Boletín Sociedad Entomológica Aragonesa, nº **45** (2009) : 157−161.

TETRAMORIUM PARVIOCULUM SP. N. (FORMICIDAE: MYRMICINAE), A NEW SPECIES OF THE *T. SIMILLIMUM* GROUP FROM GIBRALTAR

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Abstract: We describe a new species of *Tetramorium*, which has so far only been found in Gibraltar. *Tetramorium parvioculum* **sp. n.** belongs to the *simillimum*-group, which is of Afrotropical origin. It is likely that this species is a non native and was imported with plant material originating from tropical Africa. The ecology of this new species is discussed.
Key words: Hymenoptera, Formicidae, *Tetramorium parvioculum* **sp. n.**, Gibraltar.

***Tetramorium parvioculum* sp. n. (Formicidae: Myrmicinae), especie nueva del grupo *T. simillimum*, de Gibraltar**
Resumen: Se describe una especie nueva de *Tetramorium*, que hasta ahora solamente se ha localizado en Gibraltar. *Tetramorium parvioculum* **sp. n.** pertenece al grupo '*simillimum*', que es de origen afrotropical. Es probable que esta especie no sea autóctona de Gibraltar, y que haya sido importada con plantas provenientes de África tropical. Se resume la ecología de esta especie nueva.
Palabras clave: Hymenoptera, Formicidae, *Tetramorium parvioculum* **sp. n.**, Gibraltar.

Taxonomy/Taxonomía: *Tetramorium parvioculum* **sp. n.**

Introduction

Tetramorium Mayr, 1855 is one of the largest genera of ants. It has a mainly Old World distribution and is most diverse in the Afrotropics. A few endemic and tramp species can be found in the New World (Bernard, 1968; Bolton, 1979, 1980). In 2005, the number of *Tetramorium* species stood at 727 (Bolton *et al.*, 2007). These include a number of well-known tramp species. Bolton (1977, 1979, 1980) deals with the members of the genus that inhabit tropical regions. The *Tetramorium* faunas of different parts of Europe are treated in a range of publications (*e.g.,* Collingwood, 1978; Agosti & Collingwood, 1987; Radchenko, 1992; Sanetra *et al.*, 1999; Czechowski *et al.*, 2002; Seifert, 2007), whilst the representatives of the genus in Morocco have been studied by Cagniant (1997). All *Tetramorium* species endemic to the West Palaearctic belong to the *caespitum*-group (Bolton, 1977; Güsten *et al.*, 2006). Eight species are known from Iberia (Gomez & Espadaler, 2007), of which three species - *Tetramorium bicarinatum* (Nylander, 1846), *Tetramorium lanuginosum* Mayr, 1870 and *Tetramorium caldarium* (Roger, 1857) are exotics (Reyes & Espadaler, 2005), the latter belonging to the *simillimum*-group. Three *Tetramorium* have currently been recorded from the approx. 6 km^2 British Territory of Gibraltar. Two of these, *Tetramorium semilaeve* (André, 1883) and *Tetramorium caespitum* (Linnaeus, 1758) (the latter in its *sensu lato*) are common species that are widespread in Iberia (Gomez & Espadaler, 2007). The third species, first encountered in July 2007, was not attributable to any of the European or Moroccan species. With this article we describe a new species of *Tetramorium* of the *simillimum*-group, from the Rock of Gibraltar (36°08'N, 5°21'W).

Methods

General surveying of ants has been taking place in Gibraltar since May 2007. All habitats are surveyed regularly using a variety of techniques such as searching for ants on the ground and on vegetation, locating nests within trees and shrubs, in the ground and under rocks and stones, beating vegetation and sieving soil and leaf litter. During these surveys, we collected specimens of an ant belonging to the genus *Tetramorium* that did not match any of the species that have been recorded in Iberia. We ran them through different regional keys and descriptions for Europe and North Africa (Collingwood, 1978; Agosti & Collingwood, 1987; Cagniant, 1987; Sanetra *et al.*, 1999; Czechowski *et al.*, 2002) but had no success. We sent specimens to Drs. Tinaut (Universidad de Granