (28); PeNI 57–63 (60); LPeI 18–27 (24); DPeI 400–590 (450); PpNI 60–67 (64); LPpI 67–75 (71); DPpI 152–167 (159); PPI 102–110 (107) (15 measured).

Head longer than wide (CI 95–99). Anterior clypeal margin with median impression. Frontal carinae weakly to moderately developed, fading out between posterior eye margin and posterior head margin. Antennal scrobes weakly developed, narrow, and shallow. Antennal scapes very short, not reaching posterior head margin (SI 62–64). Eyes comparatively large (OI 25–26). Mesosoma with well-developed anterior face and anterodorsal median protuberance on pronotum, moderately marginate from lateral to dorsal mesosoma, promesonotal suture and metanotal groove absent, mesosoma comparatively high, compact, and stout (LMI 46–51). Propodeal spines medium-sized to long, spinose, and acute (PSLI 26–31); propodeal lobes small and triangular. Petiolar node in profile triangular cuneiform and strongly anteroposteriorly compressed dorsally, approximately 3.7 to 5.6 times higher than long (LPeI 18–27), anterior and posterior faces not parallel, node in dorsal view highly transverse and very thin, between 4.0 to 5.9 times wider than long (DPeI 400–590). Postpetiole in profile approximately rounded to weakly anteroposteriorly compressed, approximately 1.3 to 1.5 times higher than long (LPpI 67–75), in dorsal view approximately 1.5 to 1.7 times wider than long (DPpI 152–167). Postpetiole in profile more voluminous than petiolar node, in dorsal view as wide as to weakly wider than petiolar node (PPI 102–110). Mandibles striate; clypeus longitudinally rugose with one median ruga distinctly developed and one to three often weaker or shorter rugae laterally; cephalic dorsum between frontal carinae anteriorly and centrally longitudinally rugose, posteriorly reticulate-rugose, dorsum with six to ten longitudinal rugae, rugae ending close to posterior head margin but often broken or with cross-meshes, always with one well-developed longitudinal median ruga, median ruga running from posterior head margin to posterior clypeal margin, approximately at eye level diverging into two rugae leading to posterior clypeal margin; lateral and ventral head reticulate-rugose to longitudinally rugose. Ground sculpture on head usually reticulate-punctate. Mesosoma laterally reticulate-rugose to longitudinally rugose, anteriorly more reticulate-rugose; dorsal mesosoma completely reticulate-rugose. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with very abundant, moderately long, fine, and erect pilosity. Body of uniform yellow to light brown colour.







FIGURES 57–59. *T. popell*, holotype—CASENT0016867 (Estella Ortega 2012). 57. Body in profile. 58. Body in dorsal view. 59. Head in full-face view.

Notes

Tetramorium popell is widely distributed in Madagascar. It is especially common in the southeast, the southwest, and the southern part of the Central Plateau, while it is less common in western Madagascar and was found only once in Central Madagascar. Also, it is completely absent from the north and the east, except the southeastern localities around the type locality Andohahela. *Tetramorium popell* is encountered in tropical dry forests, gallery forests, and spiny forests. Moreover, it was sampled from the leaf litter, the ground, and the lower vegetation. The altitudinal range is 20 to 990 m, but most of the material was sampled from lower elevations.

Within the group, *T. popell* is unlikely to be mistaken for *T. kali*, *T. vony*, *T. sada*, *T. nosybe*, or *T. olana* because they all lack a distinct anterodorsal protuberance on the pronotum which is present and very conspicuous in *T. popell*. The remaining two species, *T. bonibony* and *T. trafo*, also possess the anterodorsal protuberance on the pronotum but cannot be confused with *T. popell*. *Tetramorium bonibony* is always distinctly bicoloured, whereas *T. popell* and *T. trafo* are of uniformly yellowish to light brown colour. The latter two can be easily separated by the petiolar node shape, which differs significantly. The node is triangular cuneiform and dorsally strongly anteroposteriorly compressed in *T. popell* (LPeI 18–27; DPeI 400–590), while it is cuneiform and dorsally much less anteroposteriorly compressed in *T. trafo* (LPeI 48–54; DPeI 161–188).

Despite being widely distributed and seemingly very common, *T. popell* stays remarkably consistent throughout its range.

Etymology

The new species is named in honour of Andy and Rebecca Popell for their support to discover and identify life on earth.

Material examined

MADAGASCAR: Antananarivo, Ambohitantely, 18.198 S, 47.2815 E, 700 m, forêt sclerophylle, 28.XII.2003–10.I.2004 (*R. Rin'Ha & M.E. Irwin*); Antsiranana, 48 km ENE Morondava, 20.06667 S, 44.65 E, tropical dry forest, 4.I.1991 (*D.M. Olson*); Fianarantsoa, 1 km E of Isalo National Park Interpretive Center, 22.62667 S, 45.35817 E, 885 m, dry wash, 30.III.–7.IV.2002 (*R. Harin'Hala*); Fianarantsoa, Parc National d'Isalo, 9.1 km 354° N Ranohira, 22.48167 S, 45.46167 E, 725 m, gallery forest, 27.–31.I.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, Parc National d'Isalo, Sahanafa River, 29.2 km 351° N Ranohira, 22.31333 S, 45.29167 E, 500 m, gallery forest, 10.–13.II.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, Parc National d'Isalo, Ambovo Springs, 29.3 km 4° N Ranohira, 22.29833 S, 45.35167 E, 990 m, Uapaca woodland, 9.–14.II.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, Forêt d'Analalava, 29.6 km 280° W Ranohira, 22.59167 S, 45.12833 E, 770 m, tropical dry forest, 1.–5.II.2003 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Forêt de Tsimembo, 8.7 km 336° NNW Soatana, 19.02139 S, 44.44067 E, 20 m, tropical dry forest, 21.–25.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Parc National d'Ankarafantsika, Ampijoroa Station Forestière, 40 km 306° NW Andranofasika, 16.32083 S, 46.81067 E, 130 m, tropical dry forest, 26.III.–1.IV.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Parc National d'Ankarafantsika, Forêt de Tsimaloto, 18.3 km 46° NE de Tsaramandroso, 16.22806 S, 47.14361 E, 135 m, tropical dry forest, 2.–8.IV.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Parc National de Namoroka, 17.8 km 329° WNW Vilanandro, 16.37667 S, 45.32667 E, 100 m, tropical dry forest, 8.–12.XI.2002 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Réserve d'Ankoririka, 10.6 km 13° NE de Tsaramandroso, 16.26722 S, 47.04861 E, 210 m, tropical dry forest, 9.–14.IV.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Réserve forestière Beanka, 50.7 km E Maintirano, 17.88021 S, 44.46877 E, 140 m, tropical dry forest edge, 30.X.2009 (*B.L. Fisher et al.*); Toliara, Ampanihy, urban/garden, 10.XII.2006 (*B.L. Fisher et al.*); Toliara, Antafoky, 23.47861 S, 44.06417 E, 55 m, gallery forest, 25.–28.I.2002 (*Frontier Project*); Toliara, Berenty, 12 km NW Amboasary, 5.–15.V.1983 (*J.S. Noyes & M.C. Day*); Toliara, Beza Mahafaly, 27 km E Betioky, 23.65 S, 44.63333 E, 135 m, tropical dry forest, 23.IV.1997 (*B.L. Fisher*); Toliara, Beza Mahafaly Reserve, near research station, Parcel I, 23.6865 S, 44.591 E, 165 m, dry deciduous forest, 10.XI.2001–29.IV.2002 (*R. Harin'Hala*); Toliara, Beza Mahafaly Reserve, Parcel 1, 23.65 S, 44.63333333 E, 130 m, tropical dry forest, 13.II.1993 (*P.S. Ward*); Toliara, Fiherenana, 23.17694 S, 43.96083 E, 100 m, gallery forest, 21.–24.X.2002 (*Frontier Project*); Toliara, Fiherenana, 23.22252 S, 43.88088 E, 65 m, degraded gallery forest, 5.–7.VIII.2003 (*Frontier Wilderness Project*); Toliara, Forêt de Mahavelo, Isantoria River, 24.75833 S, 46.15717 E, 110 m, spiny forest/thicket, 28.I.–1.II.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Forêt de Mite, 20.7 km 29° WNW Tongobory, 23.52417 S, 44.12133 E, 75 m, gallery forest, 27.II.–3.III.2002 (*B.L.*

Fisher, C. Griswold et al.); Toliara, Forêt Vohidava 88.9 km N Amboasary, 24.24067 S, 46.28783 E, 500 m, spiny forest/dry forest transition, 6.–9.XII.2006 (*B.L. Fisher et al.*); Toliara, Makay Mts., 21.2098 S, 45.3418 E, 525 m, gallery forest, 27.XI.–2.XII.2010 (*B.L. Fisher et al.*); Toliara, Manombo, 22.81092 S, 43.7344 E, 177 m, gallery forest, 30.IV.–2.V.2004 (*Frontier Wilderness Project*); Toliara, Manombo, 22.8123 S, 43.73932 E, 165 m, gallery forest, 22.–24.V.2004 (*Frontier Wilderness Project*); Toliara, 3.5 km 236° SW Marovato, 25.55389 S, 45.25583 E, 230 m, spiny forest/thicket, 14.II.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Mikea Forest, 22.91333 S, 43.48222 E, 37 m, spiny forest, 20.–27.XI.2001 (*R. Harin'Hala*); Toliara, Parc National d'Andohahela, Forêt d'Ambohibory, 1.7 km 61° ENE Tsimelahy, 36.1 km 308° NW Tolagnaro, 24.93 S, 46.6455 E, 300 m, tropical dry forest, 16.–20.I.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Parc National de Kirindy Mite, 16.3 km 127° SE Belo sur Mer, 20.79528 S, 44.147 E, 80 m, tropical dry forest, 6.–10.XII.2001 (*B.L. Fisher, C. Griswold et al.*); Toliara, Parc National de Zombitse, 19.8 km 84° E Sakaraha, 22.84333 S, 44.71 E, 770 m, tropical dry forest, 5.–9.II.2003 (*B.L. Fisher, C. Griswold et al.*); Toliara, Réserve Berenty, 25.01667 S, 46.3 E, 25 m, tropical dry forest, 10.XII.1992 (*B.L. Fisher*); Toliara, Réserve Berenty, 25.01667 S, 46.3 E, 25 m, tropical dry forest, 9.II.1993 (*P.S. Ward*); Toliara, Réserve Privé Berenty, Forêt de Bealoka, Mandraré River, 14.6 km 329° NNW Amboasary, 24.95694 S, 46.2715 E, 35 m, gallery forest, 3.–8.II.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Réserve Privé Berenty, Forêt de Malaza, Mandraré River, 8.6 km 314° NW Amboasary, 25.00778 S, 46.306 E, 40 m, gallery forest, 6.II.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Reserve Special Berenty, 8 km NW Amboasary, 58 km SW of Fort Dauphin, 25.00667 S, 46.30333 E, 85 m, gallery forest, 25.–26.X.2002 (*M.E. Irwin, F.D. Parker & R. Harin'Hala*); Toliara, Reserve Special Berenty, 25.00667 S, 46.30333 E, 85 m, gallery forest, 7.I.2003–13.I.2004 (*R. Rin'Ha & M.E. Irwin*); Toliara, Reserve Special Berenty, 25.021 S, 46.3055 E, 37 m, spiny forest, 10.VI.2003–24.III.2004 (*R. Rin'Ha & M.E. Irwin*); Toliara, southern Isoky-Vohimena Forest, 59 km NE Sakaraha, 22.46667 S, 44.85 E, 730 m, tropical dry forest, 21.I.1996 (*B.L. Fisher*).

Tetramorium sada Hita Garcia & Fisher sp. n.

(figs 30, 37, 38, 60, 61, 62)

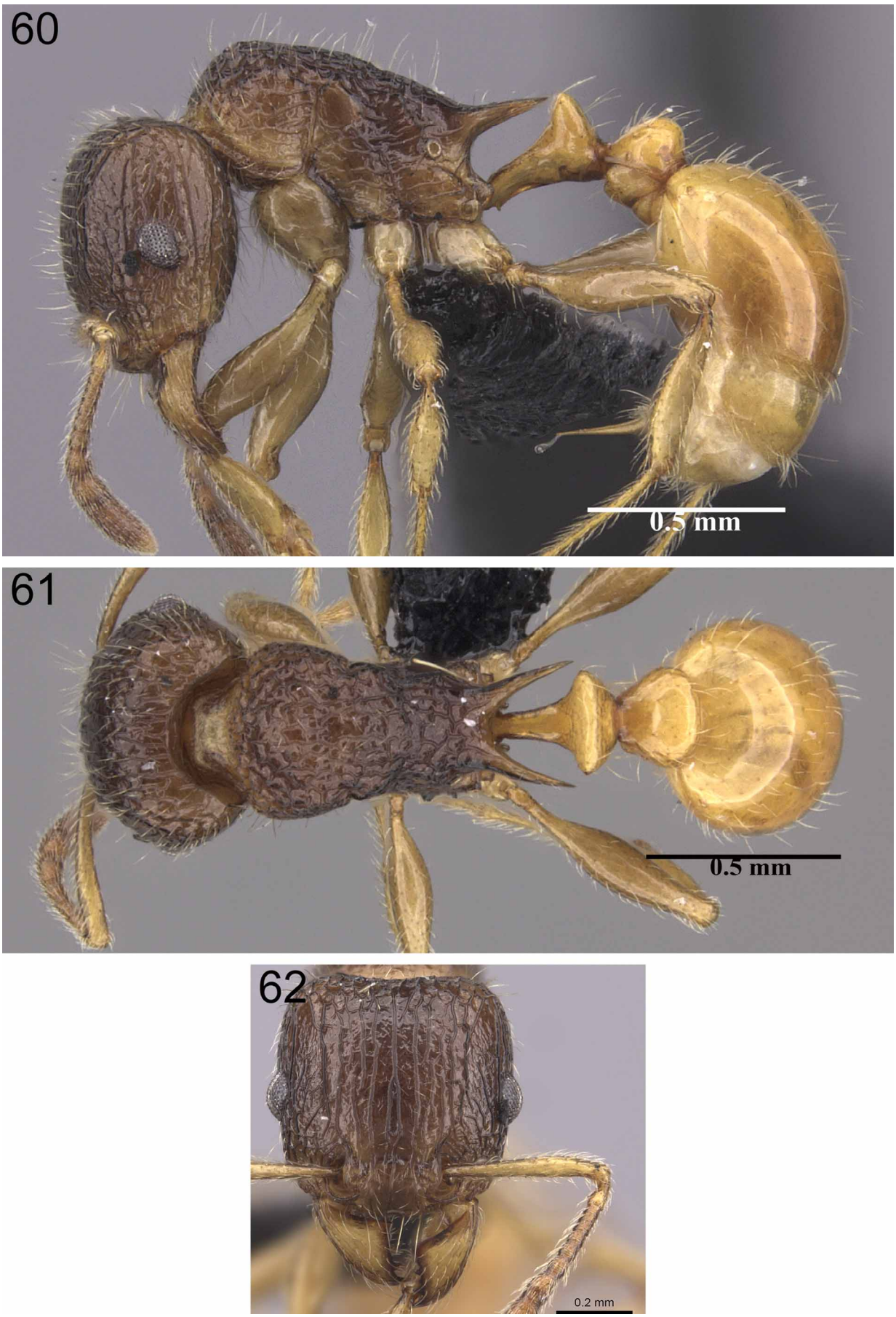
Holotype worker, MADAGASCAR, Mahajanga, Parc National Tsingy de Bemaraha, 3.4 km 93° E Bekopaka, Tombeau Vazimba, 19.14194 S, 44.828 E, 50 m, tropical dry forest, beating low vegetation, collection code BLF4234, 6.–10.XI.2001 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT0443274). Paratypes, 49 workers with same data as holotype (BMNH: CASENT0443394; CASC: CASENT0443271; CASENT0443273; CASENT0443277; CASENT0443280; CASENT0443330; CASENT0443304; CASENT0443311; CASENT0443312; CASENT0443313; CASENT0443342; CASENT0443345; CASENT0443362; CASENT0443363; CASENT0443377; CASENT0443382; CASENT0443383; CASENT0443384; CASENT0443385; CASENT0443398; CASENT0443399; CASENT0443422; CASENT0443433; CASENT0443438; MCZ: CASENT0443364; MHNG: CASENT0443439; NHMB: CASENT0443381).

Diagnosis

The following character set separates *T. sada* from all other species in the *T. bonibony* group: mesosoma with well developed anterior face of pronotum but without an anterodorsal median protuberance; petiolar node in profile triangular nodiform, strongly anteroposteriorly compressed dorsally, and highly transverse in dorsal view (LPeI 25–30; DPeI 400–463); postpetiole distinctly narrower than petiolar node (PPI 89–95); distinct bicolouration with dark brown head and mesosoma contrasting with yellow waist segments and gaster.

Description

HL 0.70–0.84 (0.79); HW 0.70–0.86 (0.80); SL 0.46–0.58 (0.54); EL 0.16–0.19 (0.18); PH 0.41–0.52 (0.48); PW 0.50–0.64 (0.59); WL 0.85–1.09 (1.01); PSL 0.30–0.37 (0.34); PTL 0.07–0.09 (0.08); PTH 0.26–0.34 (0.30); PTW 0.30–0.39 (0.36); PPL 0.21–0.25 (0.23); PPH 0.27–0.37 (0.33); PPW 0.27–0.37 (0.33); CI 100–103 (102); SI 65–70 (68); OI 21–22 (22); DMI 56–60 (58); LMI 46–49 (48); PSLI 42–45 (43); PeNI 59–63 (61); LPeI 25–30 (28); DPeI 400–463 (425); PpNI 54–60 (56); LPpI 67–76 (70); DPpI 132–152 (142); PPI 89–95 (92) (12 measured).



FIGURES 60–62. *T. sada*, holotype—CASENT0443274 (William Ericson 2011). 60. Body in profile. 61. Body in dorsal view. 62. Head in full-face view.

Head as wide as long to weakly wider (CI 100–103). Anterior clypeal margin with median impression. Frontal carinae moderately developed, ending between posterior eye margin and posterior head margin. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 65–70). Eyes comparatively small (OI 21–22). Mesosoma with well developed anterior face of pronotum but without an anterodorsal median protuberance, mesosoma weakly to moderately marginate from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent; mesosoma very high, compact, and stout (LMI 46–49). Propodeal spines very long, spinose, and acute (PSLI 42–45); propodeal lobes small and triangular. Petiolar node in profile triangular cuneiform and strongly anteroposteriorly compressed dorsally, approximately 3.3 to 3.9 times higher than long (LPeI 25–30), anterior and posterior faces not parallel, node in dorsal view highly transverse and very thin, between 4.0 to 4.6 times wider than long (DPeI 400–463). Postpetiole in profile approximately rounded, approximately 1.3 to 1.5 times higher than long (LPpI 67–76), in dorsal view approximately 1.3 to 1.5 times wider than long (DPpI 132–152). Postpetiole in profile more voluminous than petiolar node, in dorsal view distinctly less broad than petiolar node, only approximately 0.9 times width of petiolar node (PPI 89–95). Mandibles striate; clypeus with one distinct median longitudinal ruga and one or two often weaker rugae at each side; cephalic dorsum between frontal carinae anteriorly and centrally longitudinally rugose and posteriorly reticulate-rugose, dorsum with five to nine longitudinal rugae, rugae ending close to posterior head margin but often broken or with cross-meshes, always with one well-developed longitudinal median ruga, median ruga running from posterior head margin to posterior clypeal margin, approximately at eye level diverging into two rugae leading to posterior clypeal margin; lateral and ventral head mainly reticulate-rugose to longitudinally rugose. Ground sculpture on head weakly to moderately reticulate-punctate. Lateral mesosoma reticulate-rugose to irregularly longitudinally rugose; dorsal mesosoma anteriorly strongly reticulate-rugose, posteriorly reticulate-rugose to longitudinally rugose. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, moderately long, fine, and erect pilosity. Body distinctly bicoloured, head and mesosoma brown to dark brown, waist segments and gaster yellow, appendages of lighter brown than head and mesosoma.

Notes

The distribution of *T. sada* is limited to western Madagascar. It seems to be common from Tsingy de Bemaraha to Namoroka, but further north it is only known from Ankarafantsika. Furthermore, it lives in tropical dry forests, sometimes on tsingy, and was mainly collected from the leaf litter or lower vegetation.

Tetramorium sada cannot be mistaken for any other group member due to a few important diagnostic characters. The lack of a distinct anterodorsal median protuberance on the pronotum separates it from *T. bonibony*, *T. popell*, and *T. trafo*, while the conspicuous bicolouration distinguishes it from the remaining species of the group. Nonetheless, *T. bonibony* shares the same bicolouration and both could be confused with each other since their distribution ranges are comparatively similar and they co-occur in some localities. In addition to the difference in the development of the median protuberance on the pronotum, *T. sada* has shorter antennal scapes (SI 65–70) than *T. bonibony* (SI 69–74), although the variation is not highly significant. A better supporting character is the relationship between the widths of the petiolar node and the postpetiole. In *T. sada* the postpetiole is distinctly narrower than the petiolar node (PPI 89–95), whereas the postpetiole is as wide as to weakly wider than the petiolar node in *T. bonibony* (PPI 100–106).

If one does not consider the evident difference in colouration, *T. sada* also resembles *T. vony* and *T. nosybe* in general morphology. However, the latter two species also have a postpetiole which is as wide as to weakly wider than the petiolar node (PPI 100–107). The remaining two species, *T. kali* and *T. olana*, both have a much less anteroposteriorly compressed and transverse petiolar node (LPeI 45–57; DPeI 135–200), and are thus not likely to be misidentified with *T. sada* (LPeI 25–30; DPeI 400–463).

Etymology

The name of the new species is Malagasy and means "mixture of colour". It refers to the distinctive bicolouration of the new species. The species name is a noun in apposition, and thus invariant.

Material examined

MADAGASCAR: Mahajanga, Parc National d'Ankarafantsika, Forêt de Tsimaloto, 18.3 km 46° NE de Tsaramandroso, 16.22806 S, 47.14361 E, 135 m, tropical dry forest, 2.–8.IV.2001 (*B.L. Fisher, C. Griswold et al.*);

Mahajanga, Parc National de Namoroka, 16.9 km 317° NW Vilanandro, 16.40667 E, 45.31 E, 100 m, tropical dry forest, 12.–16.XI.2002 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Parc National Tsingy de Bemaraha, 3.4 km 93° E Bekopaka, Tombeau Vazimba, 19.14194 S, 44.828 E, 50 m, tropical dry forest, 6.–10.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Parc National Tsingy de Bemaraha, 10.6 km ESE 123° Antsalova, 18.70944 S, 44.71817 E, 150 m, tropical dry forest on tsingy, 26.–20.XI.2001 (*B.L. Fisher, C. Griswold et al.*); Mahajanga, Réserve forestière Beanka, 54.3 km E Maintirano, 18.06009 S, 44.54086 E, 262 m, tropical dry forest on tsingy, 18.X.2009 (*B.L. Fisher et al.*); Mahajanga, Réserve forestière Beanka, 50.2 km E Maintirano, 18.02649 S, 44.05051 E, 250 m, tropical dry forest on tsingy, 19.–20.X.2009 (*B.L. Fisher et al.*); Mahajanga, Réserve forestière Beanka, 53.6 km E Maintirano, 18.04014 S, 44.53394 E, 272 m, tropical dry forest on tsingy, 25.X.2009 (*B.L. Fisher et al.*); Mahajanga, Réserve Spéciale de Bemarivo, 23.8 km 223° SW Besalampy, 16.925 S, 44.36833 E, 30 m, tropical dry forest, 19.–23.XI.2002 (*B.L. Fisher, C. Griswold et al.*).

Tetramorium trafo Hita Garcia & Fisher sp. n.

(figs 33, 35, 63, 64, 65)

Holotype worker, MADAGASCAR, Antsiranana, Forêt d'Orangea, 3.6 km 128° SE Remena, 12.25889 S, 49.37467 E, 90 m, littoral rainforest, sifted litter (leaf mold, rotten wood), collection code BLF3200, 22.–28.II.2001 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT0404115). Paratypes, 32 workers with same data as holotype (BMNH: CASENT0404104; CASENT0404114; CASC: CASENT0404103; CASENT0404107; CASENT0404108; CASENT0404109; CASENT0404111; CASENT0404112; CASENT0404113; CASENT0404116; CASENT0404117; CASENT0404118; CASENT0404122; CASENT0404124; CASENT0404125; CASENT0404126; CASENT0404127; CASENT0404128; CASENT0404129; CASENT0404130; CASENT0404131; CASENT0404132; CASENT0404133; CASENT0404137; CASENT0404138; CASENT0404139; CASENT0404140; CASENT0404141; CASENT0404146; MCZ: CASENT0404102; MHNG: CASENT0404134; NHMB: CASENT0404136).

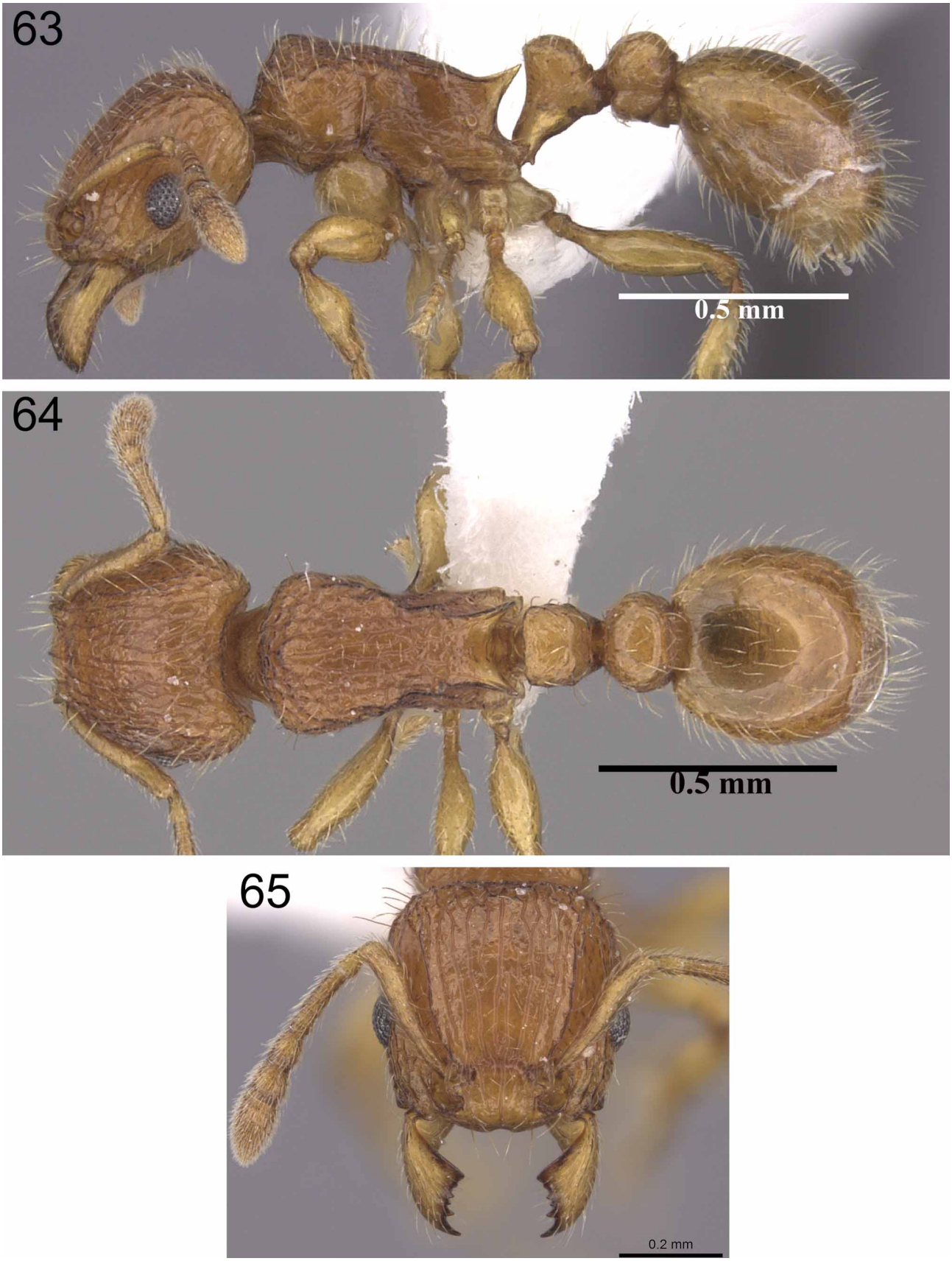
Diagnosis

Tetramorium trafo is recognisable within the species group due to the character combination of: mesosoma with well-developed anterior face and distinct anterodorsal protuberance or bump on pronotum; petiolar node cuneiform and only weakly anteroposteriorly compressed dorsally (LPeI 48–54; DPeI 161–188); body of uniformly yellowish to brownish colour.

Description

HL 0.57–0.64 (0.61); HW 0.54–0.62 (0.58); SL 0.36–0.41 (0.39); EL 0.13–0.15 (0.14); PH 0.35–0.40 (0.37); PW 0.41–0.45 (0.43); WL 0.68–0.79 (0.74); PSL 0.15–0.18 (0.17); PTL 0.11–0.14 (0.13); PTH 0.23–0.28 (0.26); PTW 0.19–0.25 (0.23); PPL 0.16–0.20 (0.18); PPH 0.23–0.28 (0.25); PPW 0.24–0.29 (0.27); CI 94–97 (95); SI 65–67 (66); OI 24–25 (24); DMI 56–60 (58); LMI 49–51 (50); PSLI 26–29 (27); PeNI 46–57 (53); LPeI 48–54 (51); DPeI 161–188 (175); PpNI 59–66 (63); LPpI 70–75 (73); DPpI 145–156 (149); PPI 116–126 (119) (11 measured).

Head longer than wide (CI 94–97). Anterior clypeal margin medially impressed. Frontal carinae moderately developed, ending between posterior eye margin and posterior head margin. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 65–67). Eyes medium-sized to comparatively large (OI 24–25). Mesosoma with very well developed anterior face and distinct anterodorsal protuberance or bump on pronotum, mesosoma moderately marginate from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent; mesosoma very high, compact, and stout (LMI 49–51). Propodeal spines medium-sized to long, elongate-triangular to spinose, and acute (PSLI 26–29); propodeal lobes small and triangular. Petiolar node in profile cuneiform, weakly anteroposteriorly compressed dorsally, approximately 1.8 to 2.1 times higher than long (LPeI 48–54), anterior and posterior faces not parallel, anterodorsal margin situated weakly higher than posterodorsal, dorsum moderately tapering backwards posteriorly; node in dorsal view between 1.6 to 1.9 times wider than long (DPeI 161–188). Postpetiole in profile approximately rounded, approximately 1.3 to 1.4 times higher than long (LPpI 70–75), in dorsal view approximately 1.4 to 1.6 times wider than long (DPpI 145–156).



FIGURES 63–65. *T. trafo*, holotype—CASENT0404115 (William Ericson 2011). 63. Body in profile. 64. Body in dorsal view. 65. Head in full-face view.

Postpetiole in profile approximately as voluminous as petiolar node, in dorsal view approximately 1.1 to 1.3 times wider than petiolar node (PPI 116–126). Mandibles striate; clypeus with one distinct median ruga and one or two weaker and often shorter rugae or rugulae laterally; cephalic dorsum between frontal carinae with five to nine longitudinal rugae anteriorly and dorsally, posteriorly distinctly reticulate-rugose, rugae ending at posterior head margin but often broken or with cross-meshes, always with one well-developed longitudinal median ruga, median ruga running from posterior head margin to posterior clypeal margin, approximately at eye level diverging into two rugae leading to posterior clypeal margin; lateral and ventral head mainly reticulate-rugose to longitudinally rugose. Ground sculpture on head faint to absent. Mesosoma laterally mostly irregularly longitudinally rugose, with unsculptured areas; dorsal mesosoma anteriorly strongly reticulate-rugose, posteriorly reticulate-rugose to longitudinally rugose. Waist segments usually weakly, superficially sculptured, appearing rough, sometimes almost unsculptured. Gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with very abundant, moderately long, fine, and erect pilosity. Body of uniform yellow to light brown colour.

Notes

Tetramorium trafo is only found at a coastal strip at the eastern side of the northern tip of Madagascar. It ranges from the southernmost locality of Analabe to the northernmost, Ampombofofo. The species seems to prefer littoral rainforests or tropical dry forests in close proximity to the coast, located at low elevations of 10 to 180 m. In addition, *T. trafo* appears to be a leaf litter inhabitant.

Due to its distinct anterodorsal mesosomal protuberance, *T. trafo* cannot be misidentified with *T. vony*, *T. kali*, *T. sada*, *T. nosybe*, and *T. olana* since they all lack the mesosomal protuberance. In the remaining two species, *T. bonibony* and *T. popell*, the protuberance is present and well developed. However, *T. bonibony* is distinctly bicoloured, while *T. trafo* is uniformly yellow to brown. Finally, the distinction from *T. popell* is based on petiolar node shape and sculpture. *Tetramorium trafo* has a cuneiform petiolar node with a much less anteroposteriorly compressed dorsum than *T. popell*. Also, the node of the latter is always completely unsculptured, smooth, and shiny, whereas the node of *T. trafo* is weakly sculptured and appears moderately rough.

Etymology

The species epithet is Malagasy and means "the hump of cattle" in reference to the anterodorsal protuberance or hump on the anterior mesosoma of the new species. The species name is a noun in apposition, and thus invariant.

Material examined

MADAGASCAR: Antsiranana, Forêt d'Ampombofofo, 12.09949 S, 49.33874 E, 25 m, littoral forest, 21.–22.XI.2007 (*B.L. Fisher et al.*); Antsiranana, Forêt d'Ampondrabe, 26.3 km 10° NNE Daraina, 12.97 S, 49.7 E, 175 m, tropical dry forest, 10.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt d'Analabe, 30.0 km 72° ENE Daraina, 13.08333 S, 49.90833 E, 30 m, littoral rainforest, 27.–29.XI.2003 (*B.L. Fisher*); Antsiranana, Forêt d'Orangea, 3.6 km 128° SE Remena, 12.25889 S, 49.37467 E, 90 m, littoral rainforest, 22.–28.II.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Montagne des Français, 12.32033 S, 49.3365 E, 180 m, 31.XII.2005 (*A. Ballerio*); Antsiranana, Montagne des Français, 7.2 km 142° SE Antsiranana (=Diego Suarez), 12.32278 S, 49.33817 E, 180 m, tropical dry forest, 22.–28.II.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Rés. Analamerana, 28.4 km 99° Anivorano-Nord, 12.74667 S, 49.49483 E, 60 m, tropical dry forest, 5.XII.2004 (*B.L. Fisher*); Antsiranana, Sakalava Beach [vegetated beach dunes], 12.26278 S, 49.3975 E, 10 m, across sandy trail in dwarf littoral forest, 31.V.–7.VI.2001 (*R. Harin'Hala*).

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

(figs 40, 42, 44, 66, 67, 68)

Holotype worker, MADAGASCAR, Antsiranana, Réserve Spéciale de l'Ankarana, 13.6 km 192° SSW Anivorano Nord, 12.8636 S, 49.2258 E, 210 m, tropical dry forest, beating low vegetation, collection code BLF03016, 16.–21.II.2001 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT0404272). Paratypes, 43 workers with same data as holotype (BMNH: CASENT0404282; CASENT0404310; CASC: CASENT0404270; CASENT0404271; CASENT0404275; CASENT0404276; CASENT0404279; CASENT0404280; CASENT0404281;

CASENT0404286; CASENT0404287; CASENT0404288; CASENT0404290; CASENT0404291; CASENT0404292; CASENT0404293; CASENT0404297; CASENT0404298; CASENT0404299; CASENT0404301; CASENT0404304; CASENT0404305; CASENT0404306; CASENT0404308; CASENT0404309; CASENT0404311; CASENT0404312; CASENT0404320; CASENT0404321; CASENT0404332; MHNG: CASENT0404277; MCZ: CASENT0404278; NHMB: CASENT0404289).

Diagnosis

Tetramorium vony can be clearly distinguished within the *T. bonibony* group by the following character combination: mesosoma with well developed anterior face of pronotum but without anterodorsal median protuberance; petiolar node in profile triangular cuneiform, dorsally strongly anteroposteriorly compressed, and highly transverse in dorsal view (LPeI 31–41; DPeI 245–333); postpetiole as wide as to weakly wider than petiolar node (PPI 100–107); body of uniform yellow colour.

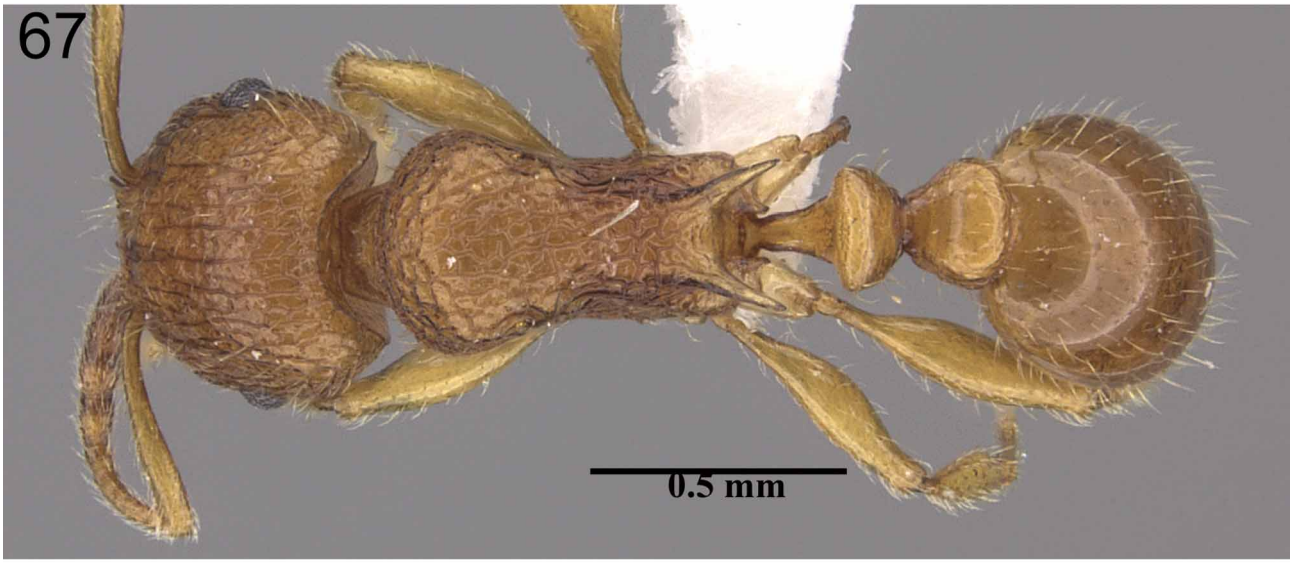
Description

HL 0.67–0.80 (0.73); HW 0.65–0.79 (0.72); SL 0.46–0.56 (0.50); EL 0.14–0.18 (0.16); PH 0.41–0.48 (0.44); PW 0.49–0.61 (0.54); WL 0.85–0.98 (0.92); PSL 0.23–0.33 (0.28); PTL 0.09–0.11 (0.10); PTH 0.27–0.33 (0.30); PTW 0.27–0.34 (0.30); PPL 0.21–0.25 (0.22); PPH 0.28–0.35 (0.31); PPW 0.28–0.34 (0.31); CI 96–99 (98); SI 68–72 (70); OI 22–24 (22); DMI 56–62 (58); LMI 46–49 (48); PSLI 33–42 (38); PeNI 53–59 (56); LPeI 31–41 (34); DPeI 245–333 (298); PpNI 55–59 (57); LPpI 69–77 (72); DPpI 133–143 (138); PPI 100–107 (102) (12 measured).

Head usually slightly longer than wide (CI 96–99). Anterior clypeal margin with median impression. Frontal carinae weakly to moderately developed, fading out between posterior eye margin and posterior head margin. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 68–72). Eyes of moderate size (OI 22–24). Mesosoma with well developed anterior face of pronotum, but without any anterodorsal median protuberance, mesosoma weakly marginate from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent, mesosoma comparatively high, compact, and stout (LMI 46–49). Propodeal spines long to very long, spinose, and acute (PSLI 33–42); propodeal lobes small and triangular. Petiolar node in profile triangular cuneiform, strongly anteroposteriorly compressed dorsally, approximately 2.4 to 3.3 times higher than long (LPeI 31–41), anterior and posterior faces not parallel; node in dorsal view highly transverse, between 2.4 to 3.3 times wider than long (DPeI 245–333). Postpetiole in profile approximately rounded and weakly anteroposteriorly compressed, approximately 1.3 to 1.5 times higher than long (LPpI 69–77), in dorsal view between 1.3 to 1.5 times wider than long (DPpI 133–143). Postpetiole in profile appearing slightly more voluminous than petiolar node, in dorsal view approximately as wide as to weakly wider than petiolar node (PPI 100–107). Mandibles striate; clypeus with one distinct median longitudinal ruga and one or two often weaker rugae at each side; cephalic dorsum between frontal carinae anteriorly and centrally longitudinally rugose and posteriorly reticulate-rugose, dorsum with five to nine longitudinal rugae, rugae ending close to posterior head margin but often broken or with cross-meshes, always with one well-developed longitudinal median ruga, median ruga running from posterior head margin to posterior clypeal margin, approximately at eye level diverging into two rugae leading to posterior clypeal margin; lateral and ventral head mainly reticulate-rugose to longitudinally rugose. Ground sculpture on head weakly to moderately reticulate-punctate. Mesosoma laterally reticulate-rugose to irregularly longitudinally rugose, anteriorly often weakly sculptured; dorsal mesosoma mainly reticulate-rugose. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, moderately long, fine, and erect pilosity. Body of uniform yellow to light brown colour.

Notes

The distribution of *T. vony* is mainly restricted to the north of Madagascar. There it occurs from Andavakoera, Antsahabe, and Bekaraoka north to Montagne des Français. However, a single specimen from the botanical garden at the Andasibe National Park was confidently identified as *T. vony*, although no other conspecific material is known between Andasibe and the northern localities mentioned above. Since *T. vony* was predominantly sampled from lower vegetation, it is possible that the specimen from the botanical garden was transported with plant material from the main distribution of the species in the north. Furthermore, *T. vony* is mainly found in tropical dry forests and only very rarely in tropical rainforests. Also, it has an altitudinal range from 60 to 1025 m, but appears to prefer lower elevations.



FIGURES 66–68. *T. vony*, holotype—CASENT0404272 (William Ericson 2011). 66. Body in profile. 67. Body in dorsal view. 68. Head in full-face view.

Due to the lack of an anterodorsal median protuberance on its pronotum *T. vony* cannot be confused with the three species having a distinct protuberance, *T. bonibony*, *T. popell*, and *T. trafo*. Also, it should not be mistaken for *T. kali* since this species lacks a well-developed anterior face of the pronotum and has a less transverse petiolar node in dorsal view (DPeI 136–160) while *T. vony* possesses a very well developed anterior face of the pronotum and a much more transverse petiolar node in dorsal view (DPeI 245–333). *Tetramorium nosybe* (dark brown) and *T. sada* (dark brown and yellow) are both differently coloured than *T. vony*, and thus not likely to be confused. It should be noted, however, that apart from the colour there is little morphological dissimilarity between *T. vony* and *T. nosybe*. Nonetheless, *T. vony* is predominantly found in tropical dry forests, whereas *T. nosybe* lives in rainforests. The differences in colouration, in combination with the differences in habitat types, provides sufficient evidence to treat them as different species for the moment. Nevertheless, it has to be mentioned that *T. vony*, *T. sada*, and *T. nosybe* do not occur in sympatry. *Tetramorium vony* is mainly found in the northern tip of Madagascar, whereas *T. nosybe* is known only in the area around Nosy Be, and *T. sada* is restricted to western Madagascar. Therefore, it is possible that these three species represent geographic varieties or different ecotypes of the same species.

The remaining species of the group, *T. olana*, is morphologically very close to *T. vony* since both are of yellow to light brown colour, share a similar general habitus, and have close morphometric ranges. The main morphological difference is the shape of the petiolar node. In *T. olana* it is cuneiform and weakly anteroposteriorly compressed in profile and less transverse in dorsal view (LPeI 45–50; DPeI 183–200), whereas it is triangular cuneiform, strongly anteroposteriorly compressed and less transverse in *T. vony* (LPeI 31–41; DPeI 245–333, generally around 300). The postpetiole is also somewhat differently shaped since it is more anteroposteriorly compressed in *T. vony* (LPpI 69–77; DPpI 133–143) versus more rounded in *T. olana* (LPpI 77–88; DPpI 111–124). Additionally, both species co-occur in one locality (Andavakoera), and retain their specific characteristics, which supports their heterospecificity. Furthermore, both species also differ in their habitat preferences because *T. vony* lives mainly in tropical dry forests, whereas *T. olana* seems to be a rainforest inhabitant.

Etymology

The name of the new species is Malagasy and means "yellow". The epithet is treated as a noun in apposition, and thus invariant.

Material examined

MADAGASCAR: Antsiranana, Forêt d'Ampondrabe, 26.3 km 10° NNE Daraina, 12.97 S, 49.7 E, 175 m, tropical dry forest, 11.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt d' Andavakoera, 21.4 km 75° ENE Ambilobe, 4.6 km 356° N Betsiaka, 13.11833 S, 49.23 E, 425 m, rainforest, 16.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt d' Antsahabe, 11.4 km 275° W Daraina, 13.21167 S, 49.55667 E, 550 m, tropical dry forest, 13.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt de Bekaraoka, 6.8 km 60° ENE Daraina, 13.16667 S, 49.71 E, 150 m, tropical dry forest, 7.–8.XII.2003 (*B.L. Fisher*); Antsiranana, Montagne des Français, 7.2 km 142° SE Antsiranana (=Diego Suarez), 12.32278 S, 49.33817 E, 180 m, tropical dry forest, 22.–28.II.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Parc National Montagne d'Ambre [first campsite], 12.51444 S, 49.18139 E, 960 m, rainforest, 4.–19.III.2001 (*R. Harin'Hala*); Antsiranana, Rés. Analamerana, 16.7 km 123° Anivorano-Nord, 12.80467 S, 49.37383 E, 225 m, tropical dry forest, 3.–4.XII.2004 (*B.L. Fisher*); Antsiranana, Rés. Analamerana, 28.4 km 99° Anivorano-Nord, 12.74667 S, 49.49483 E, 60 m, tropical dry forest, 5.–6.XII.2004 (*B.L. Fisher*); Antsiranana, Réserve Spéciale d'Ambre, 3.5 km 235° SW Sakaramy, 12.46889 S, 49.24217 E, 325 m, tropical dry forest, 26.–31.I.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Rés. Ankarana, 7 km SE Matsaborimanga, 12° 54' S, 49° 07' E, 150 m, rainforest, 30.XI.1990 (*P.S. Ward*); Antsiranana, Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, 12.90889 S, 49.10983 E, 80 m, tropical dry forest,10.–16.II.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Réserve Spéciale de l'Ankarana, 13.6 km 192° SSW Anivorano Nord, 12.86361 S, 49.22583 E, 210 m, tropical dry forest, 16.–21.II.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Réserve Spéciale de l'Ankarana, 13.6 km 192° SSW Anivorano Nord, 12.86361 S, 49.22583 E, 210 m, tropical dry forest, 19.–20.II.2001 (*G.D. Alpert*); Toamasina, Andasibe National Park, botanic garden near entrance, 18.92639 S, 48.40783 E, 1025 m, tropical forest, 4.–18.VI.2001 (*M.E. Irwin & R. Harin'Hala*).

Tetramorium dysalum species group

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae usually well-developed and ending at or shortly before posterior head margin, rarely ending halfway between posterior eye margin and posterior head margin; anterior face of mesosoma not well-developed; mesosoma moderately to strongly marginate dorsolaterally; mesosoma in profile comparatively high (LMI 38–46); propodeal spines medium-sized to long, elongate-triangular to spinose; propodeal lobes variable, from very short and inconspicuous to comparatively long and spinose; petiolar node in profile squamiform and anteroposteriorly compressed to high nodiform, in profile much higher than long, anterior and posterior faces generally approximately parallel with anterodorsal and posterodorsal angles situated at about same height, in few species posterodorsal angle lower than anterodorsal, then dorsum tapering backwards posteriorly, in dorsal view always distinctly wider than long, often transverse; postpetiole approximately rounded to weakly anteroposteriorly compressed; mandibular sculpture variable; cephalic dorsum between frontal carinae with predominantly longitudinal sculpture, rarely irregularly rugulose, posterior head and mesosoma with well-developed longitudinal sculpture, rarely with irregular rugulae; waist segments generally unsculptured, in a few species weakly but distinctly sculptured; gaster unsculptured, smooth, and shiny; all dorsal surfaces of head, mesosoma, waist segments, and first gastral tergite with abundant suberect to erect hairs; sting appendage spatulate.

Comments

Most species of this group are restricted to rainforests or montane rainforests along eastern and northern Madagascar, and some species are also found on Nosy Be. However, one species seems to prefer montane shrubland.

The group is comparatively heterogeneous in its species composition, and it is likely that it does not represent a monophyletic group. The species *T. ambatovy* is a very unusual member of the group since it is the only species without mainly longitudinally rugose or rugulose sculpture on the mesosomal dorsum, which is present in all other species of the group. This character is generally very stable within this and other species groups, and in most species of the *T. dysalum* group well-developed with often very regular and distinct longitudinal rugae without any cross-meshes. Instead *T. ambatovy* has irregularly arranged rugulae that often cross each other. Another character that separates *T. ambatovy* from the others is eye size. In *T. ambatovy* they are comparatively large (OI 25–26) while they are usually much smaller in the remaining species of the group (OI 19–24). Therefore, it is possible that *T. ambatovy* is not a natural member of the *T. dysalum* group, and belongs either to another species group or represents an independent development. At present, we do not see any close affinities between *T. ambatovy* and other Malagasy groups, and considering most morphological characters, *T. ambatovy* fits best within the *T. dysalum* group. However, it cannot be ruled out that the species might be excluded from the group in the future. All other species seem to be morphologically much closer to each other, and most are comparatively similar to *T. steinheili* and *T. dysalum*. The identification of *T. dysalum*, *T. mallenseana*, *T. sargina*,. *steinheili*, *T. vohitra*, and *T. yammer* is sometimes difficult.

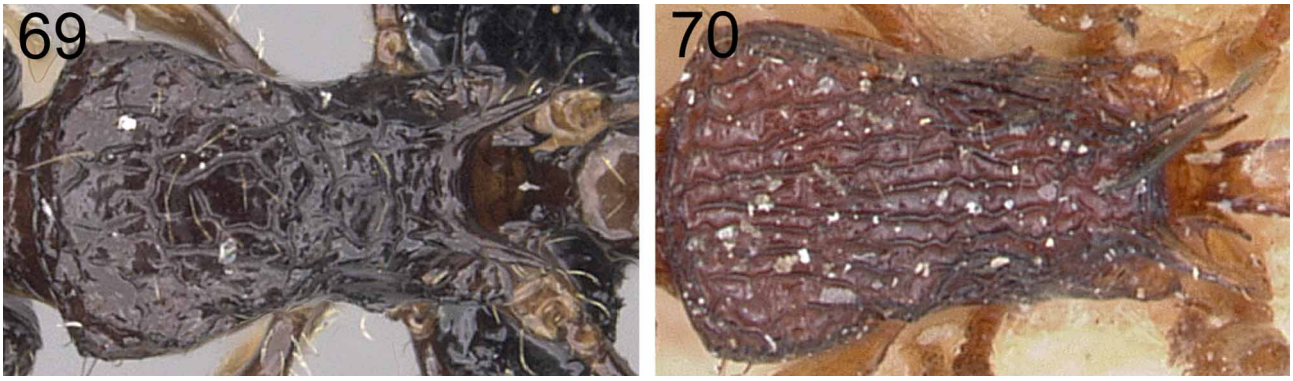
The *T. dysalum* group should not be confused with another Malagasy species group with 11-segmented antennae, although several group members have character combinations that are morphologically very close to other groups. The petiolar node shape is comparatively flexible in the *T. dysalum* group since it can be squamiform, triangular, cuneiform, high rounded nodiform, or rarely almost nodiform with a well-developed and moderately sharp anterodorsal margin but a rounded posterodorsal margin that is situated much lower. The latter condition could be confused with the rectangular nodiform node shape seen in the *T. plesiarum*, *T. ranarum*, or *T. tortuosum* groups. However, all members of the *T. plesiarum* group have a distinct antennal scrobe, which is absent in the *T. dysalum* group. The *T. ranarum* group members that could resemble *T. dysalum* species in petiolar node shape have decumbent to appressed gastral pilosity, thus are unlikely to be confused with each other. More difficult is differentiating between larger *T. dysalum* specimens and a few species in the *T. tortuosum* group (*T. pleganon* Bolton and few undescribed species) due to their very similar petiolar node shapes and general appearance. Nevertheless, *T. pleganon* and allied species have either a strongly sculptured petiolar node, a sculptured first gastral tergite, or both, while the larger specimens of *T. dysalum* display very little sculpture on the petiolar node and none on the first gastral tergite.

Some species of the *T. dysalum* group with a high rounded nodiform petiolar node in profile could be confused with some members of the *T. naganum* or *T. ranarum* groups. However, the species in the latter two groups that could be confused have decumbent to appressed pilosity on the first gastral tergite, whereas the pilosity in the species in question in the *T. dysalum* group is erect to suberect.

Within the Malagasy Tetramorium with 11-segmented antennae, the groups with reduced sculpture on head and mesosoma, *T. bessonii*, *T. marginatum*, *T. tsingy*, and *T. weitzeckeri*, differ significantly from the *T. dysalum* group, which always has distinct sculpture on head and mesosoma. The *T. naganum*, *T. schaufussi*, and *T. severini* groups cannot be confused with the *T. dysalum* group since the former groups usually have decumbent to appressed gastral pilosity which is often completely reduced, whereas the gastral pilosity of the *T. dysalum* group is usually erect to suberect and never reduced. In addition, the *T. bonibony* group, despite having a triangular or cuneiform petiolar node, is easily differentiated from the *T. dysalum* group thanks to the well-developed anterior face of the mesosoma and/or the distinct reticulate-rugose posterior head and anterior pronotum in the *T. bonibony* group. Furthermore, most species of the *T. ranarum* and *T. tortuosum* groups (except the ones mentioned above) have a distinctly rectangular nodiform petiolar node shape which is not developed in the *T. dysalum* group. The absence of a sharply defined antennal scrobe in the latter separates it also from the *T. plesiarum* group. Finally, the *T. kelleri* group with its single representative is very unlikely to be mistaken for any *T. dysalym* group member because of the clublike petiolar node shape in *T. kelleri*.

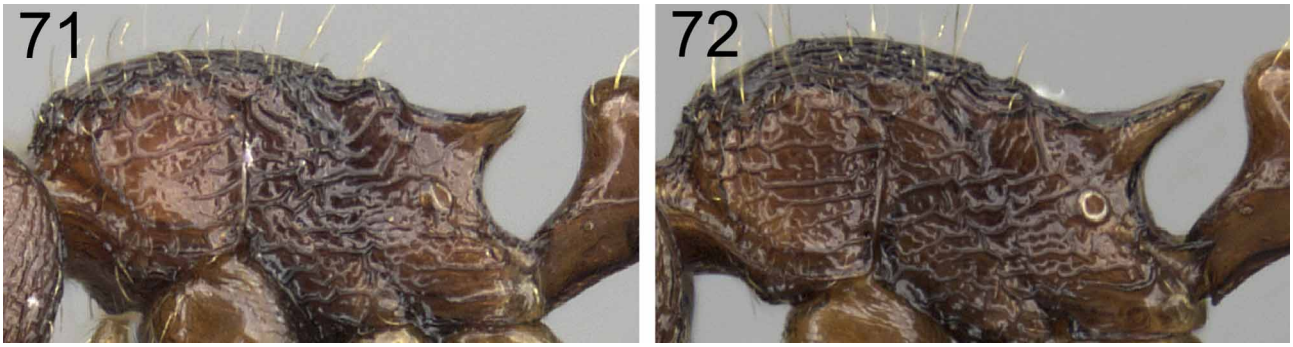
Key to the species of the *T. dysalum* group (workers)

1. Mesosomal dorsum with fine, irregularly arranged rugulae and larger unsculptured areas (Fig. 69). . . . . *T. ambatovy*
- Mesosomal dorsum with distinct, longitudinally arranged rugae or rugulae (Fig. 70). 2



FIGURES 69 & 70. 69. Mesosomal dorsum of *T. ambatovy* in dorsal view showing the fine, irregularly arranged rugulae—CASENT0124721 (William Ericson 2011). **70.** Mesosomal dorsum of *T. steinheili* with distinctly longitudinally arranged rugae—CASENT0101257 (April Nobile 2006).

2. Species with short to moderately sized propodeal spines or teeth (PSLI 19–24) (Fig. 71). 3
- Species with long to very long propodeal spines (PSLI 27–44) (Fig. 72). 5



FIGURES 71 & 72. 71. Mesosoma of *T. robitika* in lateral view displaying the comparatively short propodeal spines—CASENT0056338 (Estella Ortega 2011). **72.** Mesosoma of *T. vohitra* in lateral view showing the comparatively long propodeal spines—CASENT0189167 (Estella Ortega 2011).

3. Petiolar node rounded high nodiform, anterodorsal and posterodorsal margins situated at approximately same height (Fig. 73). . . . . *T. robitika*
- Petiolar node shape moderately cuneiform with rounded margins, anterodorsal margin situated higher than posterodorsal and dorsum tapering backwards posteriorly (Fig. 74). 4

FIGURES 73 & 74. 73. Rounded high nodiform petiolar node of *T. robitika* in profile with anterodorsal and posterodorsal margins situated at approximately same height—CASENT0056338 (Estella Ortega 2011). **74.** Petiolar node of *T. orc* in lateral view, shape moderately cuneiform with rounded margins, and anterodorsal margin situated higher than posterodorsal and dorsum tapering backwards posteriorly—CASENT0040573 (Estella Ortega 2011).

4. Mandibles unsculptured, smooth and shining, and body colouration dark brown to black (Fig. 75). . . . . *T. orc*
- Mandibles longitudinally rugose, and body colouration yellow to light brown (Fig. 76). . . . . *T. macki*

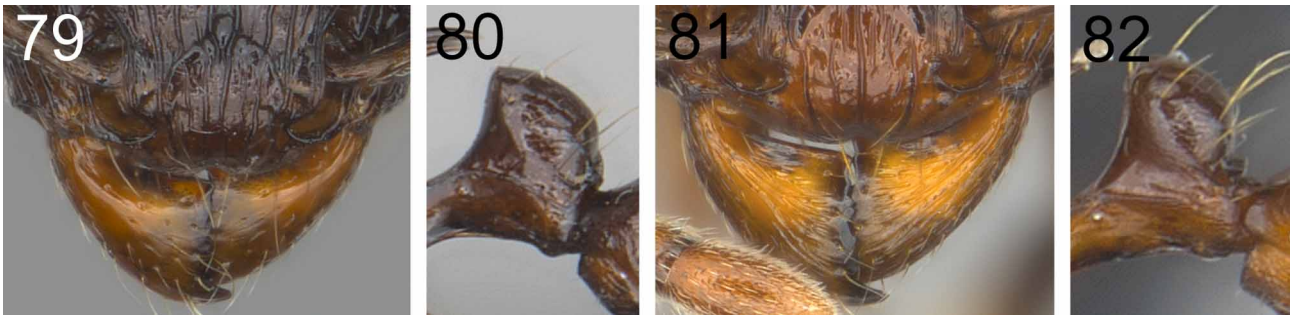
FIGURES 75 & 76. 75. Body of *T. orc* in profile with dark brown colouration—CASENT0040573 (Estella Ortega 2011). **76.** Body of *T. macki* in in profile with yellow to light brown colouration—CASENT0189093 (Estella Ortega 2011).

5. In dorsal view postpetiole always more than 1.6 times wider than petiolar node, usually distinctly so (PPI 168–200) (Fig. 77). . . . . *T. mallenseana*
- In dorsal view postpetiole usually distinctly less than 1.5 times wider than petiolar node (PPI 119–152) (Fig. 78). 6

FIGURES 77 & 78. 77. Waist segments of *T. mallenseana* in dorsal view with postpetiole much more than 1.6 times wider than petiolar node—CASENT0039659 (Estella Ortega 2011). **78.** Waist segments of *T. steinheili* in dorsal view with postpetiole less than 1.6 times wider than petiolar node—CASENT0101257 (April Nobile 2006).

6. Antennal scape comparatively short (SI 64–69); anterodorsal margin of petiolar node sharply defined and situated much higher than posterodorsal margin, dorsum strongly tapering backwards posteriorly; mandibles always completely unsculptured (Figs. 79, 80). . . . . *T. dysalum*

- Antennal scape always longer than above (SI 71–78); anterodorsal margin of petiolar node not sharply defined as above, either anterodorsal and posterodorsal margins situated at same height, or posterodorsal margin weakly lower and dorsum only weakly tapering backwards posteriorly; mandibles usually with distinct longitudinal sculpture, rarely unsculptured (Figs. 81, 82). . . 7



FIGURES 79–82. 79. Anterior head of *T. dysalum* in full-face view with with unsculptured mandibles—CASENT0192230 (Estella Ortega 2011). **80.** Petiolar node of *T. dysalum* in lateral view with a sharply defined anterodorsal margin CASENT0037931 (Estella Ortega 2011). **81.** Anterior head of *T. steinheili* in full-face view with sculptured mandibles—CASENT0142632 (Estella Ortega 2011). **82.** Petiolar node of *T. steinheili* in profile, anterodorsal margin developed but not sharply defined—CASENT0142632 (Estella Ortega 2011).

7. Petiolar node high rounded nodiform with anterodorsal and posterodorsal margins at approximately the same height, dorsum not tapering backwards posteriorly (Fig. 83). . . . . *T. vohitra*

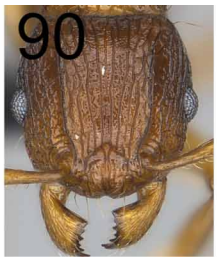
- Petiolar node high rounded nodiform or squamiform, but anterodorsal margin situated higher than posterodorsal margin, dorsum tapering backwards posteriorly (Figs. 84, 85). 8

FIGURES 83–85. 83. High nodiform petiolar node of *T. vohitra* in profile, with anterodorsal and posterodorsal margins at approximately the same height and the dorsum not tapering backwards posteriorly—CASENT0218034 (Estella Ortega 2011). **84.** High nodiform petiolar node of *T. sargina* in profile, with anterodorsal margin situated higher than posterodorsal margin and the dorsum tapering backwards posteriorly—CASENT0487390 (Estella Ortega 2011). **85.** Squamiform petiolar node of *T. steinheili* in profile, with anterodorsal margin situated higher than posterodorsal margin and the dorsum tapering backwards posteriorly—CASENT0142632 (Estella Ortega 2011).

8. First gastral tergite with decumbent to subdecumbent long hairs (Fig. 86). . . . . *T. sargina*
- First gastral tergite with erect to suberect long hairs (Fig. 87). 9

FIGURES 86 & 87. 86. First gastral tergite of *T. sargina* in profile showing the decumbent to subdecumbent long hairs—CASENT0487390 (Estella Ortega 2011). **87.** First gastral tergite of *T. steinheili* in profile showing the erect to suberect long hairs—CASENT0481234 (Estella Ortega 2011).

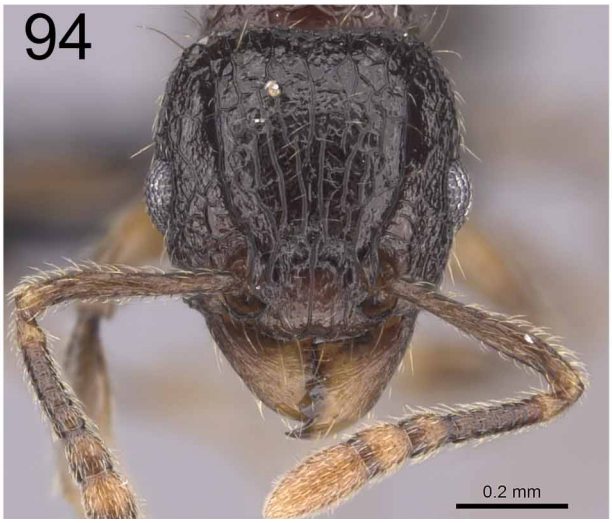
9. Eyes comparatively small (OI 19–20); propodeal spines very long (PSLI 40–41); propodeal lobes very long and spinose; head, mesosoma, waist segments, and gaster of dark brown to black colouration (Figs. 88, 89). . . . . *T. yammer*
- Eyes larger (OI 21–23); propodeal spines long to very long (PSLI 27–44); propodeal lobes short and triangular to elongate-triangular and comparatively long, but never spinose and long as above; head, mesosoma, waist segments, and gaster generally of brownish colour, only rarely dark brown (Figs. 90, 91). . . . . .. *T. steinheili*



FIGURES 88–91. 88. Head of *T. yammer* in full-face view with comparatively smaller eyes—CASENT0499759 (Estella Ortega 2011). **89.** Body of *T. yammer* in profile showing very dark brown to black colouration—CASENT0499759 (Estella Ortega 2011). **90.** Head of *T. steinheili* in full-face view with comparatively larger eyes—CASENT0024633 (Estella Ortega 2011). **91.** Body of *T. steinheili* in profile showing reddish, light brown to moderately brown colouration—CASENT0101258 (April Nobile 2006).

***Tetramorium ambatovy* sp. n.**
(figs 69, 92, 93, 94)

Holotype worker, MADAGASCAR, Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.84963 S, 48.2947 E, 1010 m, montane rainforest, sifted litter (leaf mold, rotten wood), collection code BLF16914, 3.–6.III.2007 (*B.L. Fisher et al.*) (CASC: CASENT0124721). Paratypes, six workers with same data as holotype (BMNH: CASENT0124748; CASC: CASENT: CASENT0124729; CASENT0124730; CASENT0124737; CASENT0124759; MHNG: CASENT0124741); and four workers with same data as holotype except collected from pitfall trap and collection code BLF16915 (CASC: CASENT0122307; CASENT0123371; CASENT0114807; MCZ: CASENT0122306).



FIGURES 92–94. *T. ambatovy*, holotype—CASENT0124721 (William Ericson 2011). 92. Body in profile. 93. Body in dorsal view. 94. Head in full-face view.

Diagnosis

Within its species group *T. ambatovy* can be easily differentiated from the other group members due to the fine and irregular rugulae on its mesosomal dorsum, which is never longitudinally organised, and the comparatively large eyes (OI 25–26).

Description

HL 0.66–0.72 (0.69); HW 0.65–0.71 (0.68); SL 0.48–0.52 (0.50); EL 0.17–0.18 (0.17); PH 0.32–0.38 (0.34); PW 0.47–0.52 (0.49); WL 0.80–0.87 (0.83); PSL 0.19–0.23 (0.21); PTL 0.11–0.13 (0.12); PTH 0.27–0.29 (0.28); PTW 0.20–0.23 (0.22); PPL 0.21–0.23 (0.22); PPH 0.26–0.28 (0.27); PPW 0.32–0.35 (0.33); CI 97–99 (98); SI 72–76 (74); OI 25–26 (26); DMI 58–61 (59); LMI 40–44 (41); PSLI 28–32 (30); PeNI 41–45 (44); LPeI 40–45 (43); DPeI 174–195 (181); PpNI 63–69 (67); LPpI 79–85 (82); DPpI 145–155 (150); PPI 148–163 (153) (12 measured).

Head weakly longer than wide (CI 97–99). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, ending at or shortly before posterior head margin. Antennal scrobes faint and shallow. Antennal scapes short, not reaching posterior head margin (SI 72–76). Eyes comparatively large (OI 25–26). Mesosomal outline in profile flat to weakly convex, weak to moderate margination from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent; mesosoma comparatively high, compact, and stout (LMI 40–44). Propodeal spines long, spinose, and acute (PSLI 28–32); propodeal lobes small and triangular. Petiolar node in profile squamiform, approximately 2.2 to 2.5 times higher than long (LPeI 40–45), anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; node in dorsal view 1.7. to 2 times longer than wide (DPeI 174–195). Postpetiole in profile rounded, approximately 1.2 times higher than long (LPpI 79–85), in dorsal view between 1.4 to 1.5 times wider than long (DPpI 145–155). Postpetiole in profile appearing a bit more voluminous than petiolar node, in dorsal view approximately 1.5 to 1.6 times wider than petiolar node (PPI 148–163). Mandibles longitudinally rugose or rugulose; clypeus distinctly striate, sometimes irregularly arranged; cephalic dorsum between frontal carinae reticulate-rugose but with including a portion with more pronounced longitudinal rugosity; lateral and ventral head reticulate-rugose. Ground sculpture on head often faint, sometimes moderately developed reticulate-punctate. Lateral mesosoma partly with irregular rugulae, partly completely unsculptured; dorsal mesosoma with fine and irregular rugulae; ground sculpture faint to absent. Both segments generally unsculptured, smooth, and shiny, postpetiole sometimes laterally with weak sculpture. All dorsal surfaces of body with abundant, long, erect pilosity. Body of uniform brownish colour, appendages often of lighter colour.

Notes

The distribution of *T. ambatovy* is somewhat disjunctive. Most specimens are known from a strip that extends from the area around Ambatovy, Andasibe-Mantadia, and Torotorofotsy to Sahafina and then north to Ambatovaky, but one specimen was also collected from Andohahela in the southwest. The species appears to prefer montane or lowland rainforests at elevations from 140 to 1088 m, and was always collected from the leaf litter stratum.

As noted above, the unique sculpture on the mesosoma and the comparatively large eyes (OI 25–26) make it very difficult to confuse *T. ambatovy* with any other species of the *T. dysalum* group. It is very likely that *T. ambatovy* does not belong to the group, and instead represents a different lineage within Malagasy *Tetramorium*. The shape of the petiolar node resembles the one observed in some species of the mainly Afrotropical *T. weitzeckeri* group, but as discussed in Hita Garcia and Fisher (2011) and in the *T. weitzeckeri* group section of this study, within the Malagasy region, we consider only *T. humbloti* to be an introduced member of that group, whereas similarities observed in other Malagasy groups are very probably convergent developments.

Etymology

The name of the new species refers to the type locality. The species epithet is a noun in apposition and thus invariant.

Material examined

MADAGASCAR: Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.84963 S, 48.2947 E, 1010 m, montane rainforest, 3.–6.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.83937 S, 48.30842 E, 1080 m, montane rainforest, 4.–7.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE

Moramanga, 18.84773 S, 48.29568 E, 1000 m, montane rainforest and grassland, 5.–8.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.85813 S, 48.28488 E, 1040 m, montane rainforest, 5.–8.III.2007 (*B.L. Fisher et al.*); Toamasina, Forêt Ambatovy, 14.3 km 57° Moramanga, 18.85083 S, 48.32 E, 1075 m, montane rainforest, 21.–23.III.2004 (*B.L. Fisher et al.*); Toamasina, Parc National d´ Andasibe-Mantadia, Forêt de Mantadia, 25.7 km 248° Moramanga, 18.81402 S, 48.43028 E, 1040 m, rainforest, 7.XI.2005 (*F.N. Raharimalala & B. Blaimer*); Toamasina, Parc National de Zahamena, Tetezambatana forest, near junction of Nosivola and Manakambahiny Rivers, 17.74298 S, 48.72936 E, 860 m, rainforest, 18.–19.II.2009 (*B.L. Fisher et al.*); Toamasina, Reserve Betampona, Camp Rendrirendry 34.1 km 332° Toamasina, 17.924 S, 49.19967 E, 390 m, rainforest, 28.–29.XI.2005 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.77274 S, 49.26551 E, 450 m, rainforest, 20.–22.II.2010 (*B.L. Fisher et al.*); Toamasina, Sahafina forest 11.4 km W Brickaville, 18.81445 S, 48.96205 E, 140 m, rainforest, 13.–14.II.2007 (*B.L. Fisher et al.*); Toamasina, Station forestière Analamazaotra, Analamazaotra 1.3km S Andasibe, 18.38466 S, 48.41271 E, 980 m, montane rainforest, 11.–13.XII.2007 (*B.L. Fisher et al.*); Toamasina, Torotorofotsy, 18.87082 S, 48.34737 E, 1070 m, montane rainforest, marsh edge, 24.III.2004 (*B.L. Fisher et al.*); Toliara, Parc National Andohahela, Col de Tanatana, 33.3km NW Tolagnaro, 24.7585 S, 46.85367 E, 275 m, rainforest, 24.XI.2006 (*B.L. Fisher et al.*).

Tetramorium dysalum Bolton, 1979

(figs 79, 80, 95, 96, 97, 98, 99, 100)

Tetramorium dysalum Bolton, 1979:141. Holotype worker, MADAGASCAR, Perinet and vicinity, rainforest, 17.III.1969 (*W.L. Brown*) (MCZ) [examined]. Paratypes, 39 workers and one dealate queen with same data as holotype (MCZ; BMNH) [examined].

Diagnosis

Tetramorium dysalum can be well recognised within the species group due to its unique character combination of: very short antennal scapes (SI 64–69); propodeal spines stout, long and often curved backwards (PSLI 30–43); unsculptured mandibles; mesosomal dorsum with longitudinally rugose sculpture.

Description

HL 0.54–0.91 (0.70); HW 0.53–0.90 (0.70); SL 0.35–0.60 (0.47); EL 0.11–0.20 (0.14); PH 0.27–0.45 (0.35); PW 0.38–0.67 (0.51); WL 0.64–1.15 (0.87); PSL 0.16–0.38 (0.24); PTL 0.10–0.19 (0.15); PTH 0.21–0.36 (0.29); PTW 0.15–0.28 (0.21); PPL 0.16–0.28 (0.21); PPH 0.18–0.33 (0.26); PPW 0.21–0.35 (0.27); CI 98–103 (100); SI 64–69 (67); OI 18–23 (21); DMI 55–62 (59); LMI 39–42 (40); PSLI 30–43 (34); PeNI 38–44 (41); LPeI 45–58 (52); DPeI 128–155 (142); PpNI 51–57 (54); LPpI 74–88 (80); DPpI 125–147 (131); PPI 121–140 (131) (25 measured).

Head generally as long as wide (CI 98–103). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, after posterior eye margin distinctly weaker, ending between posterior eye margin and posterior head margin. Antennal scrobes faint, narrow. Antennal scapes short, not reaching posterior head margin (SI 64–69). Eyes comparatively small to moderate (OI 18–23). Mesosomal outline in profile weakly convex, distinctly marginate from lateral to dorsal mesosoma, promesonotal suture absent, metanotal groove usually absent, rarely weakly present; mesosoma comparatively stout and compact (LMI 39–42). Propodeal spines stout, long to very long, and often curved backwards (PSLI 30–43). Propodeal lobes short and broadly triangular. Petiolar node in profile weakly cuneiform to moderately nodiform, approximately 1.7 to 2.2 times higher than long (LPeI 45–58), anterodorsal margin sharply developed and situated higher than posterodorsal, dorsum strongly tapering backwards posteriorly; node in dorsal view between 1.1 to 1.4 times longer than wide (DPeI 128–155). Postpetiole in profile rounded, approximately 1.7 to 2.2 times higher than long (LPpI 74–88), in dorsal view between 1.2 to 1.5 times wider than long (DPpI 125–147). Postpetiole in profile appearing a bit less voluminous than petiolar node, in dorsal view approximately 1.2 to 1.4 times wider than petiolar node (PPI 121–140). Mandibles always unsculptured, smooth and shiny; clypeus with variable sculpture, generally with few irregular, longitudinal rugae and medially relatively unsculptured, sometimes with more regularly arranged longitudinal rugae; cephalic dorsum between frontal carinae with eight to 13 longitudinal, mostly unbroken rugae, most rugae running from anterior clypeal margin to posterior head margin; scrobal area mostly unsculptured, smooth and shining, remainder of

lateral and ventral head with longitudinal rugae. Ground sculpture generally faint, sometimes moderately developed. Mesosoma laterally generally with irregular longitudinal rugae, sometimes lateral pronotum almost unsculptured; mesosomal dorsum packed with comparatively regular longitudinal rugae. Petiolar node laterally and posteriorly usually with weak, irregular rugulae and often with weak reticulate-punctate ground sculpture, petiolar dorsum almost always unsculptured, smooth, and shiny. Postpetiole generally with irregular longitudinal rugulae and often with reticulate-punctate ground sculpture. Gaster always unsculptured, smooth and shining. All dorsal surfaces of body with long, erect or suberect pilosity. Head, mesosoma, waist segments, and gaster uniformly brown to dark brown, often mandibles, antennae, and legs of lighter brown.

Notes

Tetramorium dysalum has a very wide distribution range in Madagascar, and can also be found on Nosy Be. It can be encountered in most rainforests and montane rainforests of eastern and northern Madagascar, and it occurs at altitudes of 25 to 1565 m.

This species displays a remarkable size variation, as can be seen in the measurements given above. Generally, there seem to be two size classes within this species that differ in several aspects. Smaller specimens (HW 0.53–0.69) are found throughout the whole range, and tend to have shorter propodeal spines (PSLI 30–34), and a stronger anteroposteriorly compressed and sculptured petiolar node. The larger specimens (HW 0.80–0.90), which are much rarer and only found in few localities (Marojejy, Anjanaharibe, Manongarivo, and Amparihibe), have larger spines (PSLI 40–43) and a less anteroposteriorly compressed and sculptured petiolar node. In Anjanaharibe, Manongarivo, and Amparihibe both forms can be found together, and this interesting division into two size classes led us to consider splitting these forms into two distinct species. However, after examining all available specimens, we found several intermediates (HW 0.74–0.77; PSLI 36–39) that connect both morphometric ranges, although we must admit that the number of intermediates is very small, and are mainly found in Ambanizana, Manongarivo, and Binara. We currently consider all the material treated here as *T. dysalum* as a single but very size-variable species, yet cannot rule out the possibility that both forms represent distinct but comparatively cryptic species. The intermediates could be tentative hybrids between the small and the large forms. However, this explanation seems unlikely as the intermediates are only rarely found in combination with both size classes. Instead, the smaller form is often the only one encountered, sometimes together with the larger form or with a few intermediates. It is also probable that the material treated as *T. dysalum* includes several currently unrecognised species, but the diagnostic characters distinguishing them have not yet been identified. The use of molecular techniques and additional material might improve this situation.

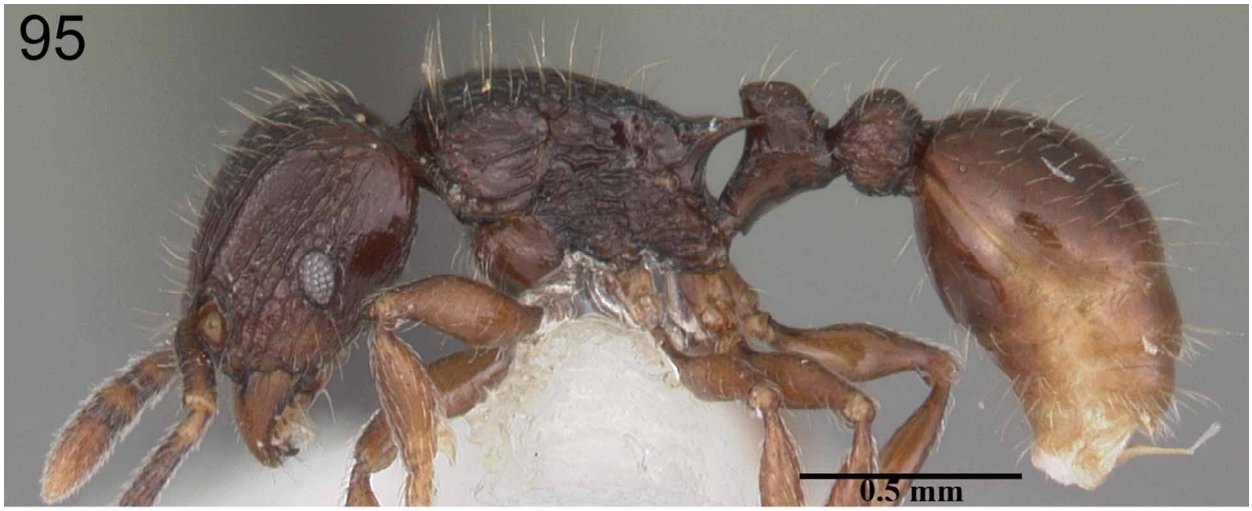
Another possibility could be the presence of morphologically distinct subcastes in this species. Within the genus *Tetramorium* it is common to find remarkable intraspecific size variation without the development of distinct subcastes (Bolton, 1980; Hita Garcia *et al.*, 2010; Hita Garcia & Fisher, 2011). Very common and widely distributed species are the most likely to display large size variations. Yamane and Jaitrong (2011) recently described a new species from Laos which appears to possess a morphologically distinct major worker subcaste. The apparent division into minor and major subcastes is based on differences in pilosity, head shape, and sculpture. This variation is comparatively common in several Afrotropical and Malagasy *Tetramorium*, and is usually considered a regular intraspecific size variation that includes minor differences in pilosity, head shape, and sculpture. Nevertheless, both subcastes described by Yamane and Jaitrong (2011) were collected from a single nest, which provides good evidence for this polymorphism. In the case of *T. dysalum*, it would be more difficult to recognise the two observed size classes as polymorphic subcastes, and we are very reluctant to do so. Despite examining a large number of specimens, more material, especially from nest collections, is necessary before drawing such a conclusion.

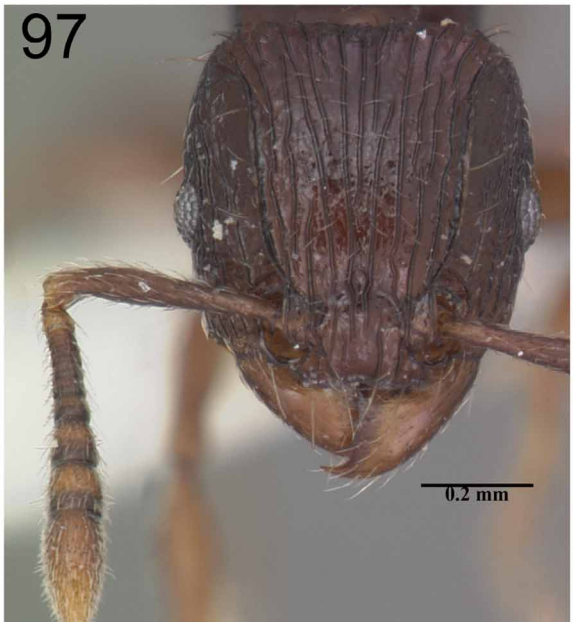
Apart from the variation described above, most other morphological and morphometric characters are very stable throughout the whole distribution range, and *T. dysalum* is generally easily recognisable within its species group due to its combination of very short antennal scapes (SI 64–69), long to very long propodeal spines (PSLI 30–43), and a mesosomal dorsum with distinct and well-developed longitudinal rugae. The sharply defined anterodorsal margin of the petiolar node with the petiolar dorsum tapering backwards posteriorly is unique in the group, since the anterodorsal margin is usually less sharply developed in the other species. However, as already mentioned in the notes on the *T. dysalum* group, larger specimens of *T. dysalum* could be confused with some species of the *T. tortuosum* group. *Tetramorium pleganon* and few undescribed species possess a petiolar node

shape which is close to the larger *T. dysalum* specimens, but the two can be easily separated in other ways. In *T. pleganon* and allies the petiolar node and usually the first gastral tergite are strongly sculptured, whereas the larger specimens of *T. dysalum* have a weakly sculptured petiolar node and a completely unsculptured first gastral tergite.

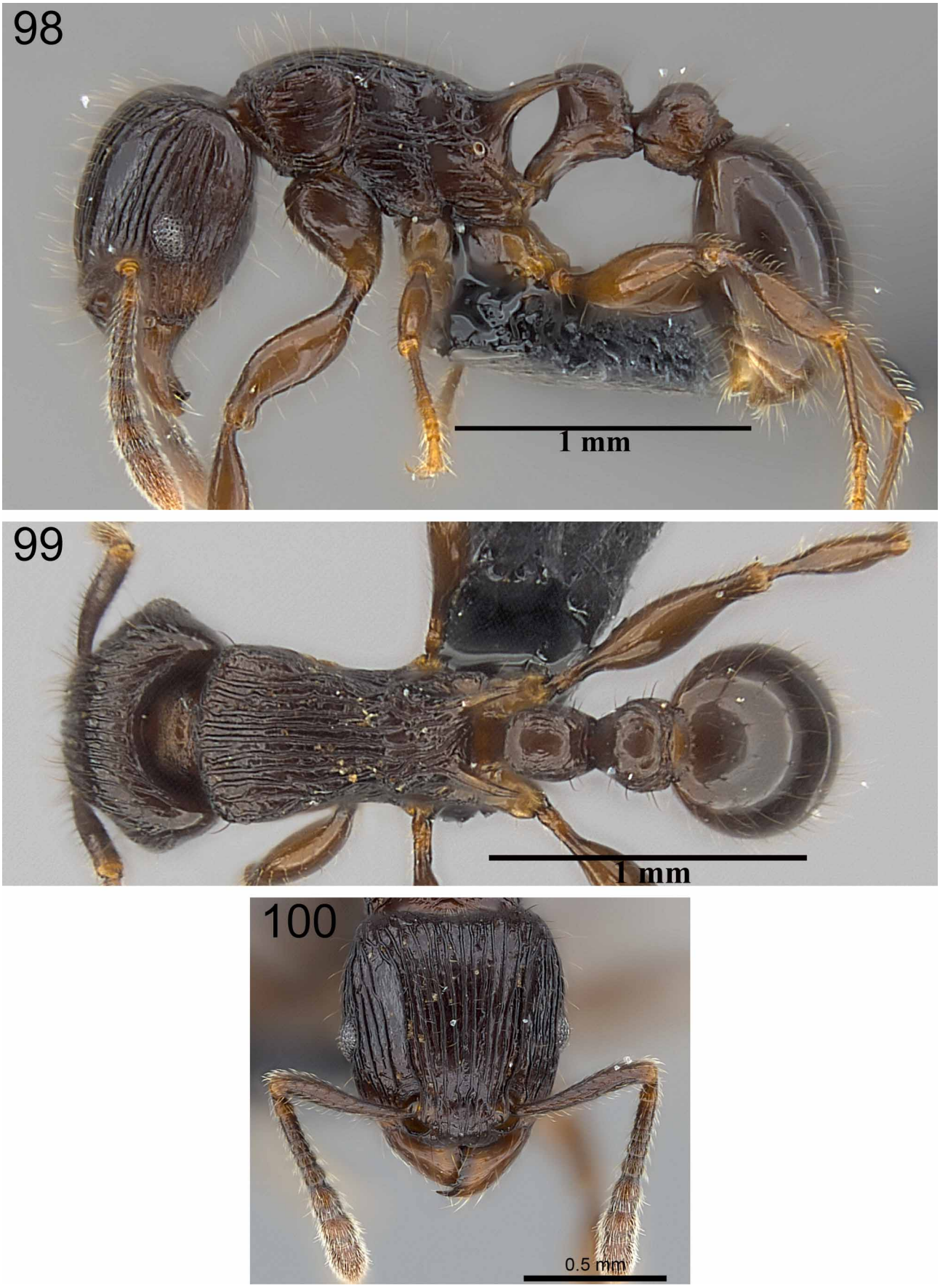
Material examined

MADAGASCAR: Amparihibe, II.–III.2003 (*K.A. Jackson & D. Carpenter*); Antananarivo, Forêt de galerie, Andranorovitra, 24.0 km NNE Ankazobe, 18.11243 S, 47.19757 E, 1491 m, disturbed gallery montane forest, 2.–3.VI.2008 (*B.L. Fisher et al.*); Antananarivo, Réserve Spéciale d'Ambohitantely, Forêt d Ambohitantely, 20.9 km 72° NE d Ankazobe, 18.22528 S, 47.28683 E, 1410 m, montane rainforest, 17.–22.IV.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Forêt de Binara, 9.4km 235° SW Daraina, 13.26333 S, 49.6 E, 1100 m, 5.XII.2003 (*B.L. Fisher*); Antsiranana, 7 km N Joffreville [camp 2 of Fisher], 12.33333 S, 49.25 E, 360 m, in dry forest, 27.IV.–13.V.2001 (*R. Harin'Hala*); Antsiranana, Parc National de Marojejy, Manantenina River, 28.0 km 38° NE Andapa, 8.2 km 333° NNW Manantenina, 14.43667 S, 49.775 E, 450 m, rainforest, 12.–25.XI.2003 (*B.L. Fisher et al.*); Antsiranana, Parc National de Marojejy, Manantenina River, 27.6 km 35° NE Andapa, 9.6 km 327° NNW Manantenina, 14.435 S, 49.76 E, 775 m, rainforest, 15.–18.XI.2003 (*B.L. Fisher et al.*); Antsiranana, Parc National de Marojejy, Antranohofa, 26.6 km 31° NNE Andapa, 10.7 km 318° NW Manantenina, 14.44333 S, 49.74333 E, 1325 m, montane rainforest, 18.–20.XI.2003 (*B.L. Fisher*); Antsiranana, Parc National Montagne d'Ambre, 12° 31' S, 49° 11' E, 1000 m, rainforest, 12.VIII.1992 (*G.D. Alpert*); Antsiranana, Parc National Montagne d'Ambre, Petit Lac, 12° 31' S, 49° 10' E, 1000 m, montane rainforest, 19.VIII.1992 (*G.D. Alpert*); Antsiranana, Parc National Montagne d'Ambre, 12.53333 S, 49.16667 E, 1100 m, montane rainforest, 23.–28.XI.1993 (*C. Griswold et al.*); Antsiranana, Parc National Montagne d'Ambre, 3.6 km 235° SW Joffreville, 12.53444 S, 49.1795 E, 925 m, 20.–26.I.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Parc National Montagne d'Ambre, Antomboka, 12.50035 S, 49.175 E, 885 m, montane rainforest, 16.XI.2007 (*B.L. Fisher et al.*); Antsiranana, Rés. Anjanaharibe-Sud, 6.5 km SSW Befingotra, 14.75 S, 49.5 E, 875 m, rainforest, 19.X.1994 (*B.L. Fisher*); Antsiranana, Rés. Anjanaharibe-Sud, 9.2 km WSW Befingotra, 14.75 S, 49.46667 E, 1200 m, montane rainforest, 9.XI.1994 (*B.L. Fisher*); Antsiranana, Rés. Anjanaharibe-Sud, 11.0 km WSW Befingotra, 14.75 S, 49.45 E, 1565 m, montane rainforest, 16.XI.1994 (*B.L. Fisher*); Antsiranana, R.S. Manongarivo, 14.5 km 220° SW Antanambao, 13.99833 S, 48.42833 E, 1175 m, montane rainforest, 20.X.1998 (*B.L. Fisher*); Fianarantsoa, 45km S. Ambalavao, rainforest, 22.21667 S, 47.01667 E, 785 m, 25.IX.–1.X.1993 (*B.L. Fisher*); Fianarantsoa, Parc National d'Isalo, 9.1 km 354° N Ranohira, 22.48167 S, 45.46167 E, 725 m, gallery forest, 27.–31.I.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, Parc Nationale Ranomafana, Talatakely, 21.24833 S, 47.42667 E, in guava forest, 9.–26.IV.1998 (*C. Griswold, D. Kavanaugh, et al.*); Fianarantsoa, Parc Nationale Ranomafana, Belle Vue trail, 21.2665 S, 47.42017 E, 1020 m, mixed tropical forest, 15.–22.XI.2001 (*R. Harin'Hala*); Fianarantsoa, Parc National de Ranomafana, Vatoharanana River, 4.1 km 231° SW Ranomafana, 21.29 S, 47.43333 E, 1100 m, montane rainforest, 27.–31.III.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, Rés. Andringitra, 43 km S Ambalavao, 22.23333 S, 47 E, 825 m, rainforest, 4.–5.X.1993 (*B.L. Fisher*); Fianarantsoa, R.S. Ivohibe, 7.5 km ENE Ivohibe, 22.47 E, 46.96 E, 900 m, rainforest, 7.–12.VII.1997 (*B.L. Fisher*); Fianarantsoa, R.S. Ivohibe 8.0 km E Ivohibe, 22.48333 S, 46.96833 E, 1200 m, montane rainforest, 15.–21.X.1997 (*B.L. Fisher*); Fianarantsoa, 9.0 km NE Ivohibe, 22.42667 S, 46.93833 E, 900 m, rainforest, 12.–17.XI.1997 (*B.L. Fisher*); Fianarantsoa, 3 km W Ranomafana, nr. Ifanadiana, 21° 15' S, 47° 25' E, 950 m, rainforest, 27.IV.1989 (*P.S. Ward*); Toamasina, Ambanizana, Parc National Masoala, 15.57167 S, 50.00611 E, 900–950 m, 26.II.–6.III.2003 (*D. Andriamalala, D. Silva, et al.*); Toamasina, Ambanizana, Parc National Masoala, 15.57222 S, 50.00694 E, 930–1110 m, 2.–6.III.2003 (*D. Andriamalala, D. Silva, et al.*); Toamasina, Ambohitsitondroina, 6.9 km NE Ambanizana, 15.56667 S, 50 E, 825 m, rainforest, 2.XII.1993 (*B.L. Fisher*); Toamasina, Andranobe, 5.3 km SSE Ambanizana, 15.66667 S, 49.96667 E, 425 m, 19.–21.XI.1993 (*B.L. Fisher*); Toamasina, Andranobe, 6.3 km S Ambanizana, 15.68131 S, 49.958 E, 25 m, 15.68131 S, 49.958 E, 25 m, 13.–15.XI.1993 (*B.L. Fisher*); Toamasina, vic. Andasibe (=Perinet), 950–980 m, 2.–6.II.1976 (*W.L. & D.E. Brown*); Toamasina, 6 km ESE Andasibe (=Perinet), 18° 57' S, 48° 28' E, 900 m, rainforest, 17.XI.1990 (*P.S. Ward*); Toamasina, F.C. Didy, 18.19833 S, 48.57833 E, 960 m, rainforest, 16.–23.XII.1998 (*H.J. Ratsirarson*); Toamasina, Mangabe island, Antongil, rainforest, 19.II.1977 (*W.L. & D.E. Brown*); Toamasina, Montagne d'Anjanaharibe, 18.0 km 21° NNE Ambinanitelo, 15.18833 S, 49.615 E, 470 m, rainforest, 8.–12.III.2003 (*B.L. Fisher, C. Griswold et al.*); Toamasina, Montagne d'Anjanaharibe, 19.5 km 27° NNE Ambinanitelo, 15.17833 S, 49.635 E, 1100 m, montane rainforest, 12.–16.III.2003 (*B.L. Fisher, C. Griswold et al.*);





FIGURES 95–97. *T. dysalum*, paratype, smaller form—CASENT0102348 (April Nobile 2005). 95. Body in profile. 96. Body in dorsal view. 97. Head in full-face view.



FIGURES 98–100. *T. dysalum*, larger form—CASENT0039336 (Estella Ortega 2011). 98. Body in profile. 99. Body in dorsal view. 100. Head in full-face view.

Toamasina, Montagne d'Akirindro 7.6 km 341° NNW Ambinanitelo, 15.28833 S, 49.54833 E, 600 m, rainforest, 17.–21.III.2003 (*B.L. Fisher, C. Griswold et al.*); Toamasina, P.N. Mantadia, 18.79167 S, 48.42667 E, 895 m, 28.XI.–1.XII.1998 (*H.J. Ratsirarson*); Toamasina, Périnet & vic., rainforest, 17.III.1969 (*W.L. Brown*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.80561 S, 49.29507 E, 480 m, rainforest, 27.X.2010 (*B.L. Fisher et al.*); Toliara, Parc National d'Andohahela, Col du Sedro, 3.8 km 113° ESE Mahamavo, 37.6 km 341° NNW Tolagnaro, 24.76389 S, 46.75167 E, 900 m, montane rainforest, 21.–25.I.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Rés. Andohahela, 11 km NW Enakara, 24.56667 S, 46.83333 E, 800 m, 17.XI.1992 (*B.L. Fisher*); Toliara, Réserve Spéciale d'Ambohijanahary, Forêt d'Ankazotsihitafototra, 35.2 km 312° NW Ambaravaranala, 18.26667 S, 45.40667 E, 1050 m, montane rainforest, 13.–17.I.2003 (*B.L. Fisher, C. Griswold et al.*).

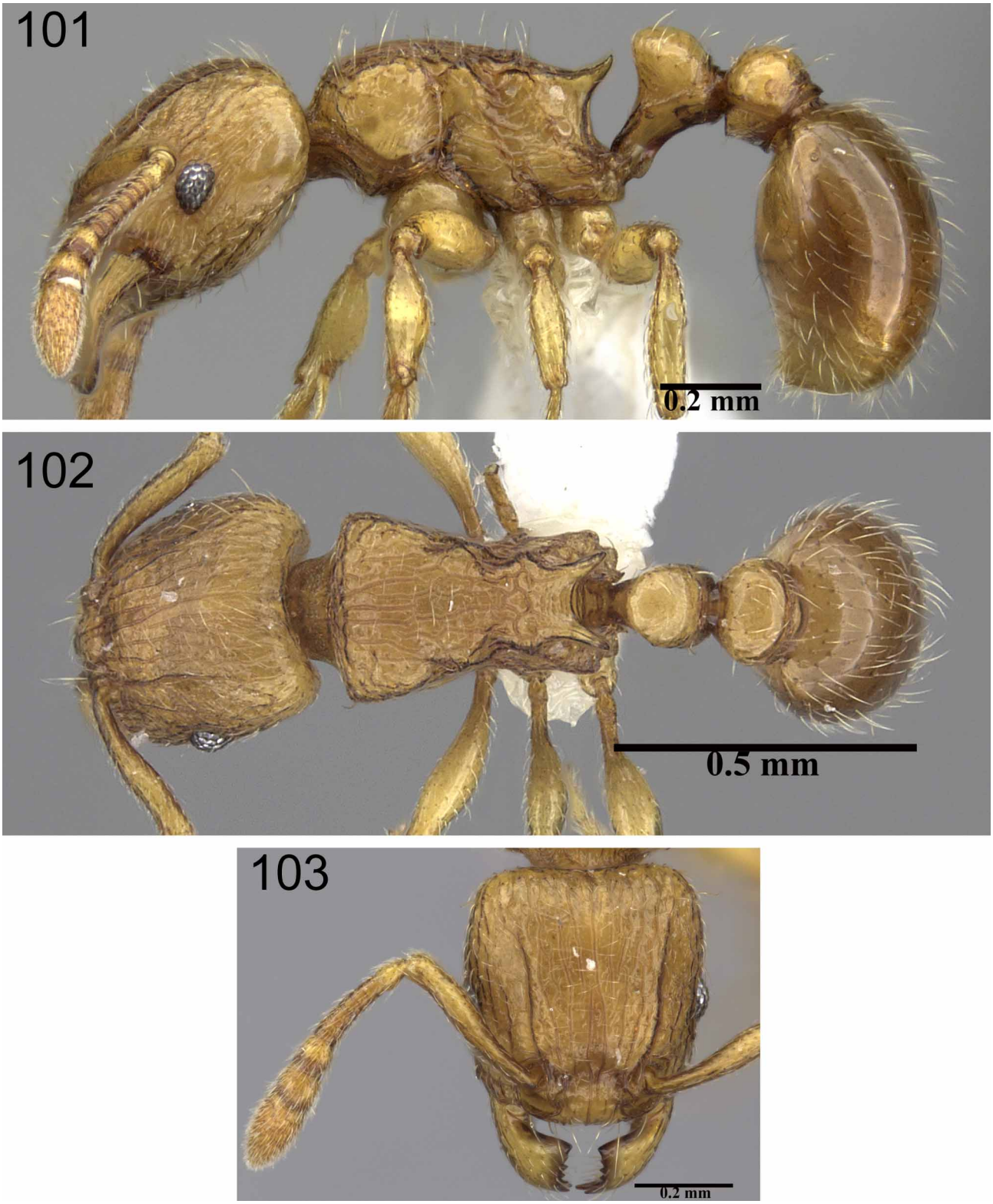
***Tetramorium macki* sp. n.**
(figs 76, 101, 102, 103)

Holotype worker, MADAGASCAR, Toamasina, F.C. Sandranantitra, 18.04833 S, 49.09167 E, 450 m, rainforest, sifted litter (leaf mold, rotten wood), collection code HJR102, 21.–24.I.1999 (*H.J. Ratsirarson*) (CASC: CASENT0189093). Paratypes, seven workers from Toamasina, F.C. Andriantantely, 18.695 S, 48.81333 E, 530 m, rainforest, sifted litter, collection code HJR121, 4.–7.XII.1998 (*H.J. Ratsirarson*) (CASC: CASENT0217710, CASENT0217711, CASENT0218032, CASENT0247151).

Diagnosis
Tetramorium macki can be recognised easily within the *T. steinheili* group due to the following character combination: short antennal scapes (SI 70–74); comparatively short propodeal spines (PSLI 21–24); weakly cuneiform petiolar node shape with the anterodorsal angle situated higher than the posterodorsal, so that the dorsum tapers backwards posteriorly; mesosomal dorsum with longitudinally rugose sculpture; completely unsculptured waist segments; yellowish colouration.

Description
HL 0.49–0.58 (0.53); HW 0.45–0.54 (0.48); SL 0.32–0.39 (0.35); EL 0.09–0.12 (0.10); PH 0.25–0.30 (0.27); PW 0.34–0.43 (0.38); WL 0.57–0.71 (0.62); PSL 0.11–0.14 (0.12); PTL 0.11–0.13 (0.12); PTH 0.20–0.23 (0.21); PTW 0.16–0.19 (0.17); PPL 0.14–0.16 (0.15); PPH 0.19–0.21 (0.20); PPW 0.21–0.24 (0.22); CI 90–94 (92); SI 70–74 (72); OI 20–23 (21); DMI 58–63 (61); LMI 42–45 (43); PSLI 21–24 (23); PeNI 43–49 (46); LPeI 51–59 (55); DPeI 142–156 (150); PpNI 52–62 (58); LPpI 71–76 (73); DPpI 147–157 (151); PPI 122–132 (127) (13 measured).

Head distinctly longer than wide (CI 90–94). Anterior clypeal margin medially impressed. Frontal carinae moderately developed and fine, ending between posterior eye margin and posterior head margin. Antennal scrobes faint. Antennal scapes short, ending between posterior eye margin and posterior head margin (SI 70–74). Eyes small to moderate (OI 20–23). Mesosomal outline in profile weakly convex, moderately marginate from lateral to dorsal mesosoma, promesonotal suture and metanotal groove absent; mesosoma in profile comparatively stout and compact (LMI 42–45). Propodeal spines short to moderate, elongate-triangular and acute (PSLI 21–24). Propodeal lobes short and triangular. Petiolar node in profile high nodiform to cuneiform, approximately 1.7 to 2 times higher than long (LPeI 51–59), anterior and posterior faces not parallel, anterodorsal margin situated much higher than posterodorsal margin, dorsum distinctly tapering backwards posteriorly; node in dorsal view approximately 1.5 times wider than long (DPeI 142–156). Postpetiole in profile rounded, approximately 1.3 to 1.4 times higher than long (LPpI 71–76), in dorsal view approximately 1.5 times wider than long (DPpI 147–157). Postpetiole in profile approximately as voluminous as petiolar node, in dorsal view approximately 1.2 to 1.3 times wider than petiolar node (PPI 122–132). Mandibles finely striate but generally fairly shiny; clypeus with three to five longitudinal rugae or rugulae; cephalic dorsum between frontal carinae with six to eight longitudinal rugae, rugae running almost unbroken to posterior head margin, cross-meshes rare; lateral head weakly sculptured, anteriorly with irregular longitudinal rugulae mostly. Ground sculpture generally faint. Lateropronotum with weak sculpture only, remainder of lateral mesosoma with mainly longitudinally arranged, irregular rugae or rugulae. Both waist segments and gaster unsculptured, smooth and shining. All dorsal surfaces of body with long, fine, erect to suberect pilosity. Head, mesosoma, waist segments, and gaster of yellowish to light brownish colour; appendages of weakly lighter colour.



FIGURES 101–103. *T. macki*, holotype—CASENT0189093 (Estella Ortega 2011). 101. Body in profile. 102. Body in dorsal view. 103. Head in full-face view.

Notes

At present, the new species is only known to occur in Andriantantely, Betampona, Didy, and Sandranantitra. All four localities are comparatively close to each other geographically, and represent lowland rainforests lying at altitudes between 450 m to 960 m. On the basis of the available collection label data, *T. macki* appears to live in leaf litter.

Tetramorium macki can be straightforwardly identified within the *T. dysalum* group due to its combination of short propodeal spines (PSLI 21–24), weakly cuneiform petiolar node, and yellow colouration. The other two species with short propodeal spines/teeth, *T. orc* and *T. robitika*, are not likely to be confused with *T. macki*. *Tetramorium robitika* has a high nodiform petiolar node with anterodorsal and posterodorsal margins at about the same height while *T. macki* has a cuneiform node with the dorsum tapering backwards posteriorly. Also, *T. orc* with its shorter antennal scapes (SI 68–69) and dark to very dark brown colouration differs strikingly from *T. macki* with its longer antennal scapes (SI 70–74) and yellowish colouration.

As noted above, within the *T. dysalum* group *T. macki* is fairly easy to differentiate from the remaining species. However, *T. macki* has a general gestalt that is comparatively close to the one seen in some members of the *T. ranarum* group (*T. degener* Santschi and few morphologically similar undescribed species), and without close examination they could be confused with each other. All are relatively small, yellowish species with a petiolar node which is higher and wider than it is long, and comparatively small propodeal spines. Yet these *T. ranarum* group members either have propodeal lobes of approximately the same length and shape as the propodeal spines or a petiolar node with distinct sculpture, whereas *T. macki* possesses propodeal spines of short to moderate length that are much longer than the propodeal lobes, and a completely unsculptured petiolar node. These ants also differ in gastral pilosity. In *T. macki* the gastral pilosity is mainly suberect to erect with few subdecumbent to decumbent hairs while the gastral pilosity of *T. degener* and allies is mainly appressed to subdecumbent with few erect hairs. This character, in combination with the unsculptured, higher and wider petiolar node, justifies the placement of *T. macki* within the *T. dysalum* group. Nevertheless, these ants represent a good example of seemingly convergent evolution. Despite belonging to different groups, *T. macki* and *T. degener* and allies all are comparatively small species with reduced characters in comparison to their respective group members, and their general habitus might be misleading at first glance. Another difference is their preferred habitat, because *T. macki*, like most other *T. dysalum* members, is only found in humid rainforests, whereas *T. degener* and allies prefer much more arid habitats, such as spiny forests or thickets, woodlands, tropical dry forests, or anthropogenically modified habitats.

Etymology

The new species is named in honor of Dawn M. Mack for her support to discover and identify life on earth.

Material examined

MADAGASCAR: Toamasina, F.C. Andriantantely, 18.695 S, 48.81333 E, 530 m, rainforest, 4.–7.XII.1998 (*H.J. Ratsirarson*); Toamasina, F.C. Didy, 18.19833 S, 48.57833 E, 960 m, rainforest, 16.–23.XII.1998 (*H.J. Ratsirarson*); Toamasina, F.C. Sandranantitra, 18.04833 S, 49.09167 E, 450 m, rainforest, 21.–24.I.1999 (*H.J. Ratsirarson*); Toamasina, Réserve Nationale Intégrale Betampona, Betampona 35.1 km NW Toamasina, 17.91801 S, 49.20074 E, 500 m, rainforest, 16.XII.2007 (*B.L. Fisher et al.*).

***Tetramorium mallenseana* sp. n.**

(figs 77, 104, 105, 106)

Holotype worker, MADAGASCAR, Fianarantsoa, Parc National de Ranomafana, Vatoharanana River, 4.1 km 231° SW Ranomafana, 21.29 S, 47.43333 E, 1100 m, montane rainforest, sifted litter (leaf mold, rotten wood), collection code BLF08400, 21.–31.III.2003 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT0039659). Paratypes, one worker with same data as holotype (CASC: CASENT039656); five workers from Fianarantsoa, 7 km W of Ranomafana, montane rainforest, pitfall trap 1000 m, 23.–28.II.1999 (*W.E. Steiner*) (MCZ: CASENT0247148; CASENT0247157); and six workers from Fianarantsoa, 7 km W of Ranomafana, montane rainforest, pitfall trap 1000 m, 8.–13.III.1999 (*W.E. Steiner*) (MCZ: CASENT0247153; CASENT0247154; CASENT0247155; CASENT0247156).

Diagnosis

The following character combination distinguishes *T. mallenseana* from the other species of the group: short antennal scapes (SI 72–75); long and curved propodeal spines (PSLI 38–43); very short propodeal lobes; petiolar node rounded high nodiform, in dorsal view only slightly wider than long (DPel 110–123), petiolar dorsum only

weakly tapering backwards posteriorly; postpetiole in dorsal view 1.7 to 2 times wider than petiolar node (PPI 168–200); dorsum of mesosoma with longitudinally rugose sculpture.

Description

HL 0.67–0.71 (0.70); HW 0.67–0.72 (0.70); SL 0.49–0.54 (0.51); EL 0.12–0.15 (0.14); PH 0.37–0.40 (0.38); PW 0.50–0.54 (0.52); WL 0.84–0.95 (0.88); PSL 0.27–0.29 (0.28); PTL 0.15–0.17 (0.16); PTH 0.30–0.33 (0.31); PTW 0.17–0.20 (0.19); PPL 0.20–0.23 (0.22); PPH 0.29–0.32 (0.30); PPW 0.29–0.38 (0.34); CI 99–101 (100); SI 72–75 (73); OI 18–21 (20); DMI 57–61 (59); LMI 42–44 (43); PSLI 38–43 (40); PeNI 33–38 (36); LPeI 48–53 (51); DPeI 110–123 (117); PpNI 58–76 (72); LPpI 66–79 (72); DPpI 145–165 (156); PPI 168–200 (182) (seven measured).

Head as long as wide (CI 99–101). Anterior clypeal margin with distinct median impression. Frontal carinae strongly developed, usually ending at posterior head margin. Antennal scrobes narrow and faint. Antennal scapes short, not reaching posterior head margin (SI 72–75). Eyes comparatively small (OI 18–21). Mesosomal outline in profile comparatively flat, moderately weakly marginate from lateral to dorsal mesosoma, promesonotal suture and metanotal groove absent; mesosoma comparatively stout and compact (LMI 42–44). Propodeal spines relatively thin, very long, and back-curved (PSLI 38–43). Propodeal lobes weakly developed, very short and triangular. Petiolar node in profile rounded high nodiform, approximately two times higher than long (LPeI 48–53), anterior and posterior faces almost parallel, anterodorsal margin situated higher than posterodorsal margin, dorsum weakly tapering backwards posteriorly; node shape in dorsal view only weakly elliptical, almost rounded, only between 1.1 to 1.2 times wider than long (DPeI 110–123). Postpetiole in profile rounded, approximately 1.3 to 1.5 times higher than long (LPpI 66–79), in dorsal view 1.4 to 1.7 times wider than long (DPpI 145–165). Postpetiole in profile a bit more voluminous than petiolar node, in dorsal view much wider than petiolar node, between 1.7 to 2 times wider (PPI 168–200). Mandibles distinctly longitudinally rugose, in some specimens unsculptured and smooth or weakly sculptured; clypeus with strong median longitudinal ruga and one often weaker ruga at each side; cephalic dorsum between frontal carinae with six to eight longitudinal rugae running to posterior head margin, some rugae broken or with cross-meshes; lateral and ventral head with weak reticulate-rugose sculpture; head with faint reticulate-punctate to punctate ground sculpture. Mesosoma laterally and dorsally strongly longitudinally rugose, rugae moderately meandering but distinctly longitudinally arranged with few cross-meshes. Petiole and postpetiole almost unsculptured, with few weak rugulae. Gaster unsculptured, smooth and shining. All dorsal surfaces of body with long, erect or suberect pilosity. Head, mesosoma, waist segments dark brown, appendages of lighter brown.

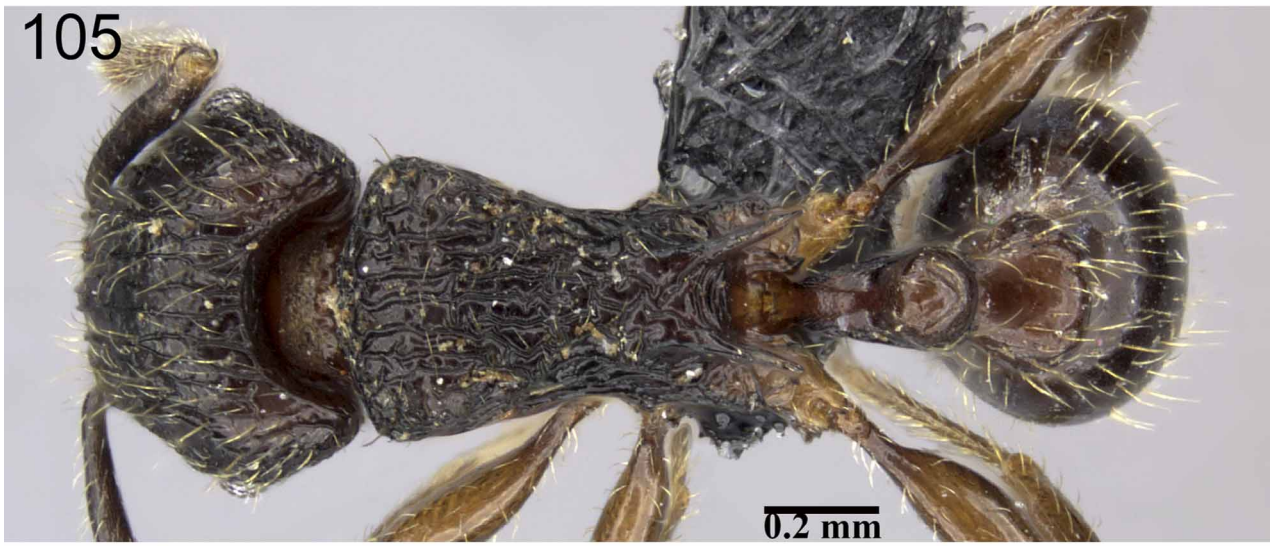
Notes

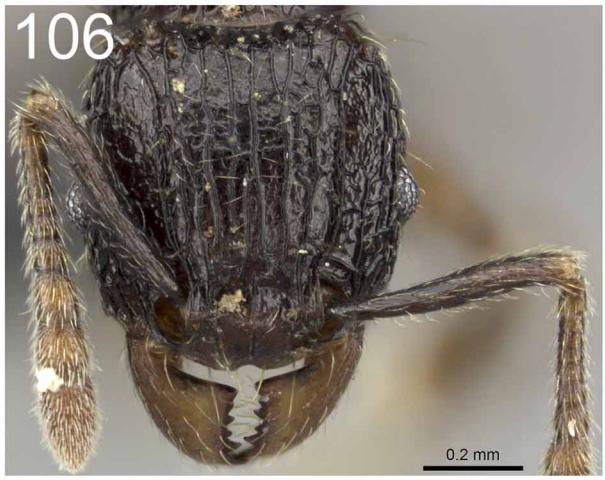
Tetramorium mallenseana is only known from the Parc National de Ranomafana and its vicinity, which is a montane rainforest situated at an altitude of 1000 to 1100 m.

Within the *T. dysalum* group, *T. mallenseana* has an interesting character combination that makes it unlikely to be misidentified with another group member. The propodeal spines are very long and strongly backcurved. This shape is only comparable with the shape of the spines seen in *T. dysalum*, although the species are unlikely to be confused since *T. dysalum* always has unsculptured, very smooth and shiny mandibles, whereas the mandibles of *T. mallenseana* are distinctly sculptured. The spines of *T. steinheili* are usually straight and only rarely backcurved, and if they are, then the propodeal lobes are very well-developed, whereas the lobes of *T. mallenseana* are very short and inconspicuous. The best character separating *T. mallenseana* from the other species, however, is the shape of the petiolar node, especially the relationship between petiolar node width and postpetiole width. The petiolar node in dorsal view is only weakly wider than long (DPeI 110–123), and its shape is only weakly elliptical and almost rounded, which is rare in the group. Also, the postpetiole is always between 1.6 to 2 times wider than the comparatively narrow petiolar node (PPI 168–200), while most other species have a postpetiole that is usually distinctly less than 1.5 times wider than the petiolar node (PPI 119–152).

Etymology

The species epithet is an arbitrary combination of letters, and the new species is dedicated to Sean Allen for his support to discover and identify life on earth.





FIGURES 104–106. *T. mallenseana*, holotype—CASENT0039659 (Estella Ortega 2011). 104. Body in profile. 105. Body in dorsal view. 106. Head in full-face view.

Material examined

MADAGASCAR: Fianarantsoa, Parc National de Ranomafana, Vatoharanana River, 4.1 km 231° SW Ranomafana, 21.29 S, 47.43333 E, 1100 m, montane rainforest, 21.–31.III.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, 7 km W of Ranomafana, montane rainforest, 1000 m, 23.II.–13.III.1990 (*W.E. Steiner*).

***Tetramorium orc* sp. n.**

(figs 74, 75, 107, 108, 109)

Holotype worker, MADAGASCAR, Antsiranana, Parc National de Marojejy, 25.4 km 30° NNE Andapa, 10.9 km 311° NW Manantenina, 14.445 S, 49.735 E, 2000 m, montane shrubland, ex soil, collection code BLF09377, 24.XI.2003 (*B.L. Fisher et al.*) (CASC: CASENT0487093). Paratypes, nine workers with same data as holotype (CASC: CASENT0487090; CASENT0487091; CASENT0487092); 24 workers with same data as holotype except collection code BLF09376 and BLF09379 (BMNH: CASENT0487022; CASC: CASENT0487094; CASENT0487096; CASENT0487166; CASENT0487167; CASENT0487168; MHNG: CASENT0487023; NHMB: CASENT0487095); 26 workers with same data as holotype except collected from under stone or moss, or as ground foragers, and collection codes BLF09385, BLF09390, and BLF09392 (CASC: CASENT0487080; CASENT0487081; CASENT0487082; CASENT0487189; CASENT0487190; CASENT0487191; CASENT0487203; CASENT0487204; CASENT0487205).

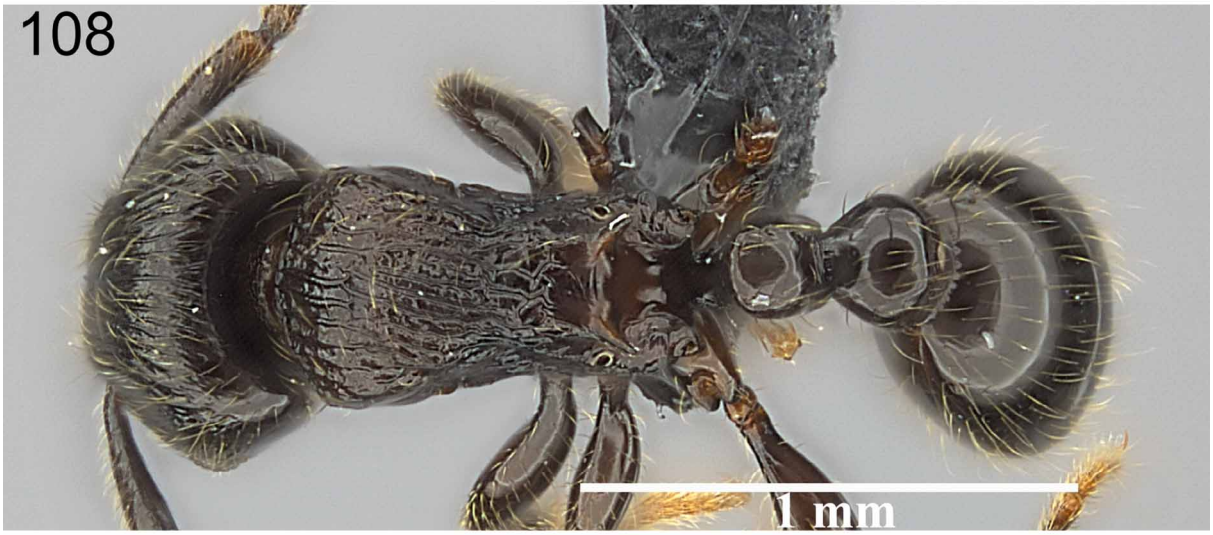
Diagnosis

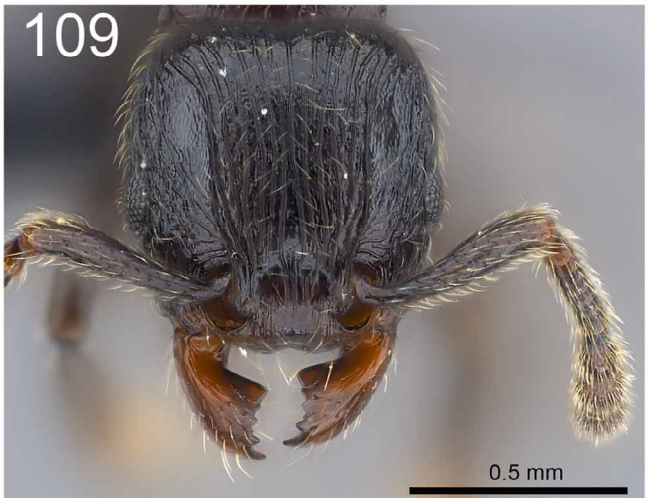
Tetramorium orc can be recognised within the *T. dysalum* group using the following character set: very short antennal scapes (SI 68–69); propodeal spines/teeth comparatively short (PSLI 19–23); weakly cuneiform petiolar node shape with the anterodorsal angle situated higher than the posterodorsal, so that the dorsum tapers backwards posteriorly; mesosomal dorsum with distinct longitudinal rugae/rugulae; completely unsculptured waist segments; dark brown colouration.

Description

HL 0.67–0.74 (0.70); HW 0.63–0.71 (0.66); SL 0.43–0.49 (0.45); EL 0.14–0.17 (0.16); PH 0.34–0.37 (0.35); PW 0.43–0.51 (0.47); WL 0.79–0.91 (0.84); PSL 0.13–0.17 (0.15); PTL 0.13–0.16 (0.14); PTH 0.25–0.29 (0.27); PTW 0.18–0.22 (0.20); PPL 0.18–0.21 (0.19); PPH 0.24–0.27 (0.25); PPW 0.26–0.29 (0.27); CI 93–96 (94); SI 68–69 (69); OI 22–24 (24); DMI 53–58 (56); LMI 40–42 (41); PSLI 19–23 (22); PeNI 39–45 (41); LPeI 46–58 (53); DPeI 130–146 (137); PpNI 55–61 (57); LPpI 72–82 (77); DPpI 137–144 (140); PPI 130–144 (139) (11 measured).

Head distinctly longer than wide (CI 93–96). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, after posterior eye margin distinctly weaker, ending between posterior eye margin and posterior head margin. Antennal scrobes faint, shallow, and narrow. Antennal scapes short, not reaching posterior head margin (SI 68–69). Eyes of moderate size (OI 22–24). Mesosomal outline in profile weakly convex, moderately marginate from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent; mesosoma comparatively stout and compact (LMI 40–42). Propodeum armed with short, elongate-triangular to spinose spines or teeth (PSLI 19–23). Propodeal lobes short, triangular, and acute, distinctly much shorter than propodeal spines. Petiolar node weakly cuneiform, approximately 1.7 to 2.2 times higher than long (LPeI 46–58), anterodorsal margin moderately developed and situated higher than posterodorsal, dorsum strongly tapering backwards posteriorly; node in dorsal view between 1.3 to 1.5 times longer than wide (DPeI 130–146). Postpetiole in profile rounded, approximately 1.2 to 1.4 times higher than long (LPpI 72–82), in dorsal view between 1.3 to 1.5 times wider than long (DPpI 137–144). Postpetiole in profile less voluminous than petiolar node, in dorsal view approximately 1.3 to 1.5 times wider than petiolar node (PPI 130–144). Mandibles always unsculptured, smooth and shiny; clypeus with five to eight fine, longitudinal rugulae, no distinct median ruga, median anterior area often without sculpture; cephalic dorsum between frontal carinae with eight to 12 longitudinal rugulae, most rugae running from anterior clypeal margin to posterior head margin, rarely broken or with cross-meshes; scrobal area mostly unsculptured, remainder of lateral and ventral head with more irregular longitudinal rugulae. Ground sculpture reticulate-punctate, usually moderately developed, sometimes faint. Mesosoma laterally generally with irregular longitudinal rugulae, sometimes lateral pronotum almost unsculptured; mesosomal dorsum with





FIGURES 107–109. *T. orc*, holotype—CASENT0040573 (Estella Ortega 2011). 107. Body in profile. 108. Body in dorsal view. 109. Head in full-face view.

longitudinal rugulae. Waist segments and gaster always unsculptured, smooth, and shining. All dorsal surfaces of body with long, erect pilosity. Whole body dark to very dark brown, often mesosoma of lighter, reddish brown colour.

Notes

The new species is only known from the type locality, the Parc National de Marojejy, where it was collected at comparatively high elevations ranging from 1575 to 2000 m. *Tetramorium orc* is the only species of the group that was predominantly found in montane shrubland habitats, and only rarely from montane rainforest, whereas all other group members were almost always collected from forests in different elevations. In addition, *T. orc* seems to live in leaf litter.

Within the *T. dysalum* species group, it is fairly easy to separate *T. orc* from the other species. The comparatively short propodeal spines/teeth (PSLI 19–23) are only shared with *T. macki* (PSLI 21–24) and *T. robitika* (PSLI 20–22), whereas all other species have much longer propodeal spines (PSLI 27–44). *Tetramorium macki* has distinctly sculptured mandibles and is yellowish to pale brownish in colour, whereas *T. orc* has unsculptured mandibles and is very dark brown to black in colour. Both *T. macki* and *T. orc* share the same cuneiform petiolar node shape, which contrasts strongly with the petiolar node of *T. robitika* which has a high rounded nodiform node with antero- and posterodorsal margins at about the same height.

Another important character that separates *T. orc* from most other species is the length of the antennal scapes (SI 68–69), which is comparatively short. Only *T. dysalum* (SI 64–69) and *T. robitika* (SI 68–71) have similarly short antennal scapes, but neither can be confused with *T. orc*. As already mentioned, *T. dysalum* possesses much longer propodeal spines (PSLI 30–43), and *T. robitika* a differently shaped petiolar node.

Etymology

The name "*orc*" is derived from Old English and means "demon". The species epithet is a noun in apposition and thus invariant.

Material examined

MADAGASCAR: Antsiranana, Parc National de Marojejy, 25.7 km 32° NNE Andapa, 10.3 km 314° NW Manantenina, 14.445 S, 49.74167 E, 1575 m, montane rainforest, 22.XI.2003 (*B.L. Fisher*); Antsiranana, Parc National de Marojejy, 25.4 km 30° NNE Andapa, 10.9 km 311° NW Manantenina, 2000 m, montane shrubland, 23–24.XI.2003 (*B.L. Fisher*).

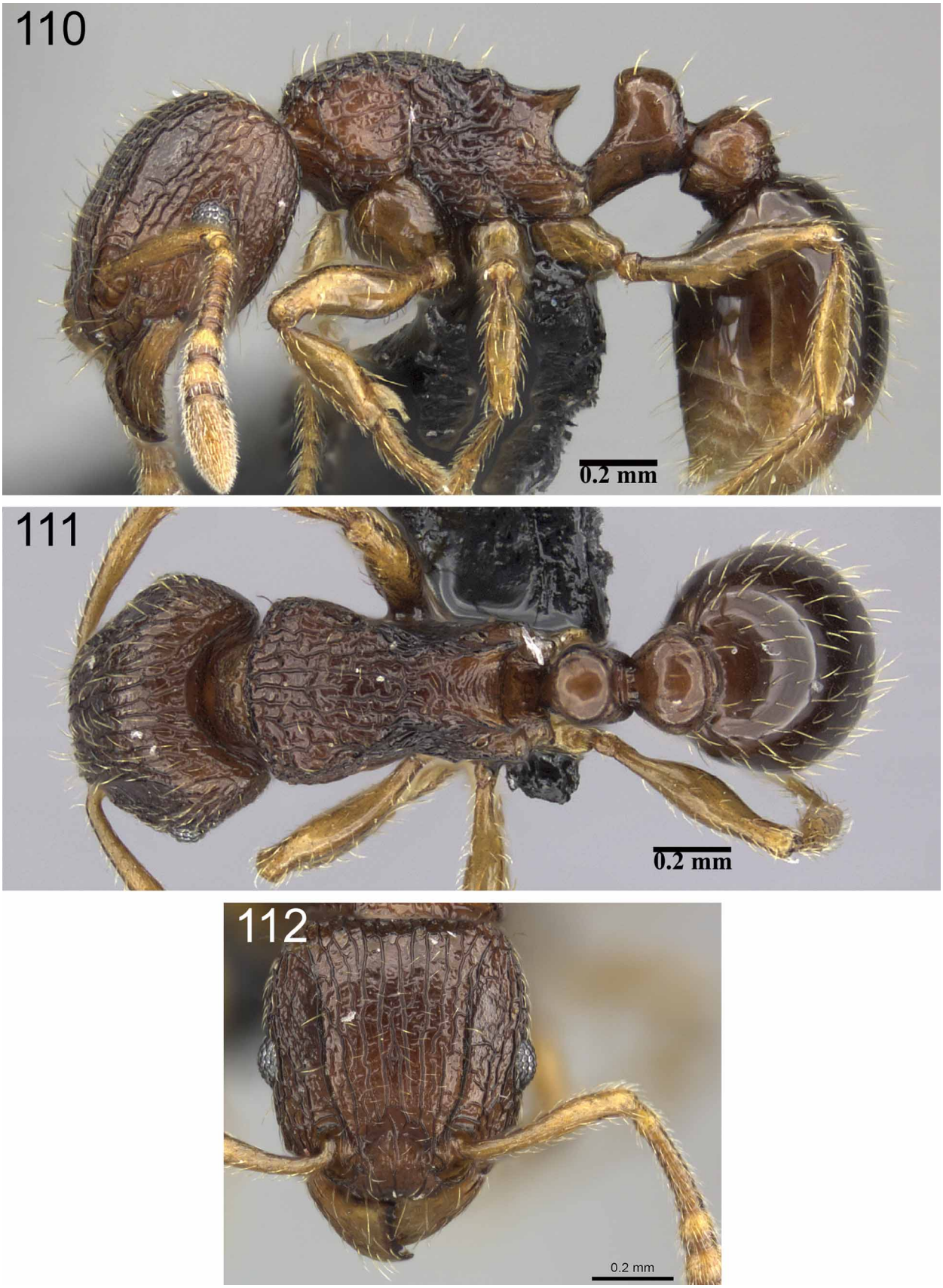
***Tetramorium robitika* sp. n.**

(figs 71, 73, 110, 111, 112)

Holotype worker, MADAGASCAR, Antananarivo, Manjakatompo, 17 km W Ambatolampy, 19.35 S, 47.31667 E, 1500 m, disturbed montane rainforest, sifted litter (leaf mold, rotten wood), collection code BLF7998, 11.II.2003 (*D. Silva, D. Andriamalala et al.*) (CASC: CASENT0056338). Paratypes, ten workers with same data as holotype (CASC: CASENT0056206, CASENT0056207, CASENT0056210, CASENT0056211, CASENT0056333, CASENT0056334, CASENT0056335, CASENT0056336, CASENT0056337; MHNG: CASENT0056209); and six workers from Antananarivo, Manjakatompo, 19º 21' S, 47º 19' E, 1600 m, montane rainforest, sifted litter (leaf mold, rotten wood), collection code PSW11971, 20.II.1993 (*P.S. Ward*) (BMNH: CASENT0247149, CASENT0247150).

Diagnosis

The subsequent set of characters clearly distinguishes *T. robitika* from all other species of the *T. dysalum* group: antennal scapes relatively short (SI 68–71); propodeal spines comparatively short (PSLI 20–22); petiolar node high nodiform with anterodorsal and posterodorsal margins at approximately same height, dorsum not tapering backwards posteriorly; dorsum of mesosoma with longitudinally arranged rugae.



FIGURES 110–112. *T. robitika*, holotype—CASENT0056338 (Estella Ortega 2011). 110. Body in profile. 111. Body in dorsal view. 112. Head in full-face view.

Description

HL 0.62–0.72 (0.68); HW 0.59–0.69 (0.65); SL 0.41–0.49 (0.45); EL 0.12–0.15 (0.14); PH 0.32–0.38 (0.35); PW 0.43–0.51 (0.48); WL 0.74–0.88 (0.81); PSL 0.14–0.16 (0.14); PTL 0.14–0.17 (0.15); PTH 0.25–0.29 (0.28); PTW 0.19–0.23 (0.21); PPL 0.17–0.22 (0.20); PPH 0.24–0.29 (0.27); PPW 0.26–0.31 (0.29); CI 95–96 (96); SI 68–71 (69); OI 20–23 (21); DMI 57–62 (59); LMI 42–43 (43); PSLI 20–22 (21); PeNI 42–45 (44); LPeI 54–57 (56); DPeI 133–142 (137); PpNI 58–62 (60); LPpI 68–75 (72); DPpI 144–155 (147); PPI 133–143 (137) (ten measured).

Head longer than wide (CI 95–96). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed and running to posterior head margin, halfway between posterior eye and posterior head margins weaker but still distinct. Antennal scrobes narrow and faint. Antennal scapes short, not reaching posterior head margin (SI 68–71). Eyes small to moderate (OI 20–23). Mesosomal outline in profile flat to slightly convex, moderately marginate from lateral to dorsal mesosoma, promesonotal suture absent, metanotal groove usually very weak or absent; mesosoma comparatively stout and compact (LMI 42–43). Propodeum armed with elongate-triangular, short to medium-sized spines (PSLI 20–22). Propodeal lobes short and triangular, much less voluminous than propodeal spines. Petiolar node in profile rounded high nodiform, approximately 1.8 times higher than long (LPeI 54–57), anterior and posterior faces parallel and anterodorsal and posterodorsal margins situated at same height, dorsum not tapering backwards posteriorly; node in dorsal view of elliptical shape and 1.3 to 1.4 times wider than long (DPeI 133–142). Postpetiole in profile rounded and weakly anteroposteriorly compressed, approximately 1.3 to 1.5 times higher than long (LPpI 68–75), in dorsal view approximately 1.5 times wider than long (DPpI 144–155). Postpetiole in profile approximately as voluminous as petiolar node, in dorsal view approximately 1.3 to 1.4 times wider than petiolar node (PPI 133–143). Mandibles strongly longitudinally rugose; clypeus with distinct median longitudinal ruga and one or two weaker rugulae at each side; cephalic dorsum between frontal carinae with seven to nine longitudinal rugae, rugae running to posterior head margin and often with cross-meshes; lateral and ventral head reticulate-rugose to longitudinally rugose; ground sculpture on head generally faint. Mesosoma laterally with irregular rugae or rugulae, dorsally longitudinally rugose, rugae weakly meandering and sometimes with few cross-meshes. Petiole and postpetiole unsculptured, smooth and shining. All dorsal surfaces of body with short to moderately long, erect or suberect pilosity. Head, mesosoma, waist segments, and gaster brown, gaster weakly darker, and appendages of lighter brown to dark yellow.

Notes

Tetramorium robitika is currently only known from the type locality, which is a montane rainforest located at an altitude of 1500 m to 1600 m, and it appears to live in leaf litter.

The possession of short propodeal spines or teeth separates *T. robitika* (PSLI 20–22) from most other species of the group, which have much longer spines (PSLI 27–44) save for *T. macki* (PSLI 21–24) and *T. orc* (PSLI 19–23). However, the latter two can be distinguished easily from *T. robitika* due to differences in their petiolar node shape. The nodes of *T. macki* and *T. orc* are moderately cuneiform with an anterodorsal margin situated much higher than the posterodorsal margin, which causes the dorsum to taper noticeably backwards posteriorly. This contrasts strongly with the high rounded nodiform node shape observed in *T. robitika*, which has anterodorsal and posterodorsal margins at approximately the same height, and the dorsum does not taper backwards posteriorly.

Ignoring the propodeal spine length, however, *T. robitika* is very similar to *T. vohitra*. Both species share most morphological characters, especially short to moderate gastral pilosity, and have a similar general gestalt, although they differ in their morphometric ranges and a few key characters. *Tetramorium robitika* possesses a slightly longer head (CI 95–96), shorter antennal scapes (SI 68–71), shorter propodeal spines (PSLI 20–22), and the postpetiole is narrower than the petiolar node (PPI 133–143) in comparison to *T. vohitra* (SI 97–101; SI 71–74; PSLI 28–31; PPI 142–152). Also, the mandibles of *T. robitika* are distinctly sculptured while they are unsculptured in *T. vohitra*, and this character is generally very stable within the species of the group, except in *T. steinheili*. However, both species are only known from their respective type localities, which are widely separated from each other. This allopatric distribution could indicate that they are both geographical varieties of the same species. Nevertheless, considering all the above data, we consider *T. robitika* and *T. vohitra* as distinct species on the basis of the morphometric and morphological differences mentioned above.

Etymology

The epithet of the new species is an arbitrary combination of letters. The new species is dedicated to Caitlin Robitaille for her support to discover and identify life on earth.

Material examined

MADAGASCAR: no locality data; Antananarivo, Manjakatompo, 19º 21' S, 47º 19' E, 1600 m, montane rainforest, 20.II.1993 (*P.S. Ward*); Antananarivo, Manjakatompo, 17 km W Ambatolampy, 19.35 S, 47.31667 E, 1500 m, 11.II.2003 (*D. Silva, D. Andriamalala et al.*).

***Tetramorium sargina* sp. n.**

(figs 84, 86, 113, 114, 115)

Holotype worker, MADAGASCAR, Antsiranana, Parc National de Marojejy, 25.7 km 32° NNE Andapa, 10.3 km 314° NW Manantenina, 14.445 S, 49.74167 E, 1575 m, montane rainforest, under moss, above ground, collection code BLF09320, 22.XI.2003 (*B.L. Fisher*) (CASC: CASENT0487390). Paratypes, seven workers with same data as holotype (CASC: CASENT0247152; CASENT0487389; CASENT0487392).

Diagnosis

Tetramorium sargina differs distinctly from the other members of the *T. dysalum* group due to the following character set: short antennal scapes SI 73–75; propodeal spines long (PSLI 30–32); mesosomal dorsum with longitudinally arranged rugae; first gastral tergite with decumbent to subdecumbent long hairs.

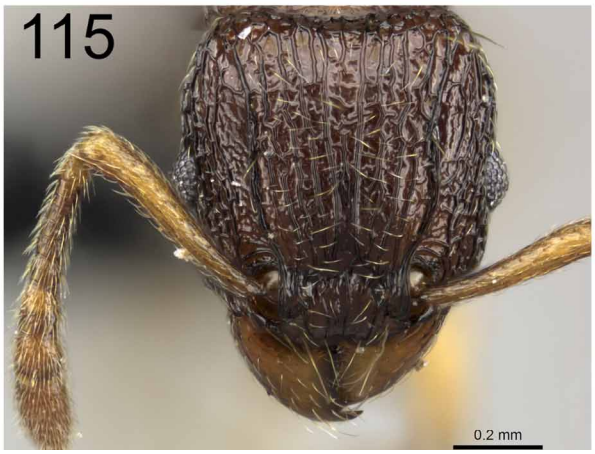
Description

HL 0.63–0.74 (0.70); HW 0.60–0.72 (0.68); SL 0.44–0.54 (0.50); EL 0.14–0.16 (0.15); PH 0.34–0.42 (0.39); PW 0.42–0.55 (0.51); WL 0.75–0.94 (0.87); PSL 0.19–0.24 (0.22); PTL 0.11–0.15 (0.14); PTH 0.27–0.31 (0.29); PTW 0.18–0.23 (0.21); PPL 0.19–0.22 (0.21); PPH 0.27–0.31 (0.29); PPW 0.27–0.33 (0.30); CI 96–99 (97); SI 73–75 (74); OI 21–23 (22); DMI 56–59 (58); LMI 43–46 (45); PSLI 30–32 (31); PeNI 39–43 (41); LPeI 41–50 (47); DPeI 148–164 (153); PpNI 56–64 (59); LPpI 72–78 (74); DPpI 129–148 (141); PPI 141–150 (144) (nine measured).

Head usually weakly longer than wide (CI 96–99). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, usually ending at or shortly before posterior head margin. Antennal scrobes shallow, narrow, and faint. Antennal scapes short, not reaching posterior head margin (SI 73–75). Eyes comparatively small to moderate (OI 21–23). Mesosomal outline in profile comparatively flat to weakly convex, weakly to moderately marginate from lateral to dorsal mesosoma, promesonotal suture absent, metanotal groove faint to absent; mesosoma comparatively stout, high, and compact (LMI 43–46). Propodeal spines long, spinose and acute (PSLI 30–32). Propodeal lobes well-developed, elongate-triangular, and usually acute. Petiolar node in profile rounded high nodiform, approximately 2 to 2.5 times higher than long (LPeI 41–50), anterior and posterior faces almost parallel, anterodorsal margin situated slightly higher than posterodorsal margin, dorsum weakly tapering backwards posteriorly; node in dorsal view between 1.4 to 1.7 times wider than long (DPeI 148–164). Postpetiole in profile approximately rounded, approximately 1.3 to 1.4 times higher than long (LPpI 72–78), in dorsal view 1.3 to 1.5 times wider than long (DPpI 129–148). Postpetiole in profile a bit more voluminous than petiolar node, in dorsal view much wider than petiolar node, between 1.4 to 1.5 times wider (PPI 141–150). Mandibles unsculptured, smooth, and shining; clypeus with three to six longitudinal rugulae, median rugula not more strongly developed than other ones, sometimes rugulae irregularly arranged; cephalic dorsum between frontal carinae with seven to ten longitudinal rugae, rugae running to posterior head margin, rugae often interrupted or with cross-meshes; lateral and ventral head with reticulate-rugose sculpture; ground sculpture on head generally faint. Mesosoma laterally and dorsally longitudinally rugose, rugae moderately meandering but distinctly longitudinally arranged with few cross-meshes. Petiole and postpetiole almost unsculptured with few weak rugulae laterally and posteriorly. Gaster unsculptured, smooth and shining. Head, mesosoma, and waist segments with long, erect or suberect pilosity; first gastral tergite with abundant long, decumbent to subdecumbent pilosity, and less abundant and shorter, but still comparatively long, appressed pubescence. Head, mesosoma, waist segments, and gaster dark brown, appendages of lighter brownish to yellowish colouration.

Notes

The new species is only known from two localities, which are widely separated from each other. The one is Marojejy in the northeast, and the other one is Kalambatritra in the southeast. Interestingly, there is not a single



FIGURES 113–115. *T. sargina*, holotype—CASENT0487390 (Estella Ortega 2011). 113. Body in profile. 114. Body in dorsal view. 115. Head in full-face view.

record from any locality in-between. Both localities are montane rainforests located at elevations of 1390 to 1575 m, and all specimens were sampled from leaf litter.

Tetramorium sargina is not likely to be misidentified with *T. ambatovy* due to the very different sculpture patterns on the mesosoma, and surely not with *T. macki*, *T. orc*, and *T. robitika*, which all possess very short propodeal spines (PSLI 19–24). Furthermore, *T. dysalum* with its very short antennal scapes (SI 64–69) should not be confused with *T. sargina*, which has much longer scapes (SI 73–75). The differentiation of *T. sargina* from the remaining species is less obvious, but still straightforward. *Tetramorium mallenseana*, *T. steinheili*, *T. yammer*, and *T. vohitra* are at first glance morphologically fairly close to *T. sargina*. However, *T. mallenseana* has minute propodeal lobes and the postpetiole is approximately 1.7 to 2 times wider than the petiolar node (PPI 168–200), whereas the propodeal lobes in *T. sargina* are well-developed and the postpetiole is approximately 1.4 to 1.5 times wider than the petiolar node (PPI 141–150). The remaining three species, *T. vohitra*, *T. steinheili*, and *T. yammer*, all have suberect to erect pilosity on the first gastral tergite, which distinguishes them from *T. sargina* with its decumbent to subdecumbent hairs.

Etymology

The new species is named in honor of Leonard M. and Sargina T. Silvani for their support to discover and identify life on earth.

Material examined

MADAGASCAR: Antsiranana, Parc National de Marojejy, 25.7 km 32° NNE Andapa, 10.3 km 314° NW Manantenina, 14.445 S, 49.74167 E, 1575 m, montane rainforest, 22.XI.2003 (*B.L. Fisher*); Toliara, Réserve Spéciale Kalambatritra, Befarara, 23.4178 S, 46.4478 E, 1390 m, montane rainforest, 7.–8.II.2009 (*B.L. Fisher et al.*); Toliara, Réserve Spéciale Kalambatritra, Ampanihy, 23.4635 S, 46.4631 E, 1270 m, montane rainforest, 9.II.2009 (*B.L. Fisher et al.*).

Tetramorium steinheili Forel, 1892

(figs 70, 78, 81, 82, 85, 87, 90, 91, 116, 117, 118, 119, 120, 121)

Tetramorium (*Xyphomyrmex*) *steinheili* Forel, 1892:520. Lectotype worker [designated here], MADAGASCAR, Forêt d'Andrangoloaka (MHNG: CASENT0101814) [examined]. Paralectotypes, two workers and two queens with same data as holotype (MHNG: CASENT0101257; CASENT0101258; CASENT0101566); one queen from Imerina (*Sikora*) (MHNG: CASENT0101801) [examined].

Diagnosis

Tetramorium steinheili can be best recognised within its species group by the following character combination: short antennal scapes (SI 71–76); eyes small to moderate (OI 21–23); propodeal spines long to very long (PSLI 27–44); propodeal lobes variably long, but never long and spinose; petiolar node squamiform with anterodorsal margin situated slightly higher than posterodorsal margin, dorsum tapering backwards posteriorly; dorsum of mesosoma with longitudinally arranged rugae; hairs on first gastral tergite erect or suberect.

Description

HL 0.72–0.95 (0.86); HW 0.73–0.96 (0.86); SL 0.53–0.71 (0.63); EL 0.16–0.21 (0.18); PH 0.36–0.50 (0.44); PW 0.50–0.71 (0.63); WL 0.91–1.23 (1.10); PSL 0.20–0.40 (0.32); PTL 0.13–0.20 (0.17); PTH 0.30–0.40 (0.36); PTW 0.20–0.31 (0.27); PPL 0.21–0.32 (0.27); PPH 0.28–0.41 (0.35); PPW 0.27–0.40 (0.34); CI 96–102 (100); SI 71–76 (73); OI 21–23 (21); DMI 55–60 (57); LMI 38–44 (40); PSLI 27–44 (37); PeNI 39–45 (42); LPeI 42–50 (47); DPeI 150–168 (157); PpNI 49–60 (55); LPpI 64–84 (77); DPpI 117–138 (127); PPI 119–137 (130) (30 measured).

Head usually approximately as long as wide, sometimes longer than wide to wider than long (CI 96–102). Anterior clypeal margin medially impressed. Frontal carinae well-developed, usually ending at posterior head margin. Antennal scrobes shallow, narrow, and very weakly developed. Antennal scapes short, not reaching posterior head margin (SI 71–76). Eyes comparatively small to moderate (OI 21–23). Mesosomal outline in profile flat, weakly to moderately marginate from lateral to dorsal mesosoma, promesonotal suture absent, metanotal

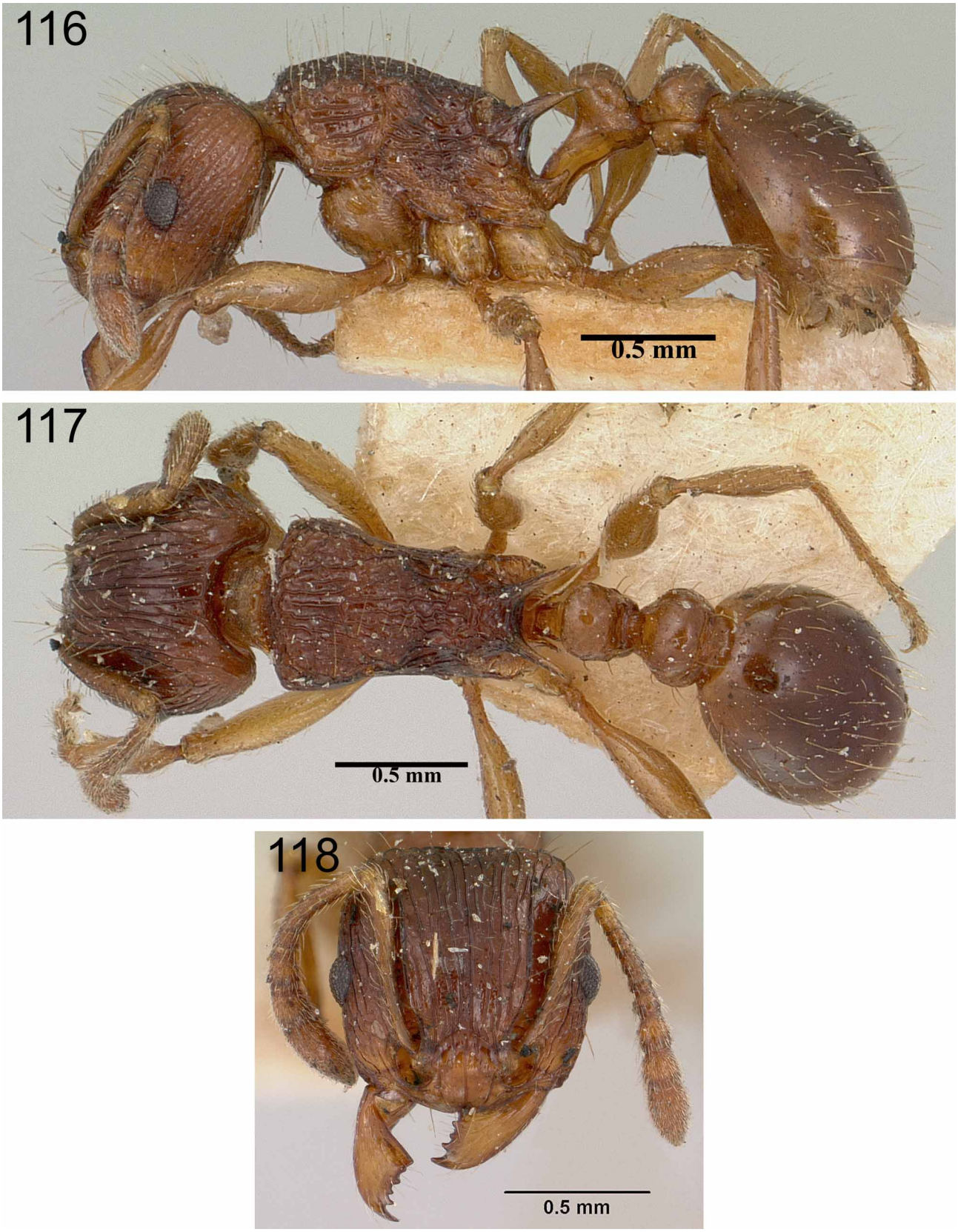
groove usually absent, sometimes weakly impressed; mesosoma comparatively stout and high (LMI 38–44). Propodeal spines long to very long, variable in shape from thick and stout to thin and fine, usually straight, rarely weakly curving backwards (PSLI 27–44); propodeal lobes variable, from broadly triangular and comparatively short to elongate triangular and comparatively long, blunt to acute. Petiolar node in profile squamiform and distinctly anteroposteriorly compressed, approximately 2 to 2.4 times higher than long (LPeI 42–50), anterior and posterior faces approximately parallel but anterodorsal margin situated slightly higher than posterodorsal margin, dorsum slightly convex and weakly tapering backwards posteriorly; node in dorsal view 1.5 to 1.7 times wider than long (DPeI 150–168). Postpetiole in profile rounded and weakly anteroposteriorly compressed, approximately 1.2 to 1.6 times higher than long (LPpI 64–84), in dorsal view between 1.1 to 1.4 times wider than long (DPpI 117–138). Postpetiole in profile more voluminous than petiolar node, in dorsal view approximately 1.2 to 1.4 times wider than petiolar node (PPI 119–137). Mandibles generally distinctly longitudinally rugose, in some series unsculptured and smooth or weakly sculptured; clypeus with well-developed median longitudinal rugula and one or two rugulae at each side; cephalic dorsum between frontal carinae with six to ten longitudinal rugae, most rugae running unbroken to posterior head margin, few rugae interrupted or with cross-meshes; lateral and ventral head with longitudinal rugae, often with cross-meshes. Ground sculpture generally faint, sometimes moderately developed. Mesosoma laterally with irregular longitudinal rugae; mesosomal dorsum longitudinally rugose, rugae often meandering and with cross-meshes, still distinctly longitudinally arranged. Petiolar node and postpetiole usually with weak sculpture laterally and posteriorly while dorsally unsculptured, both often completely unsculptured, and very rarely with distinctly developed and pronounced ground sculpture. Gaster completely unsculptured, smooth and shining. All dorsal surfaces of body with abundant, long, erect or suberect pilosity. Generally, body of brownish colour, often appendages of lighter brown to dark yellow, sometimes mesosoma of darker brown than remaining body.

Notes

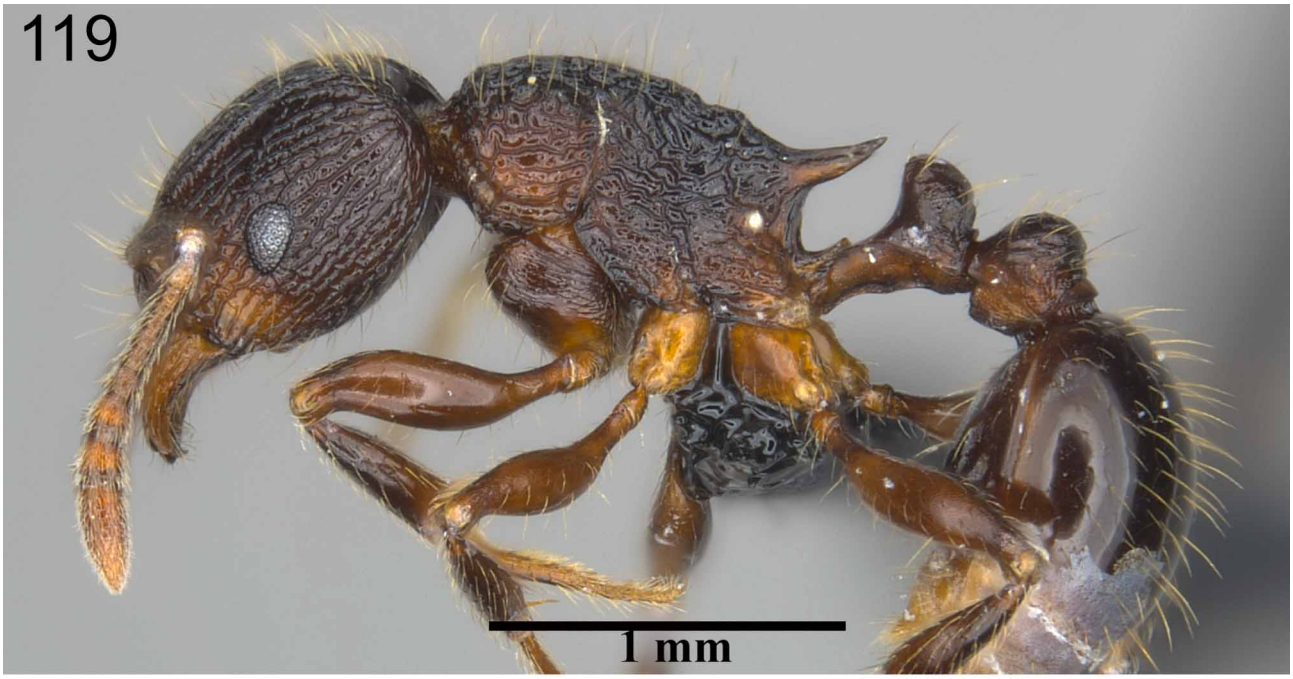
Tetramorium steinheili is a very common species in many montane rainforests of eastern Madagascar. The southernmost known locality is Andohahela and the northernmost Bemanevika, but it is also known from Analavelona in the southwest. Interestingly, the distribution is somewhat disjunct since *T. steinheili* is fairly common in a strip from Andohahela in the south to Ankazobe, Andranomay, and Betampona but is very rare further north, and the next localities are Anjanaharibe and Bemanevika. Together with *T. dysalum* it has certainly the broadest distribution range within the group, although *T. dysalum* also occurs in the north of Madagascar and Nosy Be. The altitudinal range of *T. steinheili* lies from 500 to 1700 m, although it is usually found above 1000 m, and most specimens were collected from leaf litter.

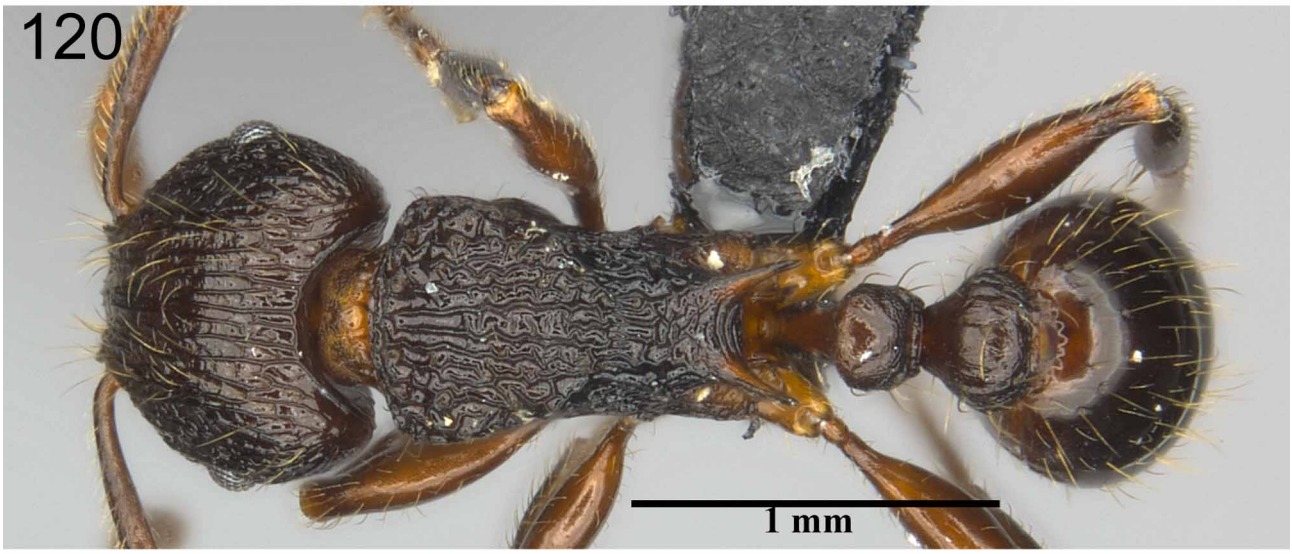
This species displays extraordinary intraspecific variation. While the general body habitus remains very stable, there is remarkable variation in the length and shape of the propodeal spines and the propodeal lobes. The spines are long in all examined material, but they differ in length from one population to another while they are comparatively constant on a local scale. The same is true for the spine shape, since it can vary in thickness and acuteness. Generally, many series from the centre of the distribution range have shorter spines than seen in those from further north or south, although some central series also have very long spines. The propodeal lobes are also fairly variable since they differ from broadly triangular and comparatively short to elongate triangular and comparatively long, and they can be acute or blunted. This variation is relatively stable within populations, and represents a remarkable intraspecific variation since this character is generally highly constant in most Malagasy *Tetramorium*. Furthermore, some series of *T. steinheili*, especially from the southeast, have smooth or almost smooth mandibles, whereas most other populations have distinctly striate mandibles. Another interesting variation concerns the sculpture on the petiolar node. It is mostly unsculptured with few rugulae laterally and posteriorly, and generally has a very shiny look. Specimens from Ambohitantely however, have a fine reticulate-punctate to punctate ground sculpture laterally and posteriorly, which gives the node a rough appearance. Also, the colouration can vary from one series to another. Generally, most specimens possess a reddish brown colour with yellowish brown appendages, although there are some series in which the appendages are of the same colour as the remaining body, and other series are darker brown or yellowish brown without any reddish tone.

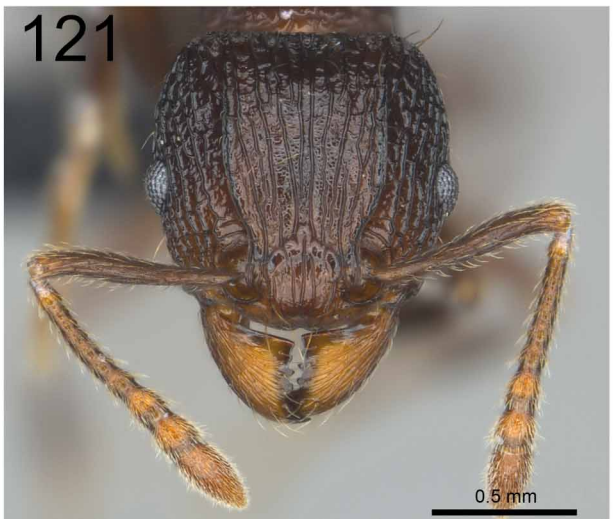
Since *T. steinheili* is mostly found in montane rainforests, which are often geographically well separated from each other, it is not surprising to encounter this type of variation. Several populations possess a specific combination of the characters mentioned above that could separate them from most other *T. steinheili* populations,



FIGURES 116–118. *T. steinheili*, lectotype—CASENT0101814 (N. Olgeirson 2005). 116. Body in profile. 117. Body in dorsal view. 118. Head in full-face view.







FIGURES 119–121. *T. steinheili*, form with strongly sculptured petiolar node—CASENT0481234 (Estella Ortega 2011). 119. Body in profile. 120. Body in dorsal view. 121. Head in full-face view.

and we suspect there might be more than one cryptic species hidden within *T. steinheili* under its current definition. However, we are reluctant to raise such populations to species on the basis of inconsistent differences. One northern series collected from Marojejy, which would have fitted the previous definition of *T. steinheili*, proved to have some valuable diagnostic characters, and was described as the new species *T. yammer*. The latter species is generally at the upper size range of *T. steinheili*, has a weakly wider head (CI 101–103), a very dark brown to black colouration, distinctly smaller eyes (OI 19–20), and very long propodeal spines and propodeal lobes. The examined *T. steinheili* material was mostly of much lighter colour with larger eyes (OI 21–23). The long spines alone, even in combination with the long propodeal lobes, might be considered comparatively weak evidence to support the naming of a new species, since these characters are quite variable within *T. steinheili*. However, the character combination of body and eye size, head width, colouration, and lengths of the propodeal spines and propodeal lobes is sufficient to separate the newly described *T. yammer* fairly well from *T. steinheili*. As mentioned above, *T. steinheili* is less common in northeastern Madagascar and not present in Marojejy, but the specimens from Anjanaharibe and Bemanevika proved to be good *T. steinheili* representatives while being fairly different from *T. yammer*. For these reasons, we are fairly confident about the separation of *T. yammer* from *T. steinheili*.

Tetramorium steinheili is the core species of the group, and not likely to be confused with the remaining eight group members. It differs strikingly from *T. ambatovy* since the latter species does not have the typical longitudinal rugae on the mesosomal dorsum present in *T. steinheili* and the other group members. *Tetramorium orc*, *T. macki*, and *T. robitika* all have comparatively short propodeal spines/teeth (PSLI 19–25), whereas the spines of *T. steinheili* are always long to very long (PSLI 27–44). *Tetramorium dysalum* is also a widely distributed and common species with a distribution range that even exceeds that of *T. steinheili*. Both species often occur in the same locality, but are not likely to be confused with each other. The main distinction is surely antennal scape length, which is very short in *T. dysalum* (SI 64–69) and much longer in *T. steinheili* (SI 71–76), but both differ also in the shape of the propodeal spines and petiolar node, and usually in mandibular sculpture. The latter is very stable in *T. dysalum* because the mandibles are always completely unsculptured, very smooth and shining, while they are mostly longitudinally sculptured in *T. steinheili*. However, as noted above, several series of *T. steinheili* have unsculptured mandibles, thus rendering this character unreliable. The propodeal spines are usually straight in *T. steinheili* while they are generally curved backwards in *T. dysalum*, but this character is also not of universal value since there are exceptions in both species. The petiolar node shape is a good character of high diagnostic value as well. The node of *T. dysalum* has a very sharply defined anterodorsal margin, which usually contrasts with the less sharply defined margin of *T. steinheili*.

The remaining species, *T. mallenseana*, *T. sargina*, and *T. vohitra*, are all morphologically comparatively close to *T. steinheili*, although they can all be well differentiated. *Tetramorium mallenseana* has a postpetiole that is between 1.6 to 2 times wider than the petiolar node (PPI 167–200) while this relationship is strikingly less pronounced in *T. steinheili* (PPI 119–137). Also, *T. sargina* with its decumbent to subdecumbent pilosity on the first gastral tergite differs noticeably from *T. steinheili* since the gastral pilosity of the latter is erect to suberect. *Tetramorium vohitra* has a high rounded nodiform petiolar node shape with the antero- and posterodorsal margins at the same height, whereas the node of *T. steinheili* is squamiform with the anterodorsal margin weakly higher than the posterodorsal, which causes the dorsum to taper backwards posteriorly.

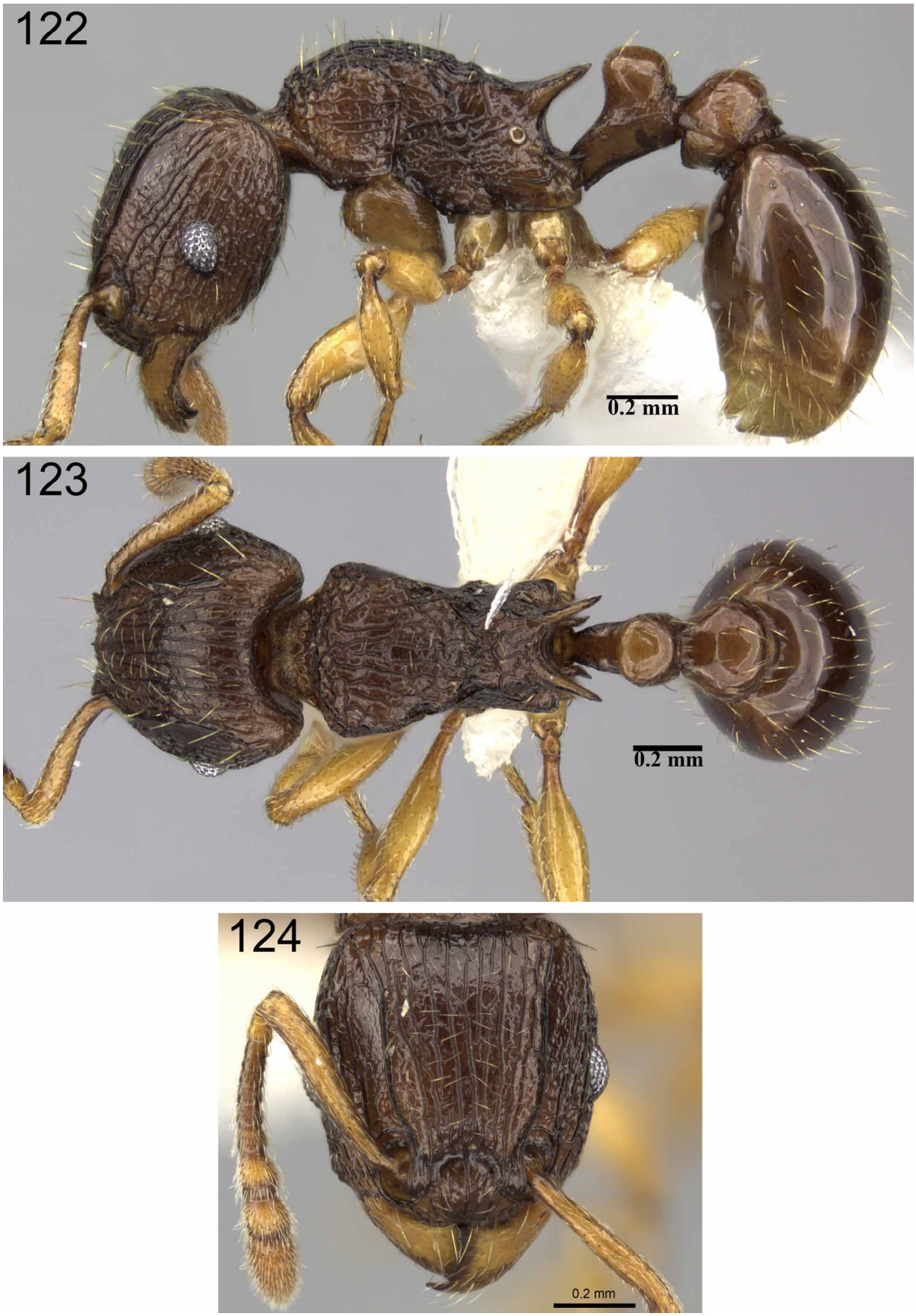
Material examined

MADAGASCAR: no locality data, 1893 (*Grandidier*); Antananarivo, Andrangoloaka; Antananarivo, 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, montane rainforest, 18.47333 S, 47.96 E, 1300 m, 5.–13.XII.2000 (*B.L. Fisher, C. Griswold et al.*); Antananarivo, Imerina (*Sikora*); Antananarivo, Tananarive, Vanjamanitra, 1380 m, 5.XII.1967 (*J.-M. Betsch*); Antananarivo, Forêt de galerie Andranorovitra, 24.0 km NNE Ankazobe, 18.11243 S, 47.19757 E, 1491 m, disturbed gallery montane forest, 2.–3.VI.2008 (*B.L. Fisher et al.*); Antananarivo, Forêt de galerie Telomirahavavy, 23.4 km NNE Ankazobe, 18.12167 S, 47.20627 E, 1520 m, disturbed gallery montane forest, 3.–4.VI.2008 (*B.L. Fisher et al.*); Antananarivo, Réserve Naturelle Sohisika, Sohisika 24.6 km NNE Ankazobe, 18.10322 S, 47.18692 E, 1464 m, 1.–2.VI.2008 (*B.L. Fisher et al.*); Antananarivo, Réserve Spéciale d'Ambohitantely, Forêt d Ambohitantely, Jardin Botanique, 24.1 km 59° NE Ankazobe, 18.17139 S, 47.28182 E, 1620 m, montane rainforest, 17.–22.IV.2001 (*B.L. Fisher, C. Griswold et al.*); Antananarivo, Réserve Spéciale d'Ambohitantely, Forêt d Ambohitantely, 20.9 km 72° NE Ankazobe, 18.22528 S, 47.28683 E, 1410 m, montane rainforest, 17.–22.IV.2001 (*B.L. Fisher, C. Griswold et al.*); Antananarivo,

Tsimbazaza, 18.928 S, 47.527 E, 1300 m, park/garden, 16.–19.XII.2006 (*B.L. Fisher et al.*); Antsiranana, 9.2 km WSW Befingotra, Rés. Anjanaharibe-Sud, 14.75 S, 49.46667 E, 1260 m, montane rainforest, 12.XI.1994 (*B.L. Fisher*); Antsiranana, 11.0 km WSW Befingotra, Rés. Anjanaharibe-Sud, 14.75 S, 49.45 E, 1550 m, montane rainforest, 18.XI.1994 (*B.L. Fisher*); Fianarantsoa, 45km S. Ambalavao, 22.21667 S, 47.01667 E, 785 m, rainforest, 24.IX.–1.X.1993 (*B.L. Fisher*); Fianarantsoa, 43 km S Ambalavao, Rés. Andringitra, 22.23333 S, 47 E, 825 m, rainforest, 10.X.1993 (*B.L. Fisher*); Fianarantsoa, 40 km S Ambalavao, Rés. Andringitra, 22.21667 S, 46.96667 E, 1275 m, montane rainforest, 14.–19.X.1993 (*B.L. Fisher*); Fianarantsoa, 38 km S Ambalavao, Rés. Andringitra, 22.2 S, 46.96667 E, 1680 m, montane rainforest, 23.X.1993 (*B.L. Fisher*); Fianarantsoa, 27.4 km SSW Ambositra, 20.77 S, 47.18667 E, 1600 m, montane rainforest, 15.I.1998 (*B.L. Fisher*); Fianarantsoa, 28 km SSW Ambositra, 20.76666667 S, 47.18333333 E, 1660 m, montane rainforest, 29.IV.1989 (*P.S. Ward*); Fianarantsoa, 29 km SSW Ambositra, Ankazomivady, 20.77667 S, 47.165 E, 1700 m, disturbed montane rainforest & montane rainforest, 7.I.1998 (*B.L. Fisher*); Fianarantsoa, 28 km SSW Ambositra, Ankazomivady, 20.775 S, 47.16833 E, 1670 m, montane rainforest & montane rainforest edge, 14.I.1998 (*B.L. Fisher*); Fianarantsoa, 2 km W Andrambovato, along river Tatamaly, 21.51167 S, 47.41 E, 1075 m, montane rainforest, 3.–5.VI.2005 (*B.L. Fisher et al.*); Fianarantsoa, Forêt d'Atsirakambiaty, 7.6 km 285° WNW Itremo, 20.59333 S, 46.56333 E, 1550 m, montane rainforest, 22.–26.I.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, Imerina (*Sikora*); Fianarantsoa, Miandritsara, 20.79267 S, 47.17567 E, 823 m, rainforest, 23.X.2004–19.III.2005 (*R. Harin'Hala & M.E. Irwin*); Fianarantsoa, Parc National Befotaka-Midongy, Papango 27.7km S Midongy-Sud, Mount Papango, 23.83517 S, 46.96367 E, 940 m, rainforest, 15.XI.2006 (*B.L. Fisher et al.*); Fianarantsoa, Parc National de Ranomafana, Vatoharanana River, 4.1 km 231° SW Ranomafana, 21.29 S, 47.43333 E, 1100 m, montane rainforest, 27.–31.III.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, R.S. Ivohibe 8.0 km E Ivohibe, 22.48333 S, 46.96833E, 1200 m, montane rainforest, 15.–21.X.1997 (*B.L. Fisher*); Fianarantsoa, R.S. Ivohibe 8.0 km E Ivohibe, 22.42167 S, 46.89833 E, 1200 m, montane rainforest, 3.–9.XI.1997 (*B.L. Fisher*); Fianarantsoa, R.S. Ivohibe, 6.5 km ESE Ivohibe, 22.49667 S, 46.955 E, 1575 m, montane rainforest, 24.X.1997 (*B.L. Fisher*); Mahajanga, Bemanevika, Souspref. de Bealanana, forest humus (*A. Peyrieras*); Toamasina, Bevolota 17.1km N Andasibe, 18.77071 S, 48.43164 E, 995 m, montane rainforest, 12.XII.2007 (*B.L. Fisher et al.*); Toamasina, Forêt Ambatovy, 14.3 km 57° Moramanga, 18.85083 S, 48.32 E, 1075 m, montane rainforest, 21.III.2004 (*B.L. Fisher et al.*); Toamasina, P.N. Mantadia, 18.79167 S, 48.42667 E, 895 m, rainforest, 25.–28.XI.1998 (*H.J. Ratsirarson*); Toamasina, Réserve Nationale Intégrale Betampona, Betampona 35.1 km NW Toamasina, 17.91801 S, 49.20074 E, 500 m, 17.XII.2007 (*B.L. Fisher et al.*); Toliara, Forêt Classée d'Analavelona, 33.2 km 344° NNW Mahaboboka, 22.64333 S, 44.17167 E, 1300 m, montane rainforest, 22.–26.II.2003 (*B.L. Fisher, C. Griswold et al.*); Toliara, Parc National d'Andohahela, Col du Sedro, 3.8 km 113° ESE Mahamavo, 37.6 km 341° NNW Tolagnaro, 24.76389 S, 46.75167 E, 900 m, montane rainforest, 21.–25.I.2002 (*B.L. Fisher, C. Griswold et al.*); Toliara, Rés. Andohahela, 13 km NW Enakara, 24.55 S, 46.8 E, 1250 m, montane rainforest, 30.XI.1992 (*B.L. Fisher*); Toliara, Réserve Spéciale Kalambatritra, Ambinanitelo, 23.4502 S, 46.45658 E, 1325 m, 22.II.2009 (*B.L. Fisher et al.*); Toliara, Réserve Spéciale Kalambatritra, Ampanihy, 23.4635 S, 46.4631 E, 1270 m, montane rainforest, 9.–10.II.2009 (*B.L. Fisher et al.*); Toliara, Réserve Spéciale Kalambatritra, Befarara, 23.4178 S, 46.4478 E, 1390 m, montane rainforest, 7.–8.II.2009 (*B.L. Fisher et al.*); Toliara, Sakaraha, 22º 54' 41" S, 44º 41' 42" E, 760 m, tropical dry forest, 5.II.1983 (*P. Rabeson*).

***Tetramorium vohitra* sp. n.**
(figs 72, 83, 122, 123, 124)

Holotype worker, MADAGASCAR, Fianarantsoa, Rés. Andringitra, Anjavidilava Forest, 8.5 km SE Antanitotsy, 22.1667 S, 46.9667 E, 1990 m, upper limit of montane forest, sifted litter (leaf mold, rotten wood), collection code BLF01526, 6.III.1997 (*B.L. Fisher*) (CASC: CASENT0189167). Paratypes, three workers with same data as holotype except BLF01524 (CASC: CASENT0189168; CASENT0218031); two workers from Rés. Andringitra, 38 km S Ambalavao, 22.2 S, 46.9667 E, 1680 m, montane rainforest, canopy moss and leaf litter, collection code BLF01529, 24.X.1993 (*B.L. Fisher*) (CASC: CASENT0192260); and nine workers from Rés. Andringitra, 38 km S Ambalavao, 22.2 S, 46.9667 E, 1680 m, montane rainforest, sifted litter (leaf mold, rotten wood), collection code BLF00820, 23.X.1993 (*B.L. Fisher*) (BMNH: CASENT0247158; CASC: CASENT0218033; CASENT0218034; CASENT0218037; CASENT0260168).



FIGURES 122–124. *T. vohitra*, holotype—CASENT0189167 (Estella Ortega 2011). 122. Body in profile. 123. Body in dorsal view. 124. Head in full-face view.

Diagnosis

Tetramorium vohitra can be separated from the remainder of the species group by the character combination of: short antennal scapes (SI 71–74); propodeal spines long (PSLI 28–31); petiolar node rounded high nodiform with anterodorsal and posterodorsal margins at approximately same height, dorsum not tapering backwards posteriorly; dorsum of mesosoma with distinctly, longitudinally arranged rugae; erect to suberect pilosity on first gastral tergite.

Description

HL 0.72–0.83 (0.78); HW 0.70–0.84 (0.78); SL 0.52–0.61 (0.57); EL 0.15–0.18 (0.17); PH 0.39–0.45 (0.42); PW 0.50–0.60 (0.55); WL 0.88–1.03 (0.96); PSL 0.21–0.25 (0.23); PTL 0.17–0.19 (0.18); PTH 0.30–0.35 (0.33); PTW 0.21–0.25 (0.23); PPL 0.22–0.26 (0.25); PPH 0.30–0.36 (0.34); PPW 0.31–0.36 (0.34); CI 97–101 (99); SI 71–74 (73); OI 20–22 (21); DMI 55–59 (57); LMI 41–44 (43); PSLI 28–31 (29); PeNI 39–44 (42); LPeI 51–58 (54); DPeI 120–138 (130); PpNI 58–65 (62); LPpI 71–75 (73); DPpI 131–143 (139); PPI 142–152 (147) (ten measured).

Head weakly wider than long to weakly longer than wide (CI 97–101). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, ending shortly before posterior head margin. Antennal scrobes weak, shallow, and narrow. Antennal scapes short, not reaching posterior head margin (SI 71–74). Eyes comparatively small (OI 22). Mesosomal outline in profile flat to weakly convex, moderately marginate from lateral to dorsal mesosoma; promesonotal suture absent; metanotal groove present but usually weakly developed; mesosoma comparatively stout and high (LMI 41–44). Propodeum armed elongate-triangular to spinose spines (PSLI 28–31); propodeal lobes short, triangular and acute. Petiolar node in profile rounded high nodiform, approximately 1.8 times higher than long (LPeI 51–58), anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; node in dorsal view 1.2 to 1.4 times longer than wide (DPeI 120–138). Postpetiole in profile approximately rounded, weakly anteroposteriorly compressed, approximately 1.3 to 1.4 times higher than long (LPpI 71–75), in dorsal view 1.3 to 1.4 times wider than long (DPpI 131–143). Postpetiole in profile approximately as voluminous as petiolar node, in dorsal view approximately 1.4 to 1.5 times wider than petiolar node (PPI 142–152). Mandibles finely longitudinally rugulose; clypeus with distinct median longitudinal ruga and one to three weaker rugulae at each side; cephalic dorsum between frontal carinae with eight to ten moderately regularly arranged longitudinal rugae, most rugae running unbroken to posterior head margin; lateral and ventral head reticulate-rugose to longitudinally rugose, except mostly unsculptured scrobal area; ground sculpture on head faint. Mesosoma laterally and dorsally longitudinally rugose, often with cross-meshes and sometimes moderately irregular, but main direction of sculpture distinctly longitudinal. Petiolar node, postpetiole, and gaster completely unsculptured, smooth, and shining. All dorsal surfaces of body abundant, moderately long, erect pilosity. Head, mesosoma, waist segments, and gaster of uniform brown colour, mandibles, antennae, and legs yellow to very light brown.

Notes

The new species is currently only known from Andringitra. It was found in montane rainforests at high elevations of 1680 to 1990 m, and seems to live in the leaf litter stratum.

Tetramorium vohitra cannot be confused with *T. ambatovy* since the latter lacks the longitudinal sculpture typical for the group. Also, due to its long propodeal spines (PSLI 28–31), *T. vohitra* is easily separated from *T. macki* (PSLI 21–24) and *T. orc* (PSLI 19–23). As noted in the description of *T. robitika*, this species and *T. vohitra* seem fairly similar at first glance, but differ in several important characters, especially mandibular sculpture and propodeal spine length. The spines of *T. robitika* are significantly shorter (PSLI 20–22) and the mandibles are clearly sculptured while the spines of *T. vohitra* are longer (PSLI 28–31) and the mandibles are completely unsculptured. Furthermore, the high rounded petiolar node shape with antero- and posterodorsal margins at about the same height without a tapering dorsum and the longer antennal scapes (SI 71–74) seen in *T. vohitra* are not present in *T. dysalum*. In the latter species the antennal scapes are shorter (64–69) and the anterodorsal margin of the petiolar node is situated higher than the posterodorsal margin, causing the dorsum to taper markedly backwards posteriorly.

In addition, *T. mallenseana* has a postpetiole that is approximately 1.7 to 2 times wider than the petiolar node (PPI 168–200), whereas this relationship is less strongly developed in *T. vohitra* (PPI 142–152). Also, the propodeal spines of *T. mallenseana* (PSLI 38–43) are much longer than the spines of *T. vohitra* (PSLI 28–31). At first glance, *T. sargina* appears morphologically close to *T. vohitra*, but both differ in gastral pilosity since it is erect to suberect and of moderate length in *T. vohitra* versus decumbent to subdecumbent and long in *T. sargina*. The last

two species of the group, *T. steinheili* and *T. yammer*, have a more transverse petiolar node (DPel 150–172) compared to *T. vohitra* (DPel 120–139), and also differ in petiolar node shape. The node of *T. vohitra* is high rounded nodiform in profile with the anterodorsal- and posterodorsal margins at the same height, whereas the node shape in *T. steinheili* and *T. yammer* is more squamiform with the anterodorsal margin always slightly situated higher than the posterodorsal margin and the dorsum weakly tapering backwards posteriorly.

Etymology

The epithet *vohitra* is Malagasy and means "hill", "village", or "mountain". The type locality is located at an altitude of almost 2000 m, and the name of the new species takes this high altitude into account. The species epithet is a noun in apposition and thus invariant.

Material examined

MADAGASCAR: Fianarantsoa, 38 km S Ambalavao, Rés. Andringitra, 22.2 S, 46.96667 E, 1680 m, montane rainforest, 22.–24.X.1993 (*B.L. Fisher*); Fianarantsoa, Rés. Andringitra, Anjavidilava Forest, 8.5 km SE Antanitotsy, 22.16667 S, 46.96667 E, 1990 m, Philipia forest and mossy forest, upper limit of montane forest, 6.III.1997 (*B.L. Fisher*).

***Tetramorium yammer* sp. n.**

(figs 88, 89, 125, 126, 127)

Holotype worker, MADAGASCAR, Antsiranana, Parc National de Marojejy, Antranohofa, 26.6 km 31° NNE Andapa, 10.7 km 318° NW Manantenina, 14.44333 S, 49.74333 E, 1325 m, montane rainforest, sifted litter (leaf mold, rotten wood), collection code BLF9080, 18.XI.2003 (*B.L. Fisher*) (CASC: CASENT0042832). Paratypes, one worker with same data as holotype (BMNH: CASENT0042886); and 18 workers with same data as holotype except sampled ex rotten log and collection codes BLF9175 and BLF9189 (CASC: CASENT0499759, CASENT0499760, CASENT0499761, CASENT0499777, CASENT0499781; MHNG: CASENT0499778).

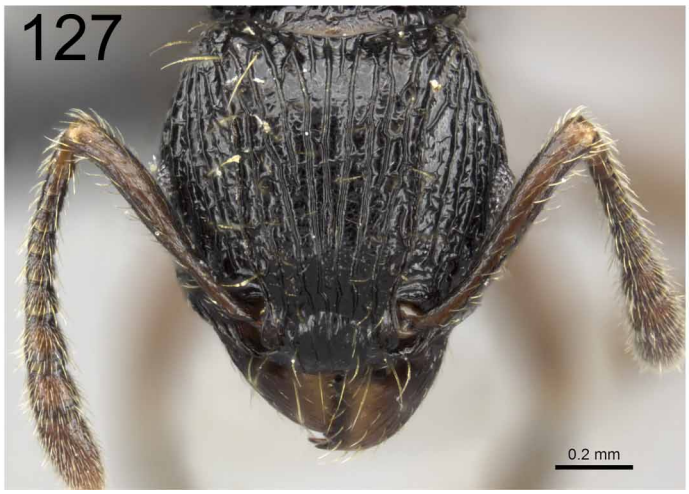
Diagnosis

Tetramorium yammer can be separated from all other group members by the following character set: short antennal scapes (SI 72–78); eyes small to moderate (OI 19–20); propodeal spines very long (PSLI 40–41); propodeal lobes very long and spinose; petiolar node squamiform with anterodorsal margin situated slightly higher than posterodorsal margin, dorsum tapering backwards posteriorly; dorsum of mesosoma with longitudinally arranged rugae; hairs on first gastral tergite erect or suberect.

Description

HL 0.88–0.94 (0.90); HW 0.89–0.95 (0.92); SL 0.67–0.74 (0.68); EL 0.17–0.19 (0.18); PH 0.46–0.52 (0.49); PW 0.66–0.72 (0.67); WL 1.16–1.30 (1.22); PSL 0.36–0.39 (0.37); PTL 0.16–0.18 (0.17); PTH 0.35–0.39 (0.37); PTW 0.27–0.31 (0.28); PPL 0.26–0.28 (0.27); PPH 0.34–0.39 (0.36); PPW 0.34–0.38 (0.35); CI 101–103 (102); SI 72–78 (74); OI 19–20 (20); DMI 51–57 (55); LMI 39–41 (40); PSLI 40–41 (41); PeNI 40–46 (42); LPeI 42–48 (46); DPeI 162–172 (166); PpNI 51–57 (53); LPpI 71–79 (75); DPpI 124–134 (130); PPI 121–130 (125) (ten measured).

Head wider than long (CI 101–103). Anterior clypeal margin with distinct median impression. Frontal carinae well-developed, usually ending at posterior head margin. Antennal scrobes narrow, shallow, and faint. Antennal scapes short, not reaching posterior head margin (SI 72–78). Eyes comparatively small (OI 19–20). Mesosomal outline in profile comparatively flat, moderately marginate from lateral to dorsal mesosoma, promesonotal suture and metanotal groove absent; mesosoma comparatively stout, high, and compact (LMI 39–41). Propodeal spines very long, spinose and acute (PSLI 40–41); propodeal lobes very long, spinose, and acute. Petiolar node in profile squamiform and anteroposteriorly compressed, approximately 2.2 to 2.3 times higher than long (LPeI 42–48), anterior and posterior faces almost parallel, anterodorsal margin situated slightly higher than posterodorsal margin, dorsum weakly tapering backwards posteriorly; node in dorsal view approximately 1.6 to 1.7 times wider than long (DPeI 162–172). Postpetiole in profile rounded, approximately 1.2 to 1.4 times higher than long (LPpI 71–79), in



FIGURES 125–127. *T. yammer*, holotype—CASENT0042832 (Estella Ortega 2011). 125. Body in profile. 126. Body in dorsal view. 127. Head in full-face view.

dorsal view 1.2 to 1.4 times wider than long (DPpI 124–134). Postpetiole in profile slightly more voluminous than petiolar node, in dorsal view approximately 1.2 to 1.3 times wider than petiolar node (PPI 121–130). Mandibles distinctly striate; clypeus with strong median longitudinal ruga and one or two weaker rugulae at each side; cephalic dorsum between frontal carinae with seven to nine longitudinal rugae, rugae running to posterior head margin, few rugae broken or with cross-meshes; lateral and ventral head with reticulate-rugose to longitudinally rugose sculpture; ground sculpture on head usually faint. Mesosoma laterally with irregular longitudinal rugae; mesosomal dorsum longitudinally rugose, rugae often meandering and with cross-meshes, still distinctly longitudinally arranged. Petiole and postpetiole almost unsculptured with few weak rugulae. Gaster unsculptured, smooth and shining. All dorsal surfaces of body with abundant, long, erect or suberect pilosity. Head, mesosoma, waist segments, and gaster very dark brown to black, appendages often of lighter colour.

Notes

Tetramorium yammer is only known from the type locality, the Parc National de Marojejy. It was collected from forest leaf litter in a montane rainforest habitat at 1325 m elevation.

Within the species group it is fairly easy to distinguish *T. yammer* from the remaining species. It differs from *T. ambatovy* in having very different sculpture on the mesosomal dorsum, and from *T. dysalum* (SI 64–69) in having distinctly longer antennal scapes (SI 72–78). The three species with short propodeal spines, *T. macki* (PSLI 21–24), *T. orc* (PSLI 19–23), and *T. robitika* (PSLI 20–22), cannot be confused with *T. yammer* with its very long and conspicuous propodeal spines (PSLI 40–41). In addition, due to its unsculptured mandibles, the moderately developed, triangular propodeal lobes, and light brown colouration, *T. vohitra* is not likely to be confused with *T. yammer* because the latter has strongly striate mandibles, very long and spinose propodeal lobes, and the colouration is of a very dark brown to black. *Tetramorium yammer* also has a more transverse petiolar node in dorsal view (DPel 162–172) compared to *T. vohitra* (DPel 120–138).

Tetramorium mallenseana is comparatively easy to discriminate from *T. yammer.* The propodeal lobes of *T. mallenseana* are very small and inconspicuous and the postpetiole is approximately 1.7 to two times wider than the petiolar node (PPI 168–200), whereas the lobes of *T. yammer* are very long and spinose and the postpetiole is only approximately 1.2 to 1.3 times wider than the petiolar node (PPI 121–130). Furthermore, *T. sargina* has decumbent to subdecumbent pilosity on the first gastral tergite, which differs significantly from the erect to suberect pilosity of *T. yammer. Tetramorium steinheili*, however, is very close to *T. yammer*, and, as mentioned in its description above, both could have been treated as one species. However, a weakly wider head (CI 101–103), distinctly smaller eyes (OI 19–20), very long propodeal spines (PSLI 40–41) together with the comparatively long and spinose propodeal lobes, and dark brown to black colour separate *T. yammer* from *T. steinheili*. The latter has a mostly longer head (CI 96–102), larger eyes (OI 21–23), and is usually of a much lighter colour. The propodeal spines (PSLI 27–44) and propodeal lobes are quite variable in this species, but the lobes are never spinose as in *T. yammer.* Some of these characters might appear weak, if considered individually, but in combination make us confident about treating them as discrete species.

Etymology

The new species is dedicated to George Zachary for his support to discover and identify life on earth, and we have named it after his company "Yammer".

Material examined

MADAGASCAR: Antsiranana, Parc National de Marojejy, Antranohofa, 26.6 km 31° NNE Andapa, 10.7 km 318° NW Manantenina, 14.44333 S, 49.74333 E, 1325 m, montane rainforest, 18.XI.2003 (*B.L. Fisher*).

Tetramorium marginatum species group

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae well developed but generally of moderate length, usually ending approximately halfway between posterior eye margin and posterior head margin; anterior face of mesosoma not well developed and no distinct anterodorsal margin present; mesosoma

moderately to strongly marginate, dorsum usually sharply separated from lateral mesosoma; mesosoma comparatively high (LMI 37–45); propodeal spines long to extremely long, and spinose; propodeal lobes triangular and short; petiolar node in profile generally triangular cuneiform or thickly cuneiform, usually strongly anteroposteriorly compressed dorsally, in profile much higher than long, anterior and posterior faces not parallel, often anterodorsal angle much better developed and situated higher than posterodorsal angle, dorsum then tapering backwards posteriorly, in dorsal view distinctly wider than long and transverse; postpetiole approximately rounded and weakly anteroposteriorly compressed; mandibular sculpture variable, but often reduced; cephalic sculpture to a large extent reduced and absent; mesosoma in most species completely unsculptured, in two species weak irregular longitudinal 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, whitish, long, fine standing hairs; never with short, dense, and appressed pilosity or pubescence; sting appendage spatulate.

Comments

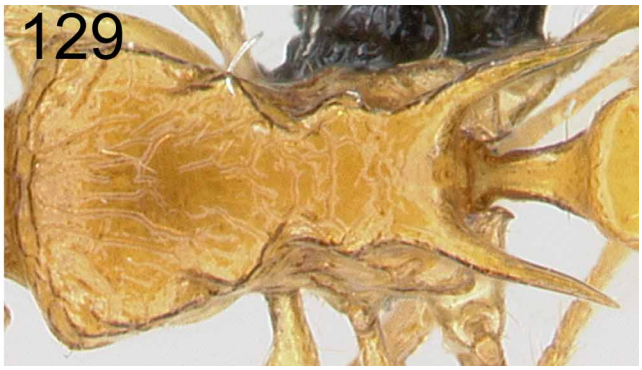
The *T. marginatum* group is endemic to the island of Madagascar, and includes six species from which only *T. marginatum* was previously described. All species live in humid forest habitats, such as tropical rainforests, littoral rainforests, and montane rainforests.

All members of the group are fairly conspicuous and easily distinguishable from all the other Malagasy *Tetramorium* with 11-segmented antennae. The very strong reduction of sculpture on head, mesosoma, and waist segments, the generally well-developed margination from lateral to dorsal mesosoma, and the generally triangular or cuneiform petiolar node distinguish this group from others in the region.

The group can be further divided into the four species with a completely unsculptured mesosoma and very dark brown to blackish colouration, *T. valky*, *T. hector*, *T. marginatum*, and *T. silvicola*, and the two species, *T. norvigi* and *T. shamshir*, which are of yellowish to pale brownish colour and display a dorsally rugulose mesosoma.

Key to the species of the *T. marginatum* group (workers)

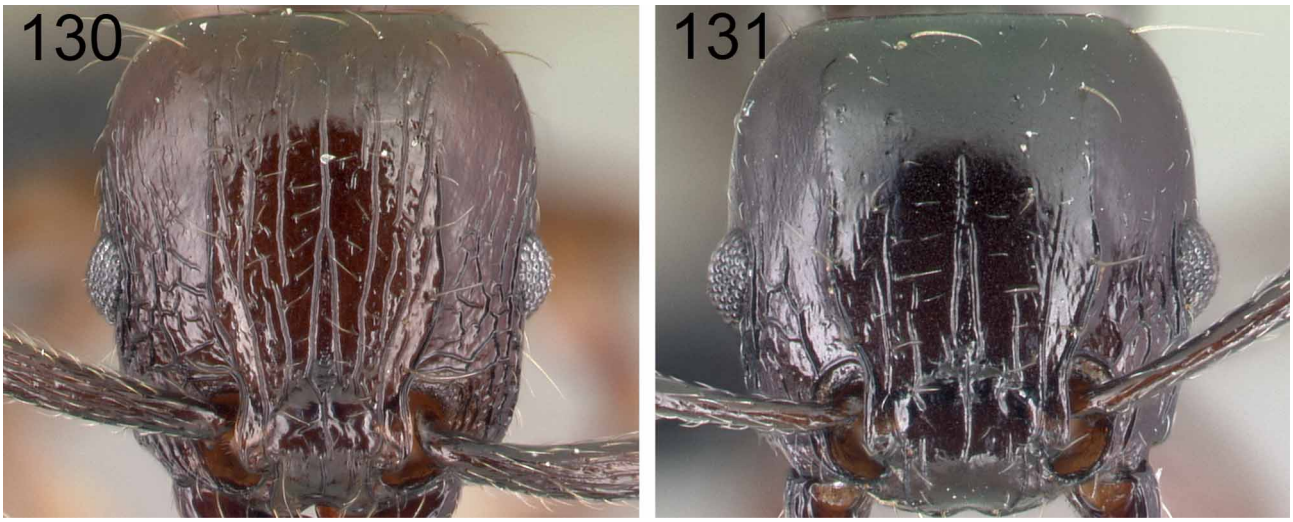
1. Mesosomal dorsum unsculptured, generally smooth and shining; body colouration usually a dark brown to black (Fig. 128). 2
- Mesosomal dorsum irregularly to longitudinally rugulose; body colouration generally yellow, rarely a pale brown (Fig. 129). 5



FIGURES 128 & 129. 128. Unsculptured, smooth, and shining mesosomal dorsum of *T. valky*—CASENT0496394 (Erin Prado 2010). **129.** Irregularly to longitudinally rugulose mesosomal dorsum of *T. shamshir*—CASENT0467696 (Erin Prado 2010).

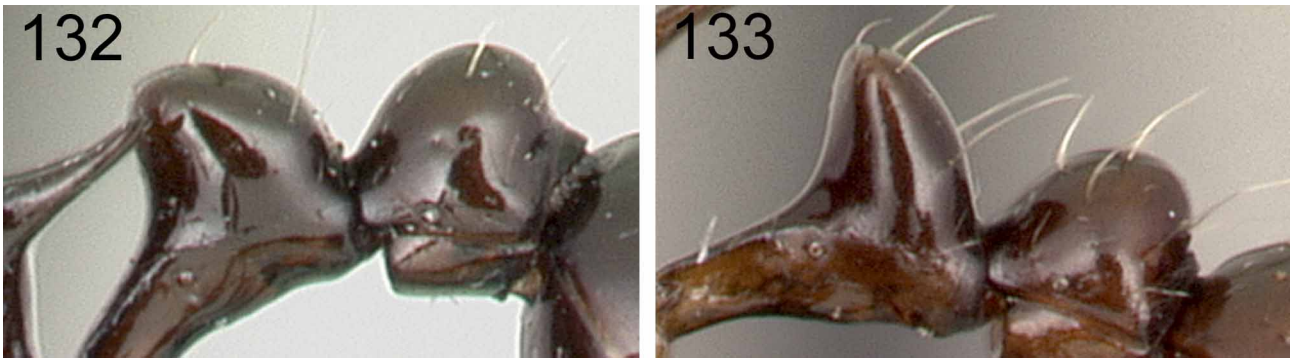
.

2. Head in frontal view distinctly much longer than wide (CI 87–90); propodeal spines long (PSLI 26–30) (Fig. 130). *T. silvicola*
- Head in frontal view longer than wide to as long as wide, much wider than above (CI 92–100); propodeal spines long to very long (PSLI 32–52) (Fig. 131). 3



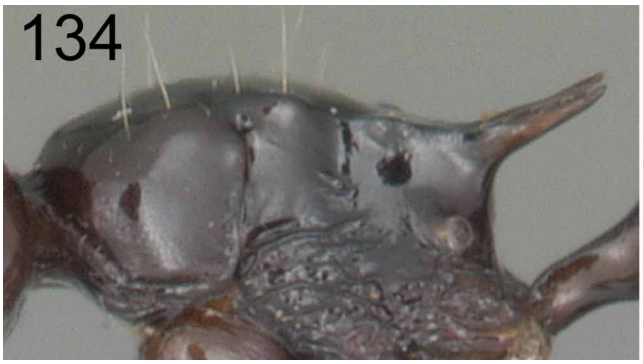
FIGURES 130 & 131. 130. Head of *T. silvicola* in frontal view distinctly much longer than wide—CASENT0042828 (Erin Prado 2010). **131.** Head of *T. hector* in frontal view moderately longer than wide—CASENT0038460 (Erin Prado 2010)

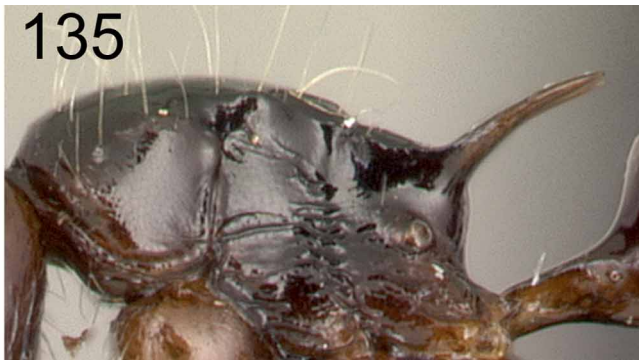
3. Petiolar node in profile thickly cuneiform and less anteroposteriorly compressed (LPeI 60–66; DPeI 134–147) (Fig. 132). . . . . *T. hector*
- Petiolar node in profile triangular cuneiform to squamiform and much more anteroposteriorly compressed than above (LPeI 16–47; DPeI 189–500) (Fig. 133). 4



FIGURES 132 & 133. 132. Petiolar node of *T. hector* in profile with a thickly cuneiform and less anteroposteriorly compressed shape—CASENT0038460 (Erin Prado 2010). **133.** Petiolar node of *T. valky* in profile with a triangular cuneiform and and much more anteroposteriorly compressed—CASENT0496394 (Erin Prado 2010).

4. Few pairs of hairs present on mesosomal dorsum, but generally restricted to dorsolateral margins of pronotum and mesonotum, rarely some hairs medially present at dorsal border between mesonotum and propodeum (Fig. 134). . . . . *T. marginatum*
- Hairs on dorsal mesosoma more abundant than above, scattered throughout whole dorsum, and not restricted to any margin (Fig. 135). . . . . *T. valky*





FIGURES 134 & 135. 134. Mesosoma of *T. marginatum* in profile with scarce pilosity, which is generally restricted to dorsolateral margins—CASENT0102398 (April Nobile 2005). **135.** Mesosoma of *T. valky* in profile with abundant pilosity, which is not restricted to any margin—CASENT0496394 (Erin Prado 2010).

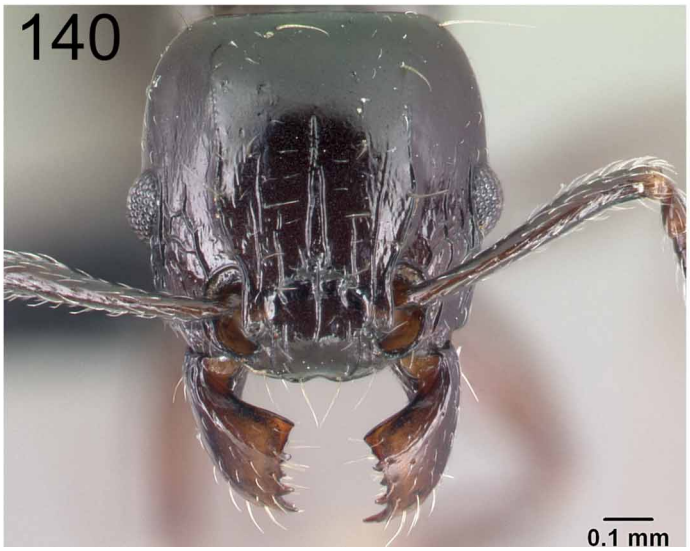
5. Propodeal spines long to extremely long and always distinctly strongly back-curved; frontal carinae moderately developed and either ending at posterior head margin or shortly before; petiolar node in profile high nodiform to weakly cuneiform, not strongly anteroposteriorly compressed dorsally (LPeI 43–53; DPeI 163–184) (Fig. 136). . . . . *T. shamshir*
- Propodeal spines generally long and usually straight-lined, rarely weakly back-curved; frontal carinae often weakly developed and ending between posterior eye margin and posterior head margin, generally closer to posterior eye margin; petiolar node in profile triangular cuneiform and strongly anteroposteriorly compressed dorsally (LPeI 26–41; DPeI 195–325) (Fig. 137). . . . . *T. norvigi*

FIGURES 136 & 137. 136. Mesosoma and waist segments of *T. shamshir* in profile, propodeal spines strongly back-curved and petiolar node high nodiform to weakly cuneiform, not strongly anteroposteriorly compressed dorsally—CASENT0467696 (Erin Prado 2010). **137.** Mesosoma and waist segments of *T. norvigi* in profile with triangular cuneiform and strongly anteroposteriorly compressed dorsally petiolar node—CASENT0489037 (Erin Prado 2010).

Tetramorium hector Hita Garcia & Fisher sp. n.

(figs 131, 132, 138, 139, 140)

Holotype worker, MADAGASCAR, Toamasina, Montagne d'Anjanaharibe, 19.5 km 27° NNE Ambinanitelo, 15.17833 S, 49.635 E, 1100 m, montane rainforest, sifted litter (leaf mold, rotten wood), collection code BLF8150, 12.–16.III.2003 (*B.L. Fisher et al.*) (CASC: CASENT0038460). Paratypes, 14 workers with same data as holotype (BMNH: CASENT0038428; CASC: CASENT0038396; CASENT0038399; CASENT0038431; CASENT0038436; CASENT0038438; CASENT0038442; CASENT0038449; CASENT0038451; CASENT0038463; CASENT0038466; MCZ: CASENT0038392; MHNG: CASENT0038455; NHMB: CASENT0038427); two workers with same data as holotype except sampled from pitfall trap and collection code BLF8154 (CASC: CASENT0048692; CASENT0048694); and nine workers with same data as holotype except sampled ex rotten stick on ground and collection code BLF8217 (CASC: CASENT0498042; CASENT0498043; CASENT0498044; CASENT0498045; CASENT0498046).



FIGURES 138–140. *T. hector*, holotype—CASENT0038460 (Erin Prado 2010). 138. Body in profile. 139. Body in dorsal view. 140. Head in full-face view.

Diagnosis

The following character combination distinguishes *T. hector* from the other species of the group: head longer than wide (CI 92–96); petiolar node in profile cuneiform, comparatively thick, and not strongly anteroposteriorly compressed dorsally; mesosomal dorsum completely unsculptured, smooth, and shiny; dark brown to black colouration.

Description

HL 0.69–0.78 (0.74); HW 0.64–0.74 (0.69); SL 0.55–0.60 (0.58); EL 0.15–0.18 (0.16); PH 0.34–0.38 (0.36); PW 0.51–0.56 (0.54); WL 0.86–0.97 (0.91); PSL 0.22–0.27 (0.25); PTL 0.18–0.21 (0.19); PTH 0.29–0.34 (0.31); PTW 0.25–0.29 (0.27); PPL 0.24–0.26 (0.25); PPH 0.29–0.36 (0.31); PPW 0.27–0.32 (0.29); CI 92–96 (94); SI 80–86 (84); OI 22–25 (24); DMI 58–62 (59); LMI 38–41 (39); PSLI 32–36 (34); PeNI 47–53 (50); LPeI 60–66 (63); DPeI 134–147 (140); PpNI 51–57 (54); LPpI 75–85 (81); DPpI 112–124 (117); PPI 100–113 (107) (12 measured).

Head longer than wide (CI 92–96). Anterior clypeal margin with median impression. Frontal carinae weakly developed, ending between posterior eye margin and posterior head margin. Antennal scrobes absent. Antennal scapes of moderate length, not reaching posterior head margin (SI 80–86). Eyes moderate to large (OI 22–25). Mesosomal outline in profile flat, strongly marginate from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent; mesosoma comparatively high, compact, and stout (LMI 38–41). Propodeal spines long, spinose, and acute (PSLI 32–36); propodeal lobes small and broadly triangular. Petiolar node in profile thickly cuneiform, approximately 1.5 to 1.7 times higher than long (LPeI 60–66), anterior and posterior faces not parallel, anterodorsal margin situated higher than posterodorsal, dorsum distinctly tapering backwards posteriorly; node in dorsal view between 1.3 to 1.5 times wider than long (DPeI 134–147). Postpetiole in profile approximately rounded and weakly anteroposteriorly compressed, approximately 1.2 to 1.3 times higher than long (LPpI 75–85), in dorsal view approximately 1.1 to 1.2 times wider than long (DPpI 112–124). Postpetiole in profile appearing slightly less voluminous than petiolar node, in dorsal view as wide as petiolar node to weakly wider (PPI 100–113). Mandibles mostly unsculptured, smooth, and shining, but usually few rugulae present; clypeus mostly unsculptured, smooth, and shining, few short rugulae or traces of rugulae present; cephalic dorsum between frontal carinae always with one well-developed longitudinal median ruga, often with one or two much shorter and weaker rugulae at each side, median ruga diverging approximately at eye level into two rugae running to posterior clypeal margin, median ruga much shorter than frontal carinae; lateral head only sculptured anteriorly, remainder and ventral head unsculptured. Ground sculpture on head faint to absent. Lateral mesosoma generally completely unsculptured, sometimes weak sculpture present posteriorly; dorsal mesosoma completely unsculptured, smooth, and shiny. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with comparatively scarce, long, erect pilosity, hairs on mesosomal dorsum not restricted to lateral margins. Body of uniform dark brown to black colour.

Notes

The new species is restricted in its distribution to Ambanizana, Ambohitsitondroina, and Anjanaharibe. All three localities are located in close proximity to each other in the northeast of Madagascar, and they represent montane rainforest or rainforest habitats at elevations of 825 to 1100 m. In addition, *T. hector* seems to live in leaf litter.

Tetramorium hector is straightforwardly recognisable within the *T. marginatum* group. It differs conspicuously from *T. norvigi* and *T. shamshir* since the latter have a sculptured mesosomal dorsum and a yellowish to brownish colouration, whereas *T. hector* has a completely unsculptured mesosomal dorsum and very dark brown to black colouration. The remaining three species, *T. valky*, *T. marginatum*, and *T. silvicola*, share the same colour and unsculptured mesosomal dorsum with *T. hector*, but are not likely to be misidentified with each other. The petiolar node shape of *T. hector* is thickly cuneiform and much thicker (LPeI 60–66; DPeI 134–147) than in the other three species (LPeI 16–47; DPeI 189–500). In addition, *T. hector* displays the strongest reduction in cephalic sculpture within the group, which contrasts with the development of this character in *T. valky*, *T. marginatum*, and *T. silvicola*.

Etymology

The new species is named after the noble and heroic Trojan prince "*Hector*" from Greek mythology mentioned in Homer's epic poem the "*Iliad*". The species epithet is a noun in apposition, and thus invariant.

Material examined

MADAGASCAR: Toamasina, Ambanizana, Parc National Masoala, 15.57167 S, 50.00611 E, 800–897 m, 26.II.–2.III.2003 (*D. Andriamalala, D. Silva, et al.*); Toamasina, Ambanizana, Parc National Masoala, 15.57167 S, 50.00611 E, 900–950 m, 26.II.–6.III.2003 (*D. Andriamalala, D. Silva, et al.*); Toamasina, Ambohitsitondroina, 6.9 km NE Ambanizana, 15.56667 S, 50 E, 825 m, rainforest, 2.–8.XII.1993 (*B.L. Fisher*); Toamasina, Montagne d'Anjanaharibe, 19.5 km 27° NNE Ambinanitelo, 15.17833 S, 49.635 E, 1100 m, montane rainforest, 12.-16.III.2003 (*B.L. Fisher et al.*).

***Tetramorium marginatum* Forel, 1895b**

(figs 134, 141, 142, 143)

Tetramorium (Xiphomyrmex) marginatum Forel, 1895b:485. Syntype workers, MADAGASCAR, Central Madagascar (*Sikora*) (MHNG: CASENT0101287, CASENT0101288) [examined].

Diagnosis

The following character combination separates *Tetramorium marginatum* from the other members of the species group: head longer than wide to almost as long as wide (CI 94–99); petiolar node in profile triangular cuneiform and strongly anteroposteriorly compressed dorsally; mesosomal dorsum usually completely unsculptured, smooth and shining, very rarely few superficial traces of rugulae present on pronotum; long standing hairs on mesosoma comparatively few and generally restricted to dorsolateral margins of pronotum and mesonotum, sometimes one or two hairs present medially at border between mesonotum and propodeum; body colouration dark brown to black.

Description

HL 0.68–0.80 (0.73); HW 0.65–0.79 (0.71); SL 0.53–0.63 (0.58); EL 0.14–0.17 (0.15); PH 0.31–0.41 (0.36); PW 0.46–0.60 (0.54); WL 0.83–1.00 (0.90); PSL 0.26–0.36 (0.31); PTL 0.09–0.16 (0.12); PTH 0.29–0.36 (0.33); PTW 0.27–0.31 (0.28); PPL 0.20–0.25 (0.23); PPH 0.28–0.33 (0.31); PPW 0.28–0.35 (0.31); CI 94–99 (97); SI 80–84 (82); OI 21–22 (22); DMI 53–62 (59); LMI 37–41 (39); PSLI 38–46 (42); PeNI 50–59 (53); LPeI 29–47 (37); DPeI 189–300 (242); PpNI 53–61 (57); LPpI 71–77 (74); DPpI 128–142 (135); PPI 104–113 (109) (15 measured).

Head longer than wide to almost as long as wide (CI 94–99). Anterior clypeal margin medially impressed. Frontal carinae weakly to moderately developed, ending between posterior eye margin and posterior head margin, usually closer to posterior eye. Antennal scrobes absent. Antennal scapes of moderate length, not reaching posterior head margin (SI 80–84). Eyes comparatively small (OI 21–22). Mesosomal outline in profile strongly convex, and margination from lateral to dorsal mesosoma strongly developed; promesonotal suture and metanotal groove absent; mesosoma comparatively high, compact, and stout (LMI 37–41). Propodeal spines very long, spinose, and acute (PSLI 38–46); propodeal lobes inconspicuous, small and broadly triangular. Petiolar node in profile triangular cuneiform, strongly anteroposteriorly compressed dorsally, approximately 2.1 to 3.5 times higher than long (LPeI 29–47), anterior and posterior faces not parallel, anterodorsal margin situated higher than posterodorsal, dorsum tapering backwards posteriorly; node in dorsal view between 1.8 to 3 times wider than long (DPeI 189–300). Postpetiole in profile approximately rounded and weakly anteroposteriorly compressed, approximately 1.3 to 1.4 times higher than long (LPpI 71–77), in dorsal view approximately 1.2 to 1.4 times wider than long (DPpI 128–142). Postpetiole in profile appearing approximately the same volume as petiolar node, in dorsal view approximately as wide as petiolar node to weakly wider (PPI 104–113). Mandibles varying from almost unsculptured, smooth, and shining to finely striate, usually mostly unsculptured with few striate areas; clypeus with one distinct median ruga and one or two weaker rugae or rugulae laterally; cephalic dorsum between frontal carinae with four to eight longitudinal rugae or rugulae, median ruga present, usually shorter or approximately of same length as frontal carinae and diverging approximately at eye level into two rugae running to posterior clypeal margin, remaining rugae or rugulae generally of same length as frontal carinae, sometimes broken or shorter; lateral and ventral head anteriorly with reticulate-rugose to rugulose sculpture, posteriorly almost unsculptured; ground sculpture on head faint to absent. Mesosoma laterally mostly unsculptured, posteroventrally reticulate-rugose to rugulose; dorsal mesosoma usually completely unsculptured, smooth, and shiny, rarely with few superficial traces of rugulae on pronotum. Waist segments and gaster unsculptured, smooth, and shiny. All

dorsal surfaces of body with comparatively scarce, long, erect pilosity, hairs on mesosomal dorsum usually restricted to lateral margins, sometimes one or two hairs present medially at border between mesonotum and propodeum. Body of uniform dark brown to black colour.

Notes

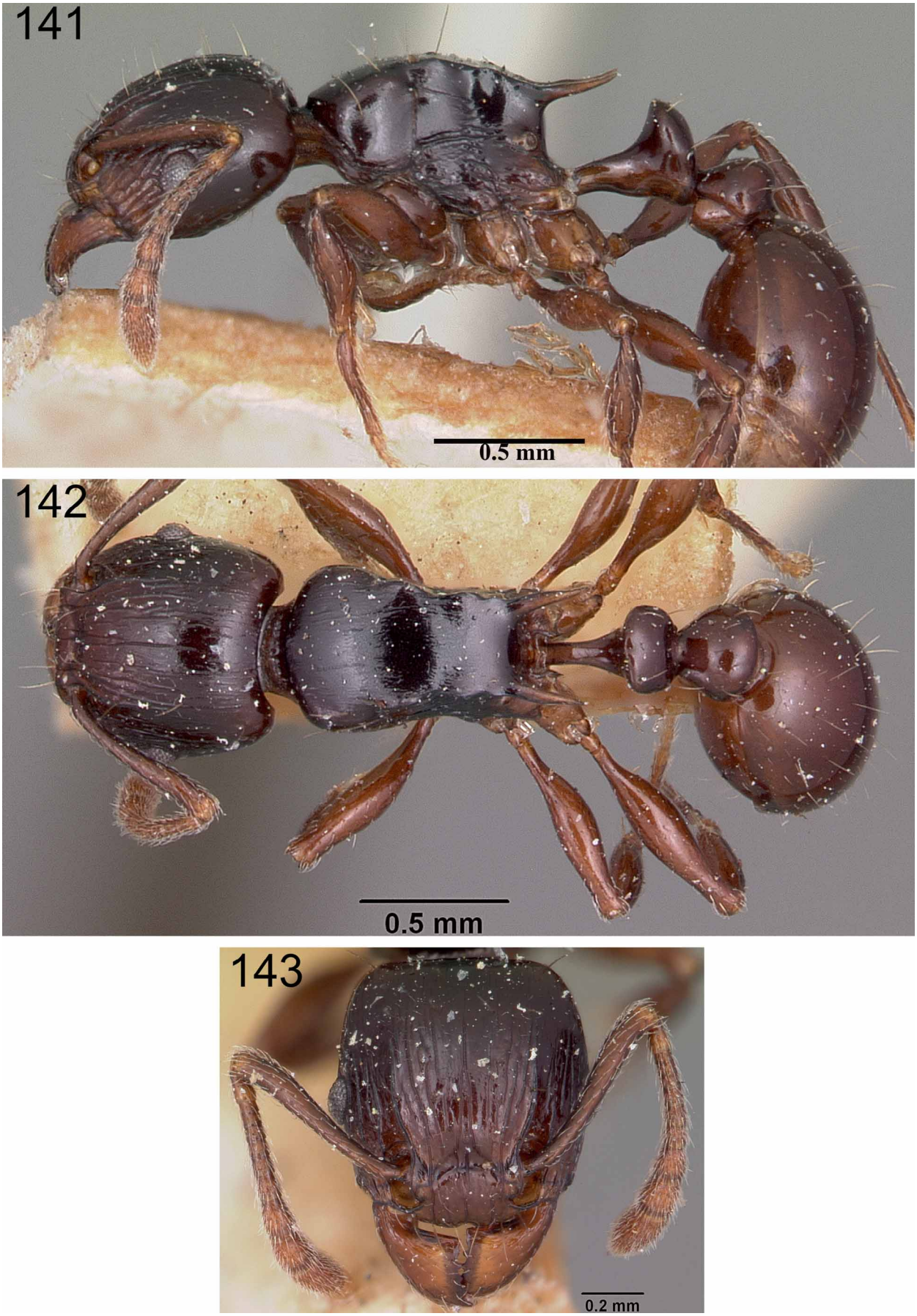
Tetramorium marginatum is distributed in eastern and northern Madagascar, although its range is somewhat disjunct. The southernmost known locality is Manombo and from there the species seems to be comparatively common through Vevembe, Ivohibe to Ranomafana. The next known region to the north, where it appears to be common, is from Andasibe, Ambatovy, and Torotorofotsy to Zahamena. Further north in eastern Madagascar it is only known from Marotandrano. Interestingly, *T. marginatum* also occurs in one locality at the northernmost tip of Madagascar, the Montagne d'Ambre. Generally, the species seems to prefer montane rainforest habitats, but can be also found in lowland rainforests, making its elevation range from 30 to 1300 m. In terms of preferred microhabitat, *T. marginatum* appears primarily to be a leaf litter inhabitant, though it was occasionally sampled from lower vegetation.

Within the species group, *T. marginatum* is relatively close to *T. valky*, whereas it can be easily separated from the other four species of the group. *Tetramorium norvigi* and *T. shamshir* both possess yellowish to light brownish colouration and very distinct rugulae on the mesosomal dorsum, whereas *T. marginatum* is of a dark brown to blackish colour and has almost no sculpture on the mesosomal dorsum. Also, *T. hector* with its much thicker petiolar node (LPeI 60–66; DPeI 134–147) is not likely to be confused with *T. marginatum* (LPeI 29–47; DPeI 189–300). *Tetramorium silvicola* has a head, which is much longer than wide (CI 88–90), and a much less pronounced margination from lateral to dorsal mesosoma, while *T. marginatum* has a much broader head (CI 94–99) and is strongly marginate from lateral to dorsal mesosoma.

Tetramorium valky and *T. marginatum*, however, both have very similar morphometric ranges, a strongly marginate mesosoma, and a similar petiolar node shape. Nevertheless, they can be easily distinguished from each other. The best character for separating the two is the mesosomal pilosity, which in *T. marginatum* is restricted to the dorsolateral margins of pronotum and mesonotum and to the middle of the dorsal border between mesonotum and propodeum, whereas in *T. valky* the hairs on the mesosomal dorsum are not restricted to any border. As mentioned in the description of *T. valky*, both differ also in petiolar node shape and mesosomal profile.

Material examined

MADAGASCAR: Central Madagascar, no additional information (*Sikora*); Antananarivo, 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, 18.47333 S, 47.96 E, 1300 m, montane rainforest, 5.-13.XII.2000 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Parc National Montagne d'Ambre [1st campsite], 12.51444 S, 49.18139 E, 960 m, rainforest, 29.I.2001 (*M.E. Irwin*); Antsiranana, Parc National Montagne d'Ambre [1st campsite], 12.51444 S, 49.18139 E, 960 m, rainforest, 12.II.–4.III.2001 (*R. Harin'Hala*); Antsiranana, Parc National Montagne d'Ambre [Petit Lac road], 12.52028 S, 49.17917 E, 1125 m, rainforest, 29.I.–11.II.2001 (*R. Harin'Hala*); Fianarantsoa, 45 km S. Ambalavao, 22.21667 S, 47.01667 E, 785 m, rainforest, 24.IX.1993 (*B.L. Fisher*); Fianarantsoa, 45 km S. Ambalavao, 22.21667 S, 47.01667 E, 785 m, rainforest, 1.X.1993 (*B.L. Fisher*); Fianarantsoa, 43 km S Ambalavao, Rés. Andringitra, 22.23333 S, 47 E, 825 m, rainforest, 4.–5.X.1993 (*B.L. Fisher*); Fianarantsoa, P.N. Ranomafana, Tolongoina-Ampasimpotsy 1/2, 21.47993 S, 47.55707 E, 577 m, stomach contents of *Mantella bernhardi*, 11.IV.2003 (*V.C. Clark*); Fianarantsoa, Parc National de Ranomafana, Vatoharanana River, 4.1 km 231° SW Ranomafana, 21.29 S, 47.43333 E, 1100 m, montane rainforest, 27.–31.III.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, R.S. Ivohibe, 7.5 km ENE Ivohibe, 22.47 S, 46.96 E, 900 m, rainforest, 7.–12.X.1997 (*B.L. Fisher*); Fianarantsoa, Ranomafana, 21.25 S, 47.36667 E, 1.III.1994 (*A. Pauly*); Fianarantsoa, Ranomafana National Park, JIRAMA water works near river, 21.2485 S, 47.45217 E, 690 m, open area near stream, 6.–15.XII.2001 (*R. Harin'Hala*); Fianarantsoa, 7 km W. of Ranomafana, montane rainforest, 900–1000 m, 20.I.1990 (*W.E. Steiner*); Fianarantsoa, 7 km W. Ranomafana National Park, montane rainforest, 900–1000 m, 17.II.–1.III.1990 (*W.E. Steiner*); Fianarantsoa, Ranomafana National Park, 950–1100 m, rainforest, 11.V.1991 (*L. Bartolozzi, S. Tiati, C. Raharimina*); Fianarantsoa, Ranomafana National Park, Vatoloaka Forest, 1150 m, 24.IX.1992 (*E. Rajariarison*); Fianarantsoa, Ranomafana National Park, montane rainforest, 700 m, 1.X.1992 (*E. Rajariarison*); Fianarantsoa, Ranomafana National Park, Ambodiamontana Forest, 800 m, 7.XI.1992 (*E. Rajariarison*); Mahajanga, Réserve Spéciale Marotandrano, Marotandrano 48.3 km S Mandritsara, 16.28322 S,



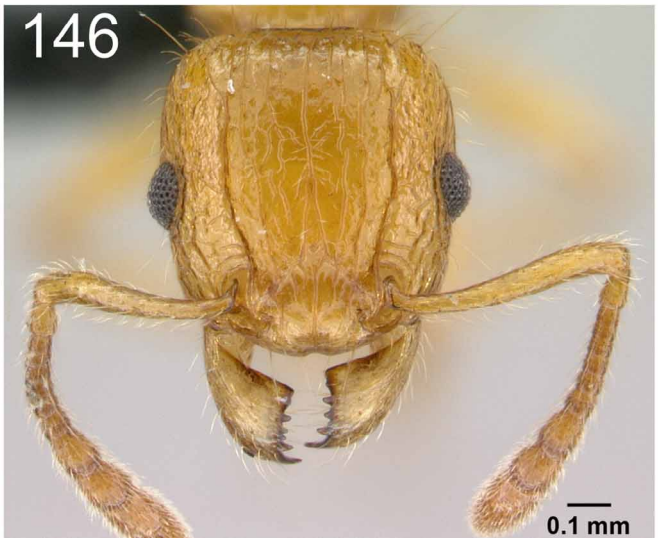
FIGURES 141–143. *T. marginatum*, syntype—CASENT0101287 (April Nobile 2005). 141. Body in profile. 142. Body in dorsal view. 143. Head in full-face view.

48.81443 E, 865 m, transition humid forest, 6.–8.XII.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.84963 S, 48.2947 E, 1010 m, montane rainforest, 3.–6.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.83937 S, 48.30842 E, 1080 m, montane rainforest, 4.–7.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.84773 S, 48.29568 E, 1000 m, montane rainforest, 5.–8.III.2007 (*B.L. Fisher et al.*); Toamasina, Ambatovy, 12.4 km NE Moramanga, 18.85813 S, 48.28488 E, 1040 m, montane rainforest, 5.–8.III.2007 (*B.L. Fisher et al.*); Toamasina, Analamay, 18.80623 S, 48.33707 E, 1068 m, montane rainforest, 21.III.2004 (*B.L. Fisher et al.*); Toamasina, Andasibe National Park, botanic garden near entrance, 18.92639 S, 48.40783 E, 1025 m, tropical forest, 19.–26.IX.2001 (*M.E. Irwin & R. Harin'Hala*); Toamasina, 6 km ESE Andasibe (=Perinet), 18° 57' S, 48° 28' E, 900 m, rainforest, 17.XI.1990 (*P.S. Ward*); Toamasina, 2 km SSE Andasibe (=Perinet), 18° 56' S, 48° 25' E, 930 m, rainforest, 11.XII.1990 (*P.S. Ward*); Toamasina, Beforona, 500 m, 1.IX.1974 (*A. Peyrieras*); Toamasina, F.C. Andriantantely, 18.695 S, 48.81333 E, 530 m, rainforest, 4.–10.XII.1998 (*H.J. Ratsirarson*); Toamasina, F.C. Didy, 18.19833 S, 48.57833 E, 960 m, rainforest, 16.–23.XII.1998 (*H.J. Ratsirarson*); Toamasina, Forêt Ambatovy, 14.3 km 57° Moramanga, 18.85083 S, 48.32 E, 1075 m, montane rainforest, 21.III.2004 (*B.L. Fisher et al.*); Toamasina, Forêt de Vevembe, 66.6 km 293° Farafangana, 22.791 S, 47.18183 E, 600 m, rainforest, transition to montane forest, 23.IV.2006 (*B.L. Fisher et al.*); Toamasina, 16 km S Moramanga, 19° 05' S, 48° 14' E, 950 m, rainforest, 18.XI.1990 (*P.S. Ward*); Toamasina, Parc National d´ Andasibe–Mantadia, Forêt de Mantadia, 25.7 km 248° Moramanga, 18.81402 S, 48.43028 E, 1040 m, rainforest, 7.XII.2005 (*F.N. Raharimalala & B. Blaimer*); Toamasina, P.N. Mantadia, 18.79167 S, 48.42667 E, 895 m, rainforest, 25.XI.–1.XII.1998 (*H.J. Ratsirarson*); Toamasina, Parc National de Zahamena, Onibe River, 17.75908 S, 48.85468 E, 780 m, rainforest, 21.–23.II.2009 (*B.L. Fisher et al.*); Toamasina, Parc National de Zahamena, Tetezambatana forest, near junction of Nosivola and Manakambahiny Rivers, 17.74298 S, 48.72936 E, 860 m, rainforest, 18.–19.II.2009 (*B.L. Fisher et al.*); Toamasina, Réserve Speciale Manombo 24.5 km 228° Farafangana, 23.01583 S, 47.719 E, 30 m, rainforest, 20.IV.2006 (*B.L. Fisher et al.*); Toamasina, Station forestière Analamazaotra, Analamazaotra 1.3 km S Andasibe, 18.38466 S, 48.41271 E, 980 m, 11.–13.XII.2007 (*B.L. Fisher et al.*); Toamasina, Torotorofotsy, 18.87082 S, 48.34737 E, 1070 m, montane rainforest, marsh edge, 24.–29.III.2004 (*B.L. Fisher et al.*).

Tetramorium norvigi **Hita Garcia & Fisher sp. n.**
(figs 137, 144, 145, 146)

Holotype worker, MADAGASCAR, Toamasina, Montagne d'Anjanaharibe, 19.5 km 27° NNE Ambinanitelo, 15.17833 S, 49.635 E, 1100 m, montane rainforest, beating low vegetation, collection code BLF8151, 12.–16.III.2003 (*B.L. Fisher, C. Griswold et al.*) (CASENT0489037). Paratypes, 12 workers with same data as holotype (BMNH: CASENT0489101; CASC: CASENT0488986; CASENT0489031; CASENT0489038; CASENT0489041; CASENT0489084; CASENT0489098; CASENT0489103; CASENT0489171; CASENT0489191; CASENT0489198; MHNG: CASENT0489227); one worker with same data as holotype except sampled from sifted litter and collection code BLF8150 (CASC: CASENT0038391); one worker with same data as holotype except sampled from rotten log and collection code BLF8211(NHMB: CASENT0497974); one worker with same data as holotype except sampled from pitfall trap and collection code BLF8153 (MCZ: CASENT0048693); one worker with same data as holotype except sampled from yellow pan trap and collection code BLF8154 (CASC: CASENT0048741); nine workers with same data as holotype except sampled from dead branch above ground and collection code BLF8247 (CASC: CASENT0497948; CASENT0497949; CASENT0497950).

Diagnosis
Tetramorium norvigi is easily separable from the other species group members by the following character combination: propodeal spines long to very long, and usually straight-lined (PSLI 37–43); petiolar node triangular cuneiform and strongly anteroposteriorly compressed dorsally (LPeI 26–41; DPeI 195–325); mesosomal dorsum always with distinct irregular to longitudinal rugulae; body colouration usually yellow, in southern populations light brown.



FIGURES 144–146. *T. norvigi*, holotype—CASENT0489037 (Erin Prado 2010). 144. Body in profile. 145. Body in dorsal view. 146. Head in full-face view.

Description

HL 0.60–0.73 (0.68); HW 0.55–0.68 (0.62); SL 0.45–0.57 (0.51); EL 0.15–0.17 (0.16); PH 0.29–0.37 (0.34); PW 0.43–0.56 (0.49); WL 0.71–0.90 (0.82); PSL 0.22–0.31 (0.27); PTL 0.07–0.11 (0.09); PTH 0.25–0.30 (0.27); PTW 0.19–0.28 (0.24); PPL 0.19–0.23 (0.22); PPH 0.22–0.29 (0.26); PPW 0.22–0.30 (0.27); CI 90–94 (91); SI 80–84 (82); OI 24–26 (25); DMI 57–64 (60); LMI 40–44 (42); PSLI 37–43 (40); PeNI 43–57 (49); LPeI 26–41 (35); DPeI 195–325 (262); PpNI 50–60 (54); LPpI 78–87 (82); DPpI 116–130 (123); PPI 98–123 (112) (16 measured).

Head longer than wide (CI 90–94). Anterior clypeal margin medially impressed. Frontal carinae moderately developed, ending between posterior eye margin and posterior head margin, usually fading out shortly after to posterior eye margin. Antennal scrobes absent. Antennal scapes of moderate length, not reaching posterior head margin (SI 80–84). Eyes moderate to large (OI 24–26). Mesosomal outline in profile flat to weakly convex, strongly marginate from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent; mesosoma comparatively high, compact, and stout (LMI 40–44). Propodeal spines very long, spinose, and acute (PSLI 37–43), usually thin and straight-lined, rarely weakly back-curved; propodeal lobes inconspicuous, small, and triangular. Petiolar node in profile triangular cuneiform, strongly anteroposteriorly compressed dorsally, between 2.4 to 3.9 times higher than long (LPeI 26–41), anterior and posterior faces not parallel, node in dorsal view strongly transverse and between 1.9 to 3.3 times wider than long (DPeI 195–325). Postpetiole in profile approximately rounded and weakly anteroposteriorly compressed, approximately 1.1 to 1.3 times higher than long (LPpI 78–87), in dorsal view between 1.1 to 1.3 times wider than long (DPpI 116–130). Postpetiole in profile appearing more voluminous than petiolar node, in dorsal view approximately as wide as petiolar node to weakly wider (PPI 98–123). Mandibles generally mostly unsculptured, smooth, and shining, sometimes weak rugulae present, less commonly fully striate; clypeus always with distinct median longitudinal ruga and one or two weaker and shorter rugulae laterally; cephalic dorsum between frontal carinae with four to eight longitudinal rugulae, rugulae ending at or close to posterior head margin, median ruga distinct and diverging approximately at eye level into two rugulae running to posterior clypeal margin, rugulae between median rugula and frontal carinae often interrupted or shorter; lateral and ventral head mostly reticulate-rugose to longitudinally rugose, sometimes weakly developed, especially posteriorly. Ground sculpture on head usually moderately developed, sometimes faint. Mesosoma laterally mostly unsculptured, only sculpture present posteroventrally; dorsal mesosoma with irregular, longitudinal rugulae, sometimes with stronger, longitudinal rugae (in southern populations). Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, long, erect, fine pilosity, hairs on mesosomal dorsum not restricted to lateral margins. Body usually of uniform yellowish colour, in southern populations light brown.

Notes

Tetramorium norvigi is another species only found in the rainforests or montane rainforests of eastern Madagascar. The known distribution range starts at Manombo, Vevembe, and Ivohibe, and extends north to Betaolana, Anjanaharibe, and Marojejy. The available collection data indicates that *T. norvigi* lives in leaf litter, lower vegetation, or on the ground, and is found at elevations from 30 to 1200 m.

Within the examined material of *T. norvigi* there is some variation that merits discussion. Generally, the specimens from the southern localities Manombo, Vevembe, Ivohibe, through Vatovavy and Ranomafana, up to Mantadia are of brownish colour, possess a more strongly sculptured mesosomal dorsum, and have a less transverse petiolar node (DPeI 195–267). The specimens from Andriantantely, Ambatovaky, up to the northern localities Anjanaharibe, Betaolana, and Marojejy are usually yellow, have less sculpture on the mesosomal dorsum, and a more transverse petiolar node (DPeI 280–325). However, there is a gradual overlap in colouration and mesosomal sculpture at the centre of the distribution range, which leads us to treat all the material as one moderately variable species. It is still possible that there are two distinct species involved, but more material, especially from the southern and central localities of the distribution range, is necessary to support this hypothesis.

Tetramorium norvigi differs strikingly from the group members with a completely unsculptured mesosomal dorsum and dark brown to black colour: *T. valky, T. hector, T. marginatum*, and *T. silvicola*. The last species of the group, *T. shamshir*, is superficially morphologically close to *T. norvigi* but the two can be separated clearly from each other. The propodeal spines are always extremely long, very thick, and strongly back-curved in *T. shamshir* (PSLI 50–63), whereas they are long, but relatively shorter and thinner in *T. norvigi* (PSLI 37–43), and, if back-curved, they are only weakly so (as in the holotype of *T. norvigi*). Furthermore, the petiolar node in lateral view is

usually thickly cuneiform without being strongly anteroposteriorly compressed dorsally in *T. shamshir* versus triangular cuneiform and strongly anteroposteriorly compressed dorsally in *T. norvigi*. The postpetiolar shape also varies in both species, being relatively higher and stronger anteroposteriorly compressed in *T. shamshir* (LPpI 64–73; DPpI 125–150) but more rounded and less anteroposteriorly compressed in *T. norvigi* (LPpI 78–87; DPpI 116–130). Also, the distribution ranges of both species overlap and they occur in sympatry in the area around Anjanaharibe to Marojejy, but both species retain their characteristic diagnostic features and can be discriminated easily from each other.

Etymology

The new species is named in honor of Peter and Kris Norvig for their support to discover and identify life on earth.

Material examined

MADAGASCAR: Amparihibe, II.–III.2003 (*K.A. Jackson & D. Carpenter*); Antsiranana, 6.5 km SSW Befingotra, Rés. Anjanaharibe-Sud, 14.75 S, 49.5 E, 875 m, rainforest, 26.X.1994 (*B.L. Fisher*); Antsiranana, 6.5 km SSW Befingotra, Rés. Anjanaharibe-Sud, 14.75 S, 49.5 E, 1000 m, rainforest, 29.X.1994 (*B.L. Fisher*); Antsiranana, 9.2 km WSW Befingotra, Rés. Anjanaharibe-Sud, 14.75 S, 49.46667 E, 1200 m, montane rainforest, 9.XI.1994 (*B.L. Fisher*); Antsiranana, Betaolana Forest, along Bekona River, 14.52996 S, 49.44039 E, 880 m, rainforest, 4.III.2009 (*B.L. Fisher et al.*); Antsiranana, Parc National de Marojejy, Manantenina River, 27.6 km 35° NE Andapa, 9.6 km 327° NNW Manantenina, 14.435 S, 49.76 E, 775 m, rainforest, 17.XI.2003 (*B.L. Fisher*); Fianarantsoa, Belle Vue trail, Ranomafana National Park, 21.2665 S, 47.42017 E, 1020 m, mixed tropical forest, 14.–21.I.2002 (*R. Harin'Hala*); Fianarantsoa, Forêt de Vevembe, 66.6 km 293° Farafangana, 22.791 S, 47.18183 E, 600 m, rainforest, transition to montane forest, 23.IV.2004 (*B.L. Fisher et al.*); Fianarantsoa, 7.6 km 122º Kianjavato, Forêt Classée Vatovavy, 21.4 S, 47.94 E, 175 m, rainforest, 6.–8.VI.2005 (*B.L. Fisher et al.*); Fianarantsoa, Parc National de Ranomafana, Vatoharanana River, 4.1 km 231° SW Ranomafana, 21.29 S, 47.43333 E, 1100 m, montane rainforest, 27.–31.III.2003 (*B.L. Fisher, C. Griswold et al.*); Fianarantsoa, 7 km W. Ranomafana National Park, montane rainforest, 900 m, 17.–23.II.1990 (*W.E. Steiner*); Fianarantsoa, 7 km W. of Ranomafana, montane rainforest, 900–1000 m, 20.I.1990 (*W.E. Steiner*); Fianarantsoa, Ranomafana National Park, Miaranony Village, 700 m, 20.II.1991 (*A. Kingman*); Fianarantsoa, R.S. Ivohibe, 7.5 km ENE Ivohibe, 22.47 S, 46.96 E, 900 m, rainforest, 7.–12.X.1997 (*B.L. Fisher*); Fianarantsoa, Réserve Speciale Manombo 24.5 km 228° Farafangana, 23.01583 S, 47.719 E, 30 m, rainforest, 20.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Vatoharanana, 21.28955 S, 47.4304 E, 1100 m, stomach contents of *Mantella baroni*, 30.III.2003 (*V.C. Clark*); Toamasina, F.C. Andriantantely, 18.695 S, 48.81333 E, 530 m, rainforest, 4.–7.XII.1998 (*H.J. Ratsirarson*); Toamasina, P.N. Mantadia, 18.79167 S, 48.42667 E, 895 m, rainforest, 25.XI.–1.XII.1998 (*H.J. Ratsirarson*); Toamasina, Montagne d'Anjanaharibe, 18.0 km 21° NNE Ambinanitelo, 15.18833 S, 49.615 E, 470 m, rainforest, 8.–12.III.2003 (*B.L. Fisher, C. Griswold et al.*); Toamasina, Montagne d'Anjanaharibe, 19.5 km 27° NNE Ambinanitelo, 15.17833 S, 49.635 E, 1100 m, montane rainforest, 12.–16.III.2003 (*B.L. Fisher, C. Griswold et al.*); Toamasina, Perinet, 27.IV.–3.V.1983 (*J.S. Noyes & M.C. Day*); Toamasina, Réserve Nationale Intégrale Betampona, Betampona 35.1 km NW Toamasina, 17.91801 S, 49.20074 E, 500 m, rainforest, 16.XI.2007 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.76912 S, 49.26704 E, 475 m, rainforest, 21.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.7702 S, 49.26638 E, 475 m, rainforest, 23.II.2010 (*B.L. Fisher et al.*).

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

(figs 129, 136, 147, 148, 149)

Holotype worker, MADAGASCAR, Antsiranana, Nosy Be, Réserve Naturelle Intégrale de Lokobe, 6.3 km 112° ESE Hellville, 13.41933 S, 48.33117 E, 30 m, rainforest, sifted litter, collection code BLF3422, 19.–24.III.2001 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT04676969). Paratypes, 32 workers with same data as holotype (BMNH: CASENT0466635; CASENT0466788; CASC: CASENT0466638; CASENT0466639; CASENT0466641; CASENT0466645; CASENT0466651; CASENT0466682; CASENT0466683; CASENT0466693; CASENT0466694; CASENT0466700; CASENT0466703; CASENT0466713;

CASENT0466741; CASENT0466789; CASENT0466843; CASENT0466874; CASENT0466986; CASENT0466989; CASENT0467027; CASENT0467031; CASENT0467037; CASENT0467055; CASENT0467082; CASENT0467087; CASENT0467093; CASENT0467111; CASENT0467698; MCZ: CASENT0466729; MHNG: CASENT0467056; NHMB: CASENT0466785).

Diagnosis

Tetramorium shamshir is easily recognised within its species group by the following character combination: propodeal spines long to extremely long (PSLI 50–63) and always distinctly curving back; petiolar node thickly cuneiform without being strongly anteroposteriorly compressed dorsally (LPeI 43–53; DPeI 163–184); mesosomal dorsum always with distinct irregular to longitudinal rugulae; body colouration yellow.

Description

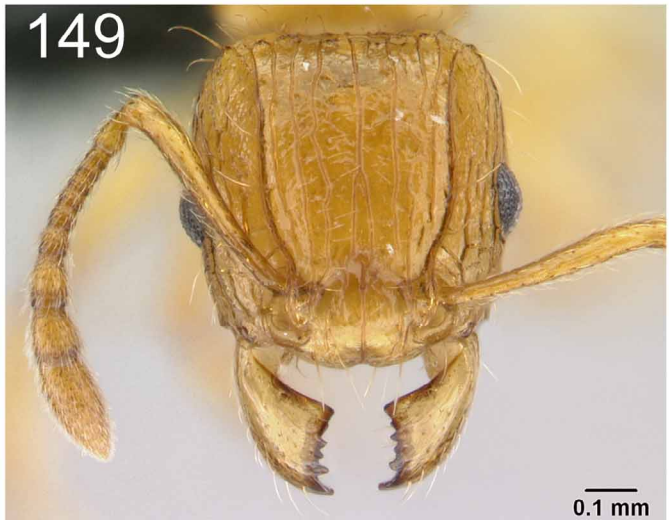
HL 0.61–0.75 (0.68); HW 0.56–0.73 (0.65); SL 0.44–0.57 (0.50); EL 0.14–0.17 (0.15); PH 0.30–0.40 (0.36); PW 0.46–0.58 (0.51); WL 0.74–0.94 (0.84); PSL 0.31–0.41 (0.37); PTL 0.12–0.18 (0.15); PTH 0.28–0.35 (0.31); PTW 0.22–0.30 (0.26); PPL 0.19–0.25 (0.21); PPH 0.28–0.35 (0.31); PPW 0.25–0.35 (0.30); CI 93–97 (95); SI 75–82 (82); OI 22–24 (23); DMI 56–68 (60); LMI 40–45 (43); PSLI 50–63 (54); PeNI 48–59 (52); LPeI 43–53 (48); DPeI 163–184 (176); PpNI 54–63 (58); LPpI 64–73 (69); DPpI 125–150 (140); PPI 107–122 (112) (15 measured).

Head longer than wide (CI 93–97). Anterior clypeal margin with median impression. Frontal carinae well-developed, ending close to posterior head margin. Antennal scrobes faint and shallow. Antennal scapes short, not reaching posterior head margin (SI 75–82). Eyes of moderate size (OI 22–24). Mesosomal outline in profile flat to weakly convex, strongly marginate from lateral to dorsal mesosoma; promesonotal suture and metanotal groove absent; mesosoma comparatively high, compact, and stout (LMI 40–45). Propodeal spines extremely long, spinose, acute, thick, and always distinctly back-curved (PSLI 50–63); propodeal lobes inconspicuous, very small, and triangular. Petiolar node in profile thickly cuneiform, weakly anteroposteriorly compressed dorsally, rarely node triangular cuneiform and strongly anteroposteriorly compressed dorsally, approximately 1.9 to 2.3 times higher than long (LPeI 43–53), anterior and posterior faces not parallel, anterodorsal margin situated higher than posterodorsal, dorsum moderately tapering backwards posteriorly; node in dorsal view between 1.6 to 1.9 times wider than long (DPeI 163–184). Postpetiole in profile approximately rounded and weakly anteroposteriorly compressed, approximately 1.3 to 1.6 times higher than long (LPpI 64–73), in dorsal view approximately 1.2 to 1.5 times wider than long (DPpI 125–150). Postpetiole in profile less voluminous than petiolar node, in dorsal view approximately 1.1 to 1.2 times wider than petiolar node (PPI 107–122). Mandibles variable, mostly unsculptured, smooth, and shining, often with partly, weak, fine striation, sometimes fully striate; clypeus with one distinct median ruga and one to two weaker and usually shorter rugulae or traces of rugulae laterally; cephalic dorsum between frontal carinae with six to eight longitudinal rugae, rugae mostly unbroken and ending close to posterior head margin, always with one well-developed longitudinal median ruga, median ruga diverging approximately at eye level into two rugae running to posterior clypeal margin, median ruga much shorter than frontal carinae; lateral and ventral head mainly sculptured anteriorly. Ground sculpture on head faint to absent. Mesosoma laterally mostly unsculptured, only sculpture present posteroventrally; dorsal mesosoma with irregular to longitudinal rugulae. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body usually with abundant, long, fine, and erect pilosity, hairs on mesosomal dorsum not restricted to lateral margins. Body of uniform yellow colour.

Notes

This new species is limited in distribution to the northern part of Madagascar. In the northeast, it occurs from Tampolo, Ambanizana, and Nosy Mangabe north to Montagne d'Ambre. To the northwest, it is less common since it is only found in Ampasindava, Manongarivo, and Nosy Be. *Tetramorium shamshir* is usually encountered in lowland rainforests and littoral rainforests, but rarely in montane or tropical dry forests, which is reflected in its altitudinal range from 5 to 1175 m with an average of 250 m. Furthermore, it seems to be a leaf litter species that is also found in lower vegetation.

Within the *T. marginatum* group, *T. shamshir* cannot be mistaken for *T. valky*, *T. hector*, *T. marginatum*, or *T. silvicola* since the latter four have an unsculptured mesosomal dorsum and are dark brown to black in colour. *Tetramorium norvigi*, however, shares the yellowish colouration and sculptured mesosomal dorsum of *T. shamshir*,



FIGURES 147–149. *T. shamshir*, holotype—CASENT0467696 (Erin Prado 2010). 147. Body in profile. 148. Body in dorsal view. 149. Head in full-face view.

and both are comparatively close in general habitus. Nevertheless, *T. shamshir* should not be confused with *T. norvigi* since they differ significantly in the shape of the propodeal spines and petiolar node. In *T. shamshir* the spines are always extremely long, very thick, and strongly back-curved (PSLI 50–63), which contrasts with the long, but relatively shorter and thinner spines of *T. norvigi* (PSLI 37–43). If the spines of the latter are back-curved, they are only weakly so. The petiolar node shape provides further separation since it is thickly cuneiform without being strongly anteroposteriorly compressed dorsally in *T. shamshir* (LPeI 43–53; DPeI 163–184) while it is triangular cuneiform and strongly anteroposteriorly compressed dorsally in *T. norvigi* (LPeI 26–41; DPeI 195–325). In addition, the species also differ in the shape of the postpetiole, which is relatively higher and more strongly anteroposteriorly compressed in *T. shamshir* (LPpI 64–73; DPpI 125–150) versus more rounded and less anteroposteriorly compressed in *T. norvigi* (LPpI 78–87; DPpI 116–130).

As already mentioned in the description of *T. norvigi*, both species occur in sympatry in the region around Anjanaharibe to Marojejy. Nevertheless, the samples from these localities can be discriminated clearly and assigned to either *T. norvigi* or *T. shamshir* on the basis of the abovementioned characters. However, several specimens of *T. shamshir* display a triangular cuneiform and dorsally strongly anteroposteriorly compressed petiolar node in some localities north of Marojejy, and could be mistaken for *T. norvigi*. Still, the propodeal spines are distinctly back-curved and comparatively thick, which is not common in *T. norvigi*; in addition, the latter species does not occur north of Marojejy, making the identification of *T. shamshir* always straightforward.

Etymology

The species epithet *shamshir* is derived from "sabre" in Old Persian, and refers to the sabre-like shape of the propodeal spines of the new species. The species epithet is a noun in apposition and thus invariant.

Material examined

MADAGASCAR: Antsiranana, Ambondrobe, 41.1 km 175° Vohemar, 13.71533 S, 50.10167 E, 10 m, littoral rainforest, 29.XI.–1.XII.2004 (*B.L. Fisher*); Antsiranana, Forêt Ambanitaza, 26.1 km 347° Antalaha, 14.67933 S, 50.18367 E, 240 m, rainforest, 27.XI.2004 (*B.L. Fisher*); Antsiranana, Ampasindava, Forêt d'Ambilanivy, 3.9 km 181° S Ambaliha, 13.79861 S, 48.16167 E, 600 m, rainforest, 4.–9.III.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Res. Ankarana 7 km SE Matsaborimanga, 12° 54' S, 49° 07' E, 150 m, rainforest, 29.XI.1990 (*P.S. Ward*); Antsiranana, Forêt d'Ampondrabe, 26.3 km 10° NNE Daraina, 12.97 S, 49.7 E, 175 m, tropical dry forest, 11.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt d'Analabe, 30.0 km 72° ENE Daraina, 13.08333 S, 49.90833 E, 30 m, littoral rainforest, 27.XI.2003 (*B.L. Fisher*); Antsiranana, Forêt de Binara, 7.5 km 230° SW Daraina, 13.255 S, 49.61667 E, 375 m, tropical dry forest, 1.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt de Binara, 9.1 km 233° SW Daraina, 13.26333 S, 49.60333 E, 650–800 m, rainforest, 4.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt de Binara, 9.1 km 233° SW Daraina, 13.26333 S, 49.60333 E, 800 m, rainforest, 20.XI.2004 (*B.L. Fisher*); Antsiranana, Forêt de Binara, 9.4 km 235° SW Daraina, 13.26333 S, 49.6 E, 1100 m, montane rainforest, 5.XII.2003 (*B.L. Fisher*); Antsiranana, Forêt de Bekaraoka, 6.8 km 60° ENE Daraina, 13.16667 S, 49.71 E, 150 m, tropical dry forest, 7.XII.2003 (*B.L. Fisher*); Antsiranana, Nosy Be, Réserve Naturelle Intégrale de Lokobe, 6.3 km 112° ESE Hellville, 13.41933 S, 48.33117 E, 30 m, rainforest, 19.–24.III.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Parc National de Marojejy, Manantenina River, 28.0 km 38° NE Andapa, 8.2 km 333° NNW Manantenina, 14.43667 S, 49.775 E, 450 m, rainforest, 12.–15.III.2003 (*B.L. Fisher et al.*); Antsiranana, Parc National Montagne d'Ambre, 3.6 km 235° SW Joffreville, 12.53444 S, 49.1795 E, 925 m, montane rainforest, 20.–26.I.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Réserve Spéciale d'Ambre, 3.5 km 235° SW Sakaramy, 12.46889 S, 49.24217 E, tropical dry forest edge, 325 m, 26.–31.I.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, R.S. Manongarivo, 12.8 km 228° SW Antanambao, 13.97667 S, 48.42333 E, rainforest, 780 m, 11.X.1998 (*B.L. Fisher*); Antsiranana, R.S. Manongarivo, 14.5 km 220° SW Antanambao, 13.99833 S, 48.42833 E, montane rainforest, 1175 m, 20.X.1998 (*B.L. Fisher*); Antsiranana, R.S. Manongarivo, 10.8 km 229° SW Antanambao, 13.96167 S, 48.43333 E, rainforest, 400 m, 8.XI.1998 (*B.L. Fisher*); Toamasina, 6.9 km NE Ambanizana, Ambohitsitondroina, 15.56667 S, 50 E, 825 m, rainforest, 2.XII.1993 (*B.L. Fisher*); Toamasina, 6.3 km S Ambanizana, Andranobe, 15.68131 S, 49.958 E, 25 m, rainforest, 14.XI.1993 (*B.L. Fisher*); Toamasina, 5.3 km SSE Ambanizana, Andranobe, 15.66667 S, 49.96667 E, 425 m, rainforest, 21.XI.1993 (*B.L. Fisher*); Toamasina, 19 km ESE Maroantsetra, 15° 29' S, 49° 54' E, 250 m, rainforest, 22.IV.1989 (*P.S. Ward*); Toamasina, Montagne d'Akirindro 7.6 km 341° NNW Ambinanitelo, 15.28833 S, 49.54833 E, 600 m, rainforest, 17.–21.III.2003 (*B.L.*

Fisher, C. Griswold et al.); Toamasina, Montagne d'Anjanaharibe, 18.0 km 21° NNE Ambinanitelo, 15.18833 S, 49.615 E, 470 m, rainforest, 8.–12.III.2003 (*B.L. Fisher, C. Griswold et al.*); Toamasina, Nosy Mangabe, 18.II.1990 (*G.D. Alpert*); Toamasina, Nosy Mangabe, 7.43 km S Maroantsetra, 15.4973 S, 49.76223 E, 5 m, littoral rainforest edge, 25.VII.2007 (*B.L. Fisher et al.*); Toamasina, Tampolo, 40.5 km SSE Maroantsetra, 15.73092 S, 49.95973 E, 18 m, littoral rainforest, 28.VIII.2007 (*B.L. Fisher et al.*); Toamasina, Tampolo, 39.4 km SSE Maroantsetra15.70978 S, 49.96965 E, 218 m, disturbed rainforest, 30.VIII.2007 (*B.L. Fisher et al.).*

***Tetramorium silvicola* Hita Garcia & Fisher sp. n.**
(figs 130, 150, 151, 152)

Holotype worker, MADAGASCAR, Antsiranana, Parc National de Marojejy, Parc National de Marojejy, Antranohofa, 26.6 km 31° NNE Andapa, 10.7 km 318° NW Manantenina, 14.4433 S, 49.7433 E, 1325 m, montane rainforest, sifted litter (leaf mold, rotten wood), collection code BLF9080, 18.–21.XI.2003 (*B.L. Fisher*) (CASC: CASENT0042828). Paratypes, 12 workers with same data as holotype (CASENT0042702; CASENT0042706; CASENT0042707; CASENT0042804; CASENT0042814; CASENT0042820; CASENT0042824; CASENT0042826; CASENT0042837; MCZ: CASENT0042825; MHNG: CASENT0042830; NHMB: CASENT0042816); four workers with same data as holotype except sampled from rotten log and collection code BLF9120 (BMNH: CASENT0486881; CASC: CASENT0486882); 14 workers with same data as holotype except sampled ex Melastomataceae and collection codes BLF9128 and BLF9241 (CASC: CASENT0499669; CASENT0499670; CASENT0499726; CASENT0499727; CASENT0499728).

Diagnosis
Tetramorium silvicola is easily recognisable within the *T. marginatum* species group due to the combination of: head distinctly longer than wide (CI 88–90); mesosoma only moderately marginate from sides to dorsum; mesosomal dorsum completely unsculptured, smooth, and shining; hairs on mesosomal dorsum not restricted to lateral margins; dark brown to black colour.

Description
HL 0.72–0.84 (0.77); HW 0.64–0.74 (0.68); SL 0.47–0.57 (0.51); EL 0.14–0.18 (0.16); PH 0.32–0.37 (0.34); PW 0.43–0.51 (0.47); WL 0.81–0.95 (0.87); PSL 0.21–0.23 (0.22); PTL 0.07–0.11 (0.09); PTH 0.25–0.29 (0.27); PTW 0.20–0.26 (0.22); PPL 0.18–0.23 (0.20); PPH 0.24–0.29 (0.26); PPW 0.24–0.29 (0.26); CI 88–90 (89); SI 71–79 (75); OI 22–24 (23); DMI 52–54 (53); LMI 37–42 (39); PSLI 26–30 (28); PeNI 43–51 (47); LPeI 25–40 (32); DPeI 228–308 (264); PpNI 55–59 (56); LPpI 69–88 (78); DPpI 120–135 (129); PPI 111–130 (119) (12 measured).

Head much longer than wide (CI 88–90). Anterior clypeal margin with median impression. Frontal carinae weakly developed, ending between posterior eye margin and posterior head margin. Antennal scrobes absent. Antennal scapes relatively short, not reaching posterior head margin (SI 71–79). Eyes of moderate size (OI 22–24). Mesosomal outline in profile flat to weakly convex, moderately marginate from lateral to dorsal mesosoma; promesonotal suture absent, metanotal groove present but weak; mesosoma comparatively high, compact, and stout (LMI 37–42). Propodeal spines long, spinose, and acute (PSLI 26–30); propodeal lobes small and broadly triangular. Petiolar node in profile triangular cuneiform, strongly anteroposteriorly compressed dorsally, approximately 2.5 to 4 times higher than long (LPeI 25–40), anterior and posterior faces not parallel, node in dorsal view transverse and relatively thin, between 2.3 to 3.1 times wider than long (DPeI 228–308). Postpetiole in profile approximately rounded and weakly anteroposteriorly compressed, approximately 1.1 to 1.5 times higher than long (LPpI 69–88), in dorsal view approximately 1.2 to 1.4 times wider than long (DPpI 120–135). Postpetiole in profile appearing approximately of same volume as petiolar node, in dorsal view between 1.1 to 1.3 times wider than petiolar node (PPI 111–130). Mandibles generally almost or completely unsculptured, smooth, and shining, often weak striation present in smaller areas; clypeus to great extent unsculptured, smooth, and shining, few short rugulae or traces of rugulae present, median ruga not well–developed, usually short and not reaching anterior clypeal margin; cephalic dorsum between frontal carinae with five to ten rugulae, rugulae ending between posterior eye margin and posterior head margin and of approximately same length as frontal carinae, median ruga developed and diverging approximately at eye level into two rugae running to posterior clypeal margin; lateral head reticulate-

FIGURES 150–152. *T. silvicola*, holotype—CASENT0042828 (Erin Prado 2010). 150. Body in profile. 151. Body in dorsal view. 152. Head in full-face view.

rugose to longitudinally rugose anteriorly, posteriorly less pronounced to almost unsculptured; ventral head weakly longitudinally sculptured but mostly unsculptured. Ground sculpture on head faint to absent. Mesosoma dorsally completely unsculptured, smooth and shining, lateral mesosoma mostly unsculptured but weak sculpture present posteroventrally. Waist segments and gaster unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, long, erect pilosity, hairs on mesosomal dorsum not restricted to lateral margins. Body of uniform dark brown colour.

Notes

The new species is only found in two localities. Almost all of the known material was collected from the type locality, the Parc National de Marojejy in the northeast of Madagascar. However, two specimens are from Foret d'Ambalagoavy, which is located much further south close to Ambalavao and Fianarantsoa. In Marojejy, *T. silvicola* was sampled at elevations from 775 to 1325 m, and in Foret d'Ambalagoavy at 625 m. Most of the specimens were collected from Melastomataceae and only very few from the leaf litter or ground, which suggests that *T. silvicola* either lives or forages on these plants, or both.

Tetramorium silvicola is easy to distinguish from the other five species in the group. Its unsculptured mesosomal dorsum and dark brown colour separate it from *T. norvigi* and *T. shamshir*. Furthermore, a relatively long head (CI 88–90) and less pronounced dorsolateral margination on the mesosoma clearly distinguish it from *T. valky*, *T. hector*, and *T. marginatum*, as the latter three have a broader head (CI 92–100) and much more developed margination on the mesosoma.

Etymology

The species epithet *silvicola* is Latin and means "forest inhabitant". It refers to the habitat preference of the new species since it was only found in montane or lowland rainforests. The species epithet is a noun in apposition, and thus invariant.

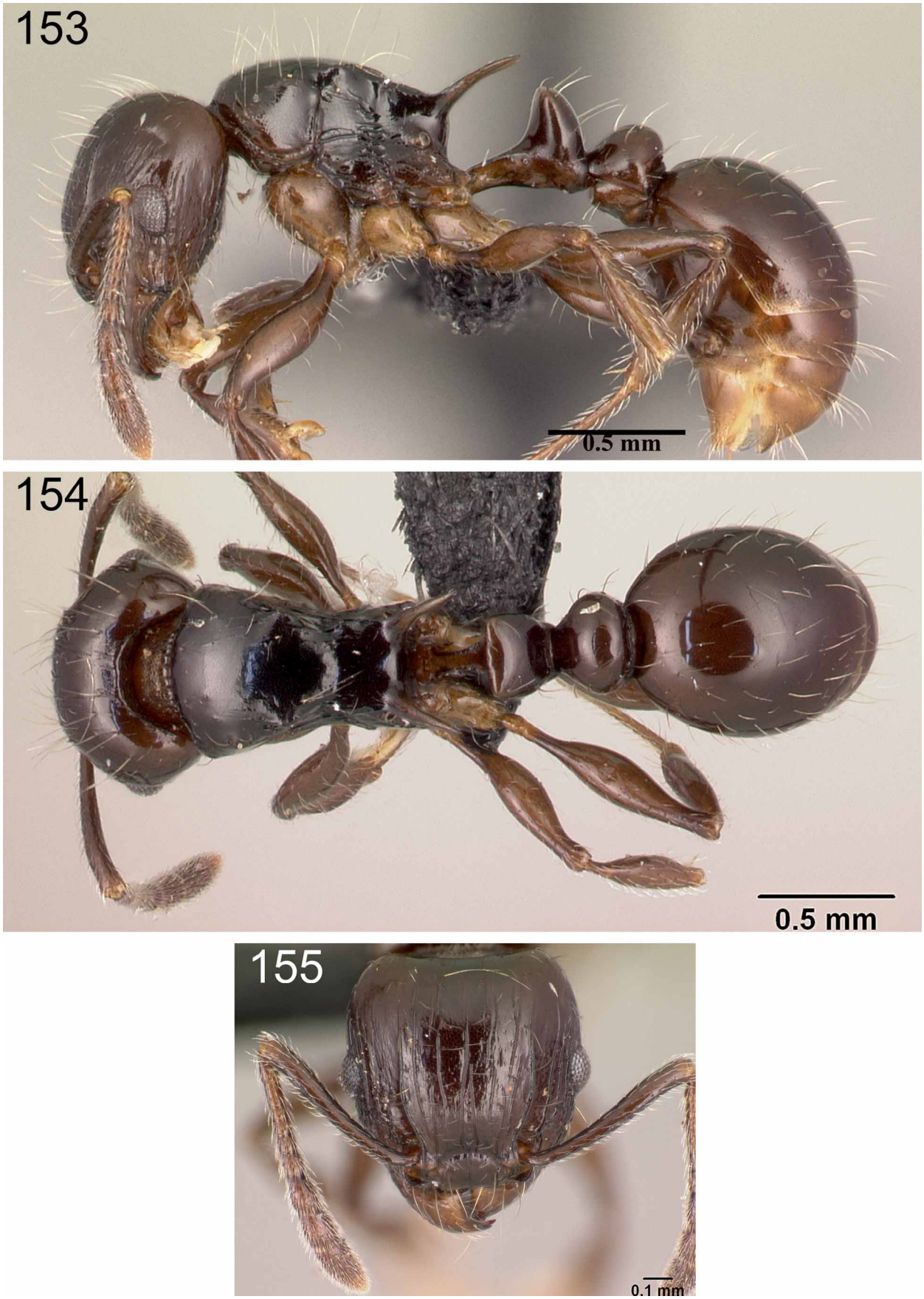
Material examined

MADAGASCAR: Antsiranana, Parc National de Marojejy, Antranohofa, 26.6 km 31° NNE Andapa, 10.7 km 318° NW Manantenina, 14.44333 S, 49.74333 E, 1325 m, montane rainforest, 18.–20.XI.2003 (*B.L. Fisher*); Antsiranana, Parc National de Marojejy, Antranohofa, 26.6 km 31° NNE Andapa, 10.7 km 318° NW Manantenina, 14.44333 S, 49.74333 E, 1325 m, montane rainforest, 14.XII.2005 (*B.L. Fisher*); Antsiranana, Parc National de Marojejy, Manantenina River, 27.6 km 35° NE Andapa, 9.6 km 327° NNW Manantenina, 14.435 S, 49.76 E, 775 m, rainforest, 15.–18.XI.2003 (*B.L. Fisher et al.*); Antsiranana, Parc National de Marojejy, Manantenina River, 27.6 km 35° NE Andapa, 9.6 km 327° NNW Manantenina, 14.435 S, 49.76 E, 775 m, rainforest, 12.XII.2005 (*B.L. Fisher et al.*); Antsiranana, R.N.I. Marojejy, 11 km NW Manantenina, 14.43333 S, 49.75 E, 1225 m, montane rainforest, 25.X.–3.XI.1996 (*E.L. Quinter*); Fianarantsoa, Foret d'Ambalagoavy Nord, Ikongo, Ambatombe, 21.8275 S, 47.33889 E, 625 m, 1.XII.2000 (*R. Harin'Hala & M.E. Irwin*).

Tetramorium valky Hita Garcia & Fisher sp. n.

(figs 128, 133, 135, 153, 154, 155)

Holotype worker, MADAGASCAR, Toamasina, Montagne d'Akirindro 7.6 km 341° NNW Ambinanitelo, 15.2883 S, 49.5483 E, 600 m, rainforest, ex rotten stick on ground, collection code BLF08376, 17.–21.III.2003 (*B.L Fisher, C. Griswold et al.*) (CASC: CASENT0496394). Paratypes, seven workers with same data as holotype (CASC: CASENT0496395; CASENT0496396; CASENT0496397); seven workers with same data as holotype except sampled from sifted litter (leaf mold, rotten wood) and collection code BLF08250 (CASC: CASENT0039323; CASENT0039384; MCZ: CASENT0039325; MHNG: CASENT0039552; NHMB: CASENT0039320); one worker with same data as holotype except sampled from yellow pan trap and collection code BLF08255 (BMNH: CASENT049289); one worker with same data as holotype except sampled from beating low vegetation and collection code BLF08359 (CASC: CASENT0496108); nine workers with same data as holotype except sampled from rotten log and collection code BLF08382 (CASC: CASENT0496369; CASENT0496370; CASENT0496371).



FIGURES 153–155. *T. valky*, holotype—CASENT0496394 (Erin Prado 2010). 153. Body in profile. 154. Body in dorsal view. 155. Head in full-face view.

Diagnosis

Tetramorium valky can be well differentiated from the other species group members by the following combination of characters: head longer than wide to as long as wide (CI 92–100); mesosoma strongly marginate from sides to dorsum; petiolar node in profile triangular cuneiform to squamiform, usually strongly anteroposteriorly compressed dorsally, sometimes whole node strongly anteroposteriorly compressed; mesosomal dorsum completely unsculptured, smooth, and shining; abundant hairs on mesosomal dorsum not restricted to lateral margins; body of dark brown to black colour.

Description

HL 0.62–0.81 (0.73); HW 0.58–0.80 (0.71); SL 0.48–0.63 (0.57); EL 0.14–0.19 (0.17); PH 0.31–0.39 (0.36); PW 0.44–0.61 (0.54); WL 0.77–0.99 (0.90); PSL 0.24–0.41 (0.34); PTL 0.06–0.11 (0.08); PTH 0.28–0.39 (0.34); PTW 0.21–0.32 (0.27); PPL 0.16–0.27 (0.23); PPH 0.25–0.39 (0.32); PPW 0.22–0.36 (0.31); CI 92–100 (96); SI 78–84 (81); OI 23–26 (24); DMI 57–63 (60); LMI 39–43 (40); PSLI 39–52 (46); PeNI 46–54 (50); LPeI 16–31 (24); DPeI 237–500 (336); PpNI 48–64 (57); LPpI 62–81 (72); DPpI 120–148 (133); PPI 102–124 (114) (15 measured).

Head longer than wide to as long as wide (CI 92–100). Anterior clypeus medially impressed. Frontal carinae well developed, ending between posterior eye margin and posterior head margin. Antennal scrobes faint to absent. Antennal scapes short to moderate, not reaching posterior head margin (SI 78–84). Eyes moderate to large (OI 23–26). Mesosomal outline in profile moderately convex, strongly marginate from lateral to dorsal mesosoma; promesonotal suture absent; metanotal groove present but weak; mesosoma comparatively high, compact, and stout (LMI 39–43). Propodeal spines very long, spinose, and acute (PSLI 39–52); propodeal lobes small and broadly triangular. Petiolar node in profile triangular cuneiform to squamiform, usually strongly anteroposteriorly compressed dorsally, approximately 3.2 to 6.3 times higher than long (LPeI 16–31), anterior and posterior faces usually not parallel, anterodorsal margin generally situated higher than posterodorsal, dorsum distinctly tapering backwards posteriorly, sometimes whole node strongly anteroposteriorly compressed, anterior and posterior faces almost parallel and node noticeably squamiform; node in dorsal view extremely transverse, between 2.3 to 5 times wider than long (DPeI 237–500). Postpetiole in profile approximately rounded and weakly anteroposteriorly compressed, approximately 1.2 to 1.6 times higher than long (LPpI 62–81), in dorsal view approximately 1.2 to 1.5 times wider than long (DPpI 120–148). Postpetiole in profile usually appearing as voluminous as petiolar node, in dorsal view weakly wider than petiolar node (PPI 102–124). Mandibles with distinct longitudinal sculpture, sometimes weak, but generally present; clypeus mostly unsculptured, smooth, and shining, few short rugulae or traces of rugulae present; cephalic dorsum between frontal carinae with six to nine longitudinal rugae or rugulae, median ruga usually shorter than frontal carinae and diverging approximately at eye level into two rugae running to posterior clypeal margin, remaining rugulae generally of same length as frontal carinae, often broken and shorter; lateral and ventral head with longitudinal sculpture, especially anteriorly, posteriorly only weakly sculptured or unsculptured. Ground sculpture on head usually faint to absent, sometimes moderately reticulate-punctate. Mesosoma laterally mostly unsculptured, weak sculpture present posteriorly; dorsal mesosoma completely unsculptured, smooth, and shiny. Waist segments and gaster completely unsculptured, smooth, and shiny. All dorsal surfaces of body with abundant, long, erect pilosity, hairs on mesosomal dorsum not restricted to lateral margins. Body of uniform dark brown to black colour.

Notes

The new species is distributed throughout eastern Madagascar from Mandena and St. Luce in the south to Ambanizana and the type locality Montagne d'Akirindro in the north. In addition, it is restricted to lowland rainforest habitats at elevations of 10 to 600 m where it appears to live in leaf litter and lower vegetation.

Tetramorium valky cannot be confused with *T. norvigi* or *T. shamshir* since the latter two have a sculptured mesosomal dorsum and are yellowish in colour, whereas *T. valky* has a completely unsculptured and smooth mesosomal dorsum and is very dark brown to black in colour. Furthermore, it is not likely to be confused with *T. silvicola* due to the much longer head of the latter (CI 88–90), while the head of *T. valky* is much broader (CI 92–100). Also, *T. valky* differs significantly from *T. hector*, and the shape of the petiolar node separates both very well. The node of *T. hector* in profile is cuneiform and comparatively thick (DPeI 134–147) versus triangular to squamiform and much thinner in *T. valky* (DPeI 237–500). The remaining species, *T. marginatum*, is morphologically close to *T. valky*, but both can be easily distinguished by the pilosity pattern on the mesosomal

dorsum. *Tetramorium marginatum* has long standing hairs only at the dorsolateral margins of the mesosoma and rarely at the dorsal border between mesonotum and propodeum, whereas the hairs of *T. valky* are present all over the mesosomal dorsum. Also, the petiolar node of *T. valky* is often more strongly compressed dorsally (LPeI 16–31; DPeI 236–500) than in *T. marginatum* (LPeI 29–47; DPeI 189–300), although this character has to be treated with caution since the morphometric ranges of the two species overlap. The shape of the mesosoma in lateral view is also much more convex in *T. marginatum* than in *T. valky.* Finally, the propodeum is often very high, much higher than the pronotum, in *T. marginatum* while it is distinctly lower in the latter, although this character is often difficult to compare.

One aspect of intraspecific variation merits particular mention. The petiolar node is usually markedly triangular cuneiform in lateral view with a strongly anteroposteriorly compressed dorsum. This is the case for almost all of the examined material. Nonetheless, in the few available specimens from Ranomafana, most of the node is anteroposteriorly compressed, causing it to look squamiform and very thin. This difference, however, is not sufficient to justify the heterospecificity of these specimens. Instead we consider this to be intraspecific variation.

Etymology

The name of the new species is an arbitrary combination of letters. The species epithet is a noun in apposition, and thus invariant.

Material examined

MADAGASCAR: Fianarantsoa, Forêt Classée Vatovavy, 7.6 km 122º Kianjavato, 21.4 S, 47.94 E, 175 m, rainforest, 6.–8.VI.2005 (*B.L. Fisher et al.*); Fianarantsoa, 9 km ESE Ranomafana, nr. Ifanadiana, 21° 17' S, 47° 32' E, 600 m, 28.IV.1989 (*P.S. Ward*); Fianarantsoa, Réserve Forestière d'Agnalazaha, Mahabo, 42.9 km 215° Farafangana, 23.19383 S, 47.723 E, 20 m, littoral rainforest, 19.IV.2006 (*B.L. Fisher et al.*); Toamasina, Andranobe, 5.3 km SSE Ambanizana, 15.66667 S, 49.96667 E, 425 m, rainforest, 19.XI.1993 (*B.L. Fisher*); Toamasina, Ile Sainte Marie, Forêt Kalalao, 9.9 km 34° Ambodifotatra, 16.9225 S, 49.88733 E, 100 m, rainforest, 24.–27.XI.2005 (*B.L. Fisher et al.*); Toamasina, Montagne d'Akirindro 7.6 km 341° NNW Ambinanitelo, 15.28833 S, 49.54833 E, 600 m, rainforest, 17.–21.III.2003 (*B.L. Fisher, C. Griswold et al.*); Toamasina, Parc National Mananara-Nord, 7.1 km 261° Antanambe, 16.455 S, 49.7875 E, 225 m, rainforest, 14.–16.XI.2005 (*B.L. Fisher et al.*); Toamasina, Res. Ambodiriana, 4.8 km 306° Manompana, along Manompana river, 16.67233 S, 49.70117 E, 125 m, rainforest, 18.–19.XI.2005 (*B.L. Fisher et al.*); Toamasina, Réserve Naturelle Betampona, 34.08 km 332° Toamasina, 17.91977 S, 49.20039 E, 525 m, rainforest, 11.–18.I.2009 (*B.L. Fisher*); Toamasina, Réserve Betampona, Camp Rendrirendry 34.1 km 332° Toamasina, 17.924 S, 49.19967 E, 390 m, rainforest, 28.V.2005 (*B.L. Fisher et al.*); Toamasina, Réserve Naturelle Betampona, 34.1 km 332° Toamasina, 17.916135 S, 49.20185 E, 550 m, rainforest, 10.–17.II.2008 (*B.L. Fisher*); Toamasina, Réserve Naturelle Betampona, 34.1 km 332° Toamasina, 17.916135 S, 49.20185 E, 550 m, rainforest, 27.IV.–4.V.2008 (*B.L. Fisher*); Toamasina, Réserve Naturelle Betampona, 34.1 km 332° Toamasina, 17.916135 S, 49.20185 E, 550 m, rainforest, 16.–23.XI.2008 (*B.L. Fisher*); Toamasina, Réserve Naturelle Betampona, 34.1 km 332° Toamasina, 17.916135 S, 49.20185 E, 550 m, rainforest, 1.–8.III.2009 (*B.L. Fisher*); Toamasina, Réserve Nationale Intégrale Betampona, Betampona 35.1 km NW Toamasina, 17.91801 S, 49.20074 E, 500 m, rainforest, 16.–17.XII.2007 (*B.L. Fisher*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.77274 S, 49.26551 E, 450 m, rainforest, 20.–22.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.76912 S, 49.26704 E, 475 m, rainforest, 21.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.77468 S, 49.26551 E, 355 m, rainforest along river, 21.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.7633 S, 49.26692 E, 520, rainforest, 22.–24.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, –16.7702 S, 49.26638 E, 470 m, rainforest, 23.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.7674 E, 49.26813 E, 500 m, rainforest, 23.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.77274 E, 49.26551 E, 450 m, rainforest, 23.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.8162 E, 49.29202 E, 425 m, rainforest, 25.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.81753 E, 49.29498 E, 360 m, rainforest, 25.–27.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.81745 E, 49.2925 E, 400 m, rainforest, 26.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river,

16.81209 E, 49.29216 E, 460 m, rainforest, 26.II.2010 (*B.L. Fisher et al.*); Toamasina, Réserve Spéciale Ambatovaky, Sandrangato river, 16.80561 E, 49.29507 E, 480 m, rainforest, 27.II.2010 (*B.L. Fisher et al.*); Toamasina, Sahafina forest 11.4 km W Brickaville, 18.81445 S, 48.96205 E, 140 m, rainforest, 13.–14.XII.2007 (*B.L. Fisher et al.*); Toamasina, S.F. Tampolo, 10 km NNE Fenoarivo Atn., 17.2825 S, 49.43 E, 10 m, littoral rainforest, 4.–12.IV.1997 (*B.L. Fisher*); Toamasina, Tampolo, Parcelle K9, 17.175 S, 49.268 E, 10 m, littoral forest, 19.IV.2004 (*B.L. Fisher et al.*); Toliara, 2.7 km WNW 302° Ste. Luce, 24.77167 S, 47.17167 E, 20 m, littoral rainforest, 9.–11.XII.1998 (*B.L. Fisher*); Toliara, Foret Ivohibe, 55 km N Tolagnaro, 24.569 S, 47.204 E, 200 m, rainforest, 2.–4.XII.2006 (*B.L. Fisher et al.*); Toliara, Mandena, 8.4 km NNE 30° Tolagnaro, 24.95167 S, 47.00167 E, 20 m, littoral rainforest, 20.XI.1998 (*B.L. Fisher*); Toliara, Southern Isoky-Vohimena Forest, 59 km NE Sakaraha, 22.46667 S, 44.85 E, 730 m, tropical dry forest, 21.I.1996 (*B.L. Fisher*).

Tetramorium tsingy species group

Diagnosis

Eleven-segmented antennae; anterior clypeal margin medially impressed; frontal carinae moderately developed, ending between posterior eye margin and posterior head margin, behind posterior eye margin weaker developed; anterior face of mesosoma not well-developed and no distinct anterodorsal margin present; margination between lateral and dorsal mesosoma moderate; mesosoma comparatively high (LMI 40–45); propodeal spines / teeth short to very short, and triangular; propodeal lobes triangular, and in profile of approximately same height and more voluminous than propodeal spines; petiolar node rectangular nodiform, in profile moderately higher than long, in dorsal view longer than wide, anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles of approximately same height; postpetiole approximately rounded; mandibles weakly sculptured to unsculptured; sculpture on head, mesosoma, and waist segments almost completely reduced; gaster unsculptured, smooth, and shiny; pilosity on dorsal surfaces of head, mesosoma, and waist segments consisting of abundant, comparatively short, fine, standing hairs; first gastral tergite either without any standing hairs at all, only with moderately long, appressed pubescence, or with comparatively short, fine erect pilosity; sting appendage spatulate.

Comments

This species groups consists of two newly discovered species, whose distribution seems to be endemic to a comparatively small area in Western Madagascar. Both type localities are located either within or in close proximity to Tsingy de Bemaraha National Park.

The unique character combination of the *T. tsingy* group makes it very difficult to confuse with any other Malagasy species group. The most distinctive of these characters is the highly reduced sculpture on head, mesosoma, and waist segments. Of the 19 species groups in the Malagasy region, only the *T. bessonii* groups and the majority of species from the *T. marginatum* group display a similar reduction of surface sculpture, but these three groups are unlikely to be misidentified with each other. All the members of the *T. bessonii* and *T. marginatum* groups possess long to very long propodeal spines and weakly developed short propodeal lobes, and in profile the propodeal spines are several times longer than the propodeal lobes. In the species of the *T. tsingy* group one can observe an almost opposite pattern since the propodeal spines/teeth are short to very short and the propodeal lobes are well developed and of approximately the same height as the propodeal spines/teeth.

Key to the species of the *T. tsingy* group (workers)

1. Propodeum with minute teeth; first gastral tergite with short, fine erect pilosity (Fig. 156) . . . . . *T. tyrion*
- Propodeum with moderately short spines; first gastral tergite with short and strongly appressed pubescence (Fig. 157). . . . . *T. tsingy*

FIGURES 156 & 157. 156. Body of *T. tyrion* in profile showing the minute propodeal teeth and short, fine erect pilosity on the first gastral tergite—CASENT0249085 (Estella Ortega 2011). **157.** Body of *T. tsingy* in profile showing the moderately short propodeal spines and short and strongly appressed pubescence on the first gastral tergite—CASENT0426807 (Shannon Hartman 2011).

***Tetramorium tsingy* sp. n.**
(Figs 157, 158, 159, 160)

Holotype worker, MADAGASCAR, Mahajanga, Parc National Tsingy de Bemaraha, 2.5 km 62° ENE Bekopaka, Ankidrodroa River, 19.13222 S, 44.81467 E, 100 m, tropical dry forest on tsingy, ground nest, BLF04392, 11.–15.XI.2001 (*B.L. Fisher, C. Griswold et al.*) (CASC: CASENT0426807). One paratype worker with same data as holotype (CASC: CASENT0247113).

Diagnosis

Tetramorium tsingy is easily identifiable within its species group due to its strongly appressed pubescence on the first gastral tergite and the moderately short propodeal spines.

Description

HL 0.63–0.66; HW 0.60–0.62; SL 0.43–0.44; EL 0.14; PH 0.33–0.34; PW 0.42; WL 0.76; PSL 0.11; PTL 0.16; PTH 0.24; PTW 0.15; PPL 0.21; PPH 0.24; PPW 0.22–0.23; CI 95; SI 71–72; OI 23; DMI 55–56; LMI 43–45; PSLI 17; PeNI 35–36; LPeI 65–67; DPeI 94; PpNI 52–55; LPpI 88; DPpI 105–110; PPI 152–153 (two measured).

Head weakly longer than wide (CI 95). Anterior clypeal margin with distinct median impression. Frontal carinae weakly developed and very fine, becoming weaker at anterior eye level, and fading out between posterior eye margin and posterior head margin. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 71–72). Eyes comparatively small to moderate (OI 23). Mesosomal outline in profile flat, weakly marginate from lateral to dorsal mesosoma, promesonotal suture and metanotal groove absent; mesosoma comparatively stout (LMI 43–45). Propodeum armed with short, triangular spines (PSLI 17). Propodeal lobes well-developed and broadly triangular, approximately of same height and volume as propodeal spines. Petiolar node in profile rectangular nodiform, approximately 1.3 times higher than long (LPeI 65–67), anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; node in dorsal view weakly but distinctly longer than wide (DPeI 94). Postpetiole in profile rounded and approximately 1.2 times higher than long (LPpI 88), in dorsal view weakly wider than long (DPpI 105–110). Postpetiole in profile more voluminous than petiolar node, in dorsal view approximately 1.5 times wider than petiolar node (PPI 152–153). Mandibles partly with superficial, weak striation, mostly unsculptured, and general

FIGURES 158–160. *T. tsingy*, holotype—CASENT0426807 (Shannon Hartman 2011). 158. Body in profile. 159. Body in dorsal view. 160. Head in full-face view.

appearance smooth and shiny; clypeus with strong median longitudinal ruga and one or two very weak rugulae at each side; cephalic dorsum between frontal carinae with a pair of weakly developed, longitudinal, median rugae, area between median rugae and frontal carinae almost unsculptured, few traces of rugulae present anteriorly, median rugae of shorter than frontal carinae and ending at eye level; lateral head mostly unsculptured with weak irregular longitudinal rugulae anteriorly. Mesosoma laterally with few irregular rugae or rugulae, remainder unsculptured, mesosomal dorsum generally unsculptured with few traces of rugulae only; petiole, postpetiole, and gaster unsculptured, smooth and shining. Ground sculpture on whole body faint to absent. All dorsal surfaces of head, mesosoma, and waist segments with short, fine subdecumbent to erect pilosity, first gastral tergite with short, strongly appressed pubescence. Body uniformly brown.

Notes

The new species is only known from the type locality, and only from two specimens, which is similar to the limited material known for *T. tyrion*. However, in contrast to the latter, more bionomic information is available for *T. tsingy.* The two specimens were sampled from a tropical dry forest on tsingy, and, interestingly, found in a ground nest of *Aphaenogaster swammerdami* Forel. Unfortunately, no additional information exists about the relationship between these two species. Nevertheless, *A. swammerdami* is a much larger species compared to *T. tsingy.* Also, *A. swammerdami* is a very common and abundant species known to have an omnivorous diet consisting of arthropods and seeds (Boehing-Gaese *et al*., 1996, 1999; Fisher, 2003). Fisher (2003) also reported that the nests of *A. swammerdami* are famous for being shared with snakes (*Leioheterodon modestus* Günther). The large nests of *A. swammerdami* appear to provide a variety of resources which could be used by *T. tsingy.* It could be that *A. swammerdami* ignores or tolerates the much smaller *T. tsingy* although this is highly speculative at the moment. However, a lifestyle carried out within another ant colony could account for the scarcity of *T. tsingy* material sampled so far. Nevertheless, more material and especially more nest collections from *A. swammerdami* or other ants including *T. tsingy* are needed to come to any final conclusion about the lifestyle of the latter species.

Tetramorium tsingy is not likely to be confused with *T. tyrion* since both differ significantly in gastral pilosity/ pubescence and development of the propodeal spines/teeth. In *T. tsingy* one can observe moderately short spines and strongly appressed pubescence on the first gastral tergite, whereas *T. tyrion* has only minute propodeal teeth and short but erect pilosity.

Etymology

The epithet *tsingy* is taken from the Malagasy language, and means "where one cannot walk barefoot". It is used to describe the karstic, vertical limestone formations encountered in the region. The new species appears to be endemic to this spectacular tsingy habitat. The species epithet is a noun in apposition and thus invariant.

Material examined

MADAGASCAR: Mahajanga, Parc National Tsingy de Bemaraha, 2.5 km 62° ENE Bekopaka, Ankidrodroa River, 19.13222 S, 44.81467 E, 100 m, tropical dry forest on tsingy, 11.–15.XI.2001 (*B.L. Fisher, C. Griswold et al.*).

***Tetramorium tyrion* sp. n.**

(Figs 156, 161, 162, 163)

Holotype worker, MADAGASCAR, Tulear, Bereboka, 60 km N.E. Morondava, collection code B.M. 1983-201, 18–23.V.1983 (*J.S. Noyes & M.C. Day*) (BMNH: CASENT0249085).

Diagnosis

Tetramorium tyrion is not likely to be confused with the other species of the group due to its unique character combination of short erect pilosity on the first gastral tergite and very minute propodeal teeth.

Description

HL 0.65; HW 0.63; SL 0.46; EL 0.14; PH 0.31; PW 0.42; WL 0.77; PSL 0.07; PTL 0.19; PTH 0.24; PTW 0.16;

PPL 0.21; PPH 0.25; PPW 0.25; CI 96; SI 74; OI 22; DMI 55; LMI 40; PSLI 10; PeNI 38; LPeI 77; DPeI 86; PpNI 60; LPpI 84; DPpI 119; PPI 156 (one measured).

Head weakly longer than wide (CI 96). Anterior clypeal margin with distinct median impression. Frontal carinae moderately developed and fine, ending shortly after level of posterior eye margin. Antennal scrobes absent. Antennal scapes short, not reaching posterior head margin (SI 74). Eyes comparatively small (OI 22). Mesosomal outline in profile flat, weakly marginate from lateral to dorsal mesosoma, promesonotal suture and metanotal groove absent; mesosoma comparatively stout (LMI 40). Propodeum armed with minute broadly triangular teeth (PSLI 10). Propodeal lobes well-developed and broadly triangular, much more voluminous than propodeal teeth. Petiolar node in profile rectangular nodiform, approximately 1.3 times higher than long (LPeI 77), anterior and posterior faces approximately parallel, anterodorsal and posterodorsal angles at about same height, dorsum not tapering backwards posteriorly; node in dorsal view 1.3 times longer than wide (DPeI 86). Postpetiole in profile rounded, approximately 1.2 times higher than long (LPpI 84), in dorsal view 1.2 times wider than long (DPpI 119). Postpetiole in profile a bit more voluminous than petiolar node, in dorsal view approximately 1.5 times wider than petiolar node (PPI 156). Mandibles unsculptured, smooth and shiny; clypeus with strong median longitudinal ruga and one very weak rugula at each side; cephalic dorsum between frontal carinae with one moderately developed longitudinal median ruga, area between median ruga and frontal carinae almost unsculptured, traces of rugulae present anteriorly, median ruga of same length as frontal carinae; lateral head mostly unsculptured with weak irregular longitudinal rugulae anteriorly. Ground sculpture faint. Mesosoma laterally with irregular rugae or rugulae, dorsally mainly unsculptured with traces of rugulae only, petiole laterally weakly sculptured, dorsally unsculptured, postpetiole and gaster unsculptured, smooth and shining. All dorsal surfaces of body with short, fine erect pilosity. Whole body of uniform brownish colour.

Notes

Tetramorium tyrion is only known from the holotype from the type locality Beroboka, which is situated close to the Tsingy de Bemaraha National Park in Central Western Madagascar. Unfortunately, very little is known about the biology of *T. tyrion* or the habitat characteristics of its type locality. Hopefully, future sampling projects in the area will find some more specimens of this very rare species.

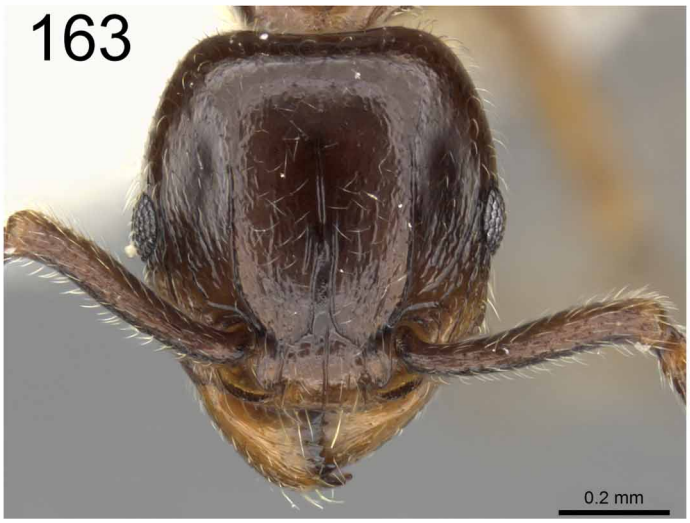
The *T. tsingy* group is a very small group based on just three specimens. This very limited material makes it relatively difficult to evaluate actual levels of intraspecific variation. The two specimens of *T. tsingy* differ in several aspects from the holotype of *T. tyrion*. The most obvious difference is the pilosity/pubescence on the first gastral tergite, which consists of short erect pilosity in *T. tyrion*, whereas *T. tsingy* has only short, strongly appressed pubescence. Also, both differ in their development of propodeal armament since *T. tsingy* has moderately short, triangular spines while *T. tyrion* possesses only very short and minute teeth. In addition, *T. tsingy* displays a better developed and more voluminous peduncle in comparison to *T. tyrion*. We believe the aforementioned character differences are significant enough to warrant describing *T. tyrion* and *T. tsingy* as distinct species. However, more material is necessary to support the species boundaries presented herein, or to provide arguments for any taxonomic change.

Etymology

The name of this unique and very characteristic new species is dedicated to the fictional character "Tyrion Lannister" from George R. R. Martin's epic fantasy series "A Song of Ice and Fire". The species epithet is a noun in apposition, and thus invariant.

Material examined

MADAGASCAR: Tulear, Bereboka, 60 km N.E. Morondava, 18–23.V.1983 (*J.S. Noyes & Day, M.C.*).



FIGURES 161–163. *T. tyrion*, holotype—CASENT0249085 (Estella Ortega 2011). 161. Body in profile. 162. Body in dorsal view. 163. 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 margin present; no distinct margination between lateral and dorsal mesosoma, sides of mesosoma smoothly rounding onto the dorsum; mesosoma comparatively high (LMI 45–48); propodeal spines long and spinose; propodeal lobes triangular and short; petiolar and postpetiolar nodes 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 margins at about same height; mandibles longitudinally rugose; cephalic sculpture well-developed, mostly reticulate-rugose with reticulate-punctate ground sculpture; mesosoma very weakly sculptured to unsculptured; 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 short, appressed pubescence only; sting appendage spatulate.

Comments

The *T. weitzeckeri* group is of primarily Afrotropical distribution with 27 known species (Hita Garcia et al., 2010). Only one member of the group, *T. humbloti*, is present in the Malagasy region, and seems very likely to have been transferred from the Afrotropical region. This species has a wide distribution range in East and South Africa, and has established itself on many islands of the South West Indian Ocean (Bolton, 1979; Hita Garcia & Fisher, 2011). In the Malagasy region, *T. humbloti* is not likely to be confused with any other *Tetramorium* due to its strongly squamiform petiole and postpetiole. No other genus member in the region possesses this squamiform condition of both waist segments, whereas it is present in several African species of the *T. weitzeckeri* group. This also supports the African origin of *T. humbloti*.

Tetramorium humbloti Forel, 1891

(Figs 164, 165, 166)

Tetramorium (*Xiphomyrmex*) *humbloti* Forel, 1891:154. Syntype workers, COMOROS, Grand Comoro Is., Ngasiya, (*L. Humblot*) (MHNG: CASENT0101295, CASENT0101296) [examined]. [Combination in *Xiphomyrmex* by Emery, 1899:285; in *Tetramorium* by Bolton, 1979:142].

Tetramorium (*Xiphomyrmex*) *humbloti* var. *pembensis* Forel, 1907:82. Syntype queens and males, TANZANIA, Pemba Island, (*Voeltzkow*) (MHNG) [examined]; syntype workers, TANZANIA, Arusha Chini, 1903 (MHNG) [examined]. [Synonymy with *T. humbloti* by Bolton, 1980:228; by Hita Garcia *et al*., 2010:72; here confirmed].

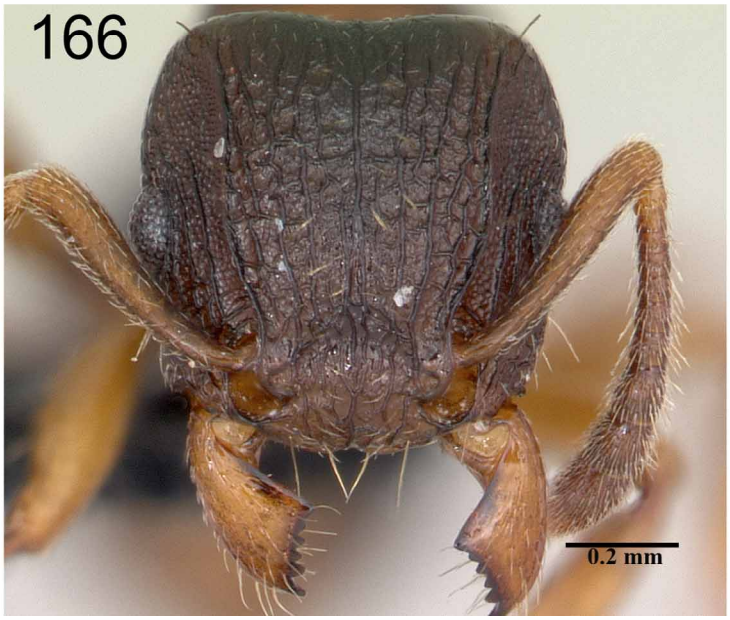
Tetramorium (*Xiphomyrmex*) *humbloti* var. *victoriensis* Forel, 1913:120. Syntype workers, ZIMBABWE, Victoria Falls, Zambezi River, 17.II.1912, (*G. Arnold*) (MHNG) [examined]. [Synonymy with *T. humbloti* by Bolton, 1980:228; by Hita Garcia *et al*., 2010:72; here confirmed].

Diagnosis

The combination of 11-segmented antennae, highly reduced sculpture and pilosity, and strongly anteroposteriorly compressed, squamiform petiole and postpetiole distinguish *T. humbloti* from all other *Tetramorium* in the Malagasy region.

Description

HL 0.73–0.83 (0.77); HW 0.71–0.82 (0.74); SL 0.52–0.62 (0.57); EL 0.16–0.21 (0.18); PH 0.40–0.45 (0.42); PW 0.53–0.63 (0.56); WL 0.87–1.00 (0.91); PSL 0.24–0.32 (0.26); PTL 0.08–0.13 (0.10); PTH 0.32–0.39 (0.35); PTW 0.29–0.38 (0.32); PPL 0.16–0.21 (0.19); PPH 0.35–0.47 (0.38); PPW 0.34–0.42 (0.37); CI 92–99 (97); SI 73–83 (77); OI 21–27 (24); LMI 45–48 (46); DMI 59–65 (62); PSLI 29–39 (34); PeNI 51–62 (57); LPeI 25–40 (30); DPeI 261–367 (318); PpNI 60–75 (66); LPpI 44–57 (50); DPpI 183–219 (198); PPI 110–125 (115) (25 measured).



FIGURES 164–166. *T. humbloti*—CASENT0059691 (April Nobile 2006). 164. Body in profile. 165. Body in dorsal view. 166. Head in full-face view.

Head longer than wide to almost as long as wide (CI 92–99). Anterior clypeal margin with distinct median impression, sometimes shallow. Frontal carinae strongly developed, ending shortly before posterior head margin. Antennal scrobes narrow and shallow, posterior and ventral margins never differentiated, as long as frontal carinae and not reaching posterior head margin. Antennal scapes of short to moderate length, not reaching posterior margin of head (SI 73–83). Eyes generally of moderate size (OI 21–27). Mesosomal outline in profile convex, comparatively stout and high, dorsally transversely rounded, weakly marginate from lateral to dorsal mesosoma, metanotal groove weakly developed or absent. Propodeal spines long to very long (PSLI 29–39); propodeal lobes small, triangular, and acute. Petiolar node strongly squamiform and anteroposteriorly compressed, anterior and posterior faces parallel, antero- and posterodorsal margins distinct but rounded and at about same height; node in dorsal view strongly transverse, usually three times wider than long, rarely less wide (DPeI 261–367), in lateral view usually more than three times higher than long, rarely less (LPeI 25–40). Postpetiole strongly squamiform and anteroposteriorly compressed, in dorsal view approximately twice as wide as long (DPpI 183–219), in lateral view approximately twice as high as long (LPpI 44–57). Postpetiole in profile weakly less voluminous than petiolar node, in dorsal view between 1.1 to 1.3 times wider than petiolar node (PPI 110–125). Mandibles distinctly longitudinally striate. Clypeus irregularly rugose, mostly longitudinally, sometimes rugo-reticulate; median ruga sometimes developed. Generally most of head with longitudinal rugae, often irregularly developed or with cross-meshes, almost reaching posterior head margin, cephalic dorsum with eight to 12 rugae, head laterally more reticulate-rugose, ground sculpture very conspicuously reticulate-punctate. Most of lateral area of mesosoma reticulate-rugose or rugose with reticulate-punctate ground sculpture; dorsum of mesosoma, especially on pronotum, typically completely unsculptured, smooth and shiny, sometimes with weak superficial sculpture on pronotum, propodeal declivity completely unsculptured and shiny. Petiole, postpetiole and gaster completely unsculptured, smooth and shiny. Head generally with numerous fine, long, erect hairs; mesosoma, petiole, and postpetiole usually completely without hairs, rarely mesosoma with up to three pairs, and petiole and postpetiole with one to two pairs. First gastral tergite always without standing hairs. Mesosoma and gaster with comparatively widely spaced and short appressed pubescence. Colouration variable, from light reddish brown to dark brown, mandibles always of lighter colour; appendages often of lighter colour, gaster often darker than remaining body.

Notes

In the Malagasy region, *T. humbloti* is present on the islands of the Comoros, Mauritius, Mayotte, Nosy Be, and Madagascar. There, most sampling localities are close to the coast in northern Madagascar, although two are situated at the southeastern coast. It seems that the species is fairly flexible in its habitat requirements since it was encountered in rainforests, tropical dry forests, littoral rainforests, coastal dunes, coastal scrubs, woodlands, disturbed forests, but also in coffee plantations and other anthropogenic habitats. This is surprising because in Africa *T. humbloti* appears to prefer open savannah, woodland, and other natural open habitats.

As mentioned above, this species is not likely to be misidentified with any other Malagasy species due to the strongly squamiform condition of both waist segments. The situation is different in the Afrotropical region because several species in the *T. weitzeckeri* species complex are morphologically very close to *T. humbloti*. However, the whole *T. weitzeckeri* species group was recently revised by Hita Garcia *et al.* (2010), and this work provides identification tools to differentiate *T. humbloti* and its Afrotropical allied species.

Material examined

BOTSWANA: Kabulabula (*Vernay-Lang*); **COMOROS**: Anjouan, Bimbini, 12.19635 S, 44.23752 E, 5 m, coastal scrub, mangrove, 27.I.2009 (*B.L. Fisher*); Grande Comoro, no further data; Grand Comoro Is., Ngasiya (*L. Humblot*); Mohéli, Ouallah, 12.32717 S, 43.65952 E, 10 m, coastal scrub, 17.I.2009 (*B.L. Fisher*); Mohéli, Ouallah, 12.34045 S, 43.66801 E, 5 m, coastal sand, 21.I.2009 (*B.L. Fisher*); Mohéli, Lac Boundouni, 12.37915 S, 43.85165 E, 25 m, dry forest, 20.I.2009 (*B.L. Fisher*); **MADAGASCAR**: no location (*Voeltzkow*); 10 km S of Cap Este, 16.I.1990 (*G.D. Alpert*); Antsiranana, Ambondrobe, 41.1 km 175° Vohemar, 13.71533 S, 50.10167 E, 10 m, littoral rainforest, 30.XI.2004, (*B.L. Fisher*); Antsiranana, Androybesakalava, 3.52 km SW Ambanja, 13.70727 S, 48.43221 E, 22 m, coffee plantation, 11.IV.2008 (*B.L. Fisher*); Antsiranana, Anketrabe, 12.40611 S, 49.22194 E, 98 m, stomach contents *Mantella viridis*, 6.I.2005 (*F. Andreone*); Antsiranana, Forêt d'Ampondrabe, 26.3 km 10° NNE Daraina, 12.97 S, 49.7 E, 175 m, tropical dry forest, 10.XII.2003 (*B.L. Fisher*); Antsiranana, 7 km N Joffreville, 12.33333 S, 49.25 E, 360 m, in forest, 26.I.2001 (*M.E. Irwin*); Antsiranana, 7 km N Joffreville,

12.33333 S, 49.25 E, 360 m, in forest, 26.–29.I.2001 (*I. Schlinger & R. Harin'Hala*); Antsiranana, Parc National Montagne d'Ambre, 12.51444 S, 49.18139 E, 960 m, rainforest, 5.–21.IV.2001 (*R. Harin'Hala*); Antsiranana, Parc National Montagne d'Ambre, 12.52028 S, 49.17917 E, 1125 m, rainforest, 29.I.–4.III.2001 (*R. Harin'Hala*); Antsiranana, Parc National Montagne d'Ambre, 12.52028 S, 49.17917 E, 1125 m, rainforest, 14.–30.V..2001 (*R. Harin'Hala*); Antsiranana, Nosy Be airport, 13.3138 S, 48.31509 E, 25 m, urban/garden, 15.IV.2008 (*B.L. Fisher*); Antsiranana, Nosy Be, Réserve Naturelle Intégrale de Lokobe, 6.3 km 112° ESE Hellville, 13.41933 S, 48.33117 E, 30 m, rainforest, 19.–24.III. 2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Nosy Faly, Tafiambotry, 35.3 km N Ambanja, 13.3654 S, 48.48775 E, 7 m, littoral rainforest, 12.IV.2008 (*B.L. Fisher*); Antsiranana, Réserve Spéciale d'Ambre, 3.5 km 235° SW Sakaramy, 12.46889 S, 49.24217 E, 325 m, tropical dry forest, 26.–31.I.2001 (*B.L. Fisher, C. Griswold et al.*); Antsiranana, Sakalava Beach, 12.26278 S, 49.3975 E, 10 m, across sandy trail in dwarf litoral forest, 16.–31.V.2001 (*R. Harin'Hala*); Antsiranana, Sakalava Beach, 12.26278 S, 49.3975 E, 10 m, across sandy trail in dwarf litoral forest, 6.–20.VII.2001 (*R. Harin'Hala*); Antsiranana, 3 km W Sakalava Beach, 12.28617 S, 49.36667 E, 40 m, whites dunes in littoral forest, 19.III.–4.IV.2001 (*I. Schlinger & R. Harin'Hala*); Antsiranana, Sakaramy, 12.33333 S, 49.25 E, 360 m, low rainforest, 6.–27.I.2007 (*R. Harin'Hala & M.E. Irwin*); Antsiranana, Sakaramy, 12.33333 S, 49.25 E, 360 m, low rainforest, 30.I.–18.II.2007 (*R. Harin'Hala & M.E. Irwin*); Fianarantsoa, Farafangana, 22.81967 S, 47.83 E, 10 m, urban gardens, 25.IV.2006 (*B.L. Fisher et al.*); Fianarantsoa, Manakara, 22.14817 S, 48.02267 E, 10 m, urban gardens, coastal *Casuarina equisetifolia*, 25.IV.2006 (*B.L. Fisher*); Fianarantsoa, Parc National d'Isalo, Ambovo Springs, 29.3 km 4° N Ranohira, 22.298 S, 45.352 E, 990 m, 9.–14.II.2003 (*B.L. Fisher*); Mahajanga, Manerinerina, 76.6 km N Antsohihy, 14.10744 S, 48.11046 E, 247 m, disturbed forest, 11.IV.2008, (*B.L. Fisher*); Toamasina, Baie d 'Antongil; **MAURITIUS**: Ile aux Aigrettes, 20.419 S, 57.731 E, 1 m, coastal scrub, 28.V.2005 (*B.L. Fisher*); **MAYOTTE**: Mont Combani, 12.80632 S, 45.15314 E, 370 m, rainforest, 25.XI.2007 (*B.L. Fisher*); Reserve forestiére Sohoa, 12.81237 S, 45.10476 E, 10 m, coastal dry scrub, 1.XII.2007 (*B.L. Fisher*); Tanaraki, 12.75754 S, 45.0678 E, 10 m, coastal scrub, 26.XI.2007 (*B.L. Fisher*); Tsingoni, 12.783 S, 45.1 E, litter of shrubs on mangrove edge, 27.II.–4.III.1999 (*R. Jocque & G. DeSmet*); **SOUTH AFRICA**: no location (*H. Swale*); **TANZANIA**: Arusha Chini, 1903; Pemba Island (*Voeltzkow*); Arusha Chini, 1903; Boma Gombe, 1903 (*Katona*); Mkomazi Game Reserve, Ibaya, 3°58' S, 37°48' E, 8.XII.1995 (*H.G. Robertson*); Mt. Meru, 28.X.1957 (*E.S. Ross & R.E. Leech*); Pemba I. (*Voeltzkow*); Sotele, 29.XI.1989 (*N.M. Varela*); Zanzibar, 16.VIII.1989 (*B. Löhr*); **ZAMBIA**: 16° 49.4' S, 26° 55.0' E, savannah woodland, 280m, 9.VIII.1998 (*B.L. Fisher*); 16° 48.4' S, 26° 57.1' E, savannah woodland, 250m (*B.L. Fisher*); Lusaka, Leopard Hill, 12° 33.29' S, 30° 17.74' E, 1300 m, miombo woodland, 29.XI.–3.XII.2005, (*B.L. Fisher*); **ZIMBABWE**: Mazoe Estates, 3.XII.1987 (*H.G. Robertson*); Rusape, 12.III.1958, 1200 m (*E.S. Ross & R.E. Leech*); Sawmills, 12.VII.1929 (*G. Arnold*); Umtali, 12.VI.1924; Umtali, Melsetter, II.1969 (*R. Mussard*); Victoria Falls, Zambezi River, 17.II.1912 (*G. Arnold*); Victoria Falls, 2.XII.1914 (*G. Arnold*); Victoria Falls, 7.III.1969 (*W.L. Brown*).

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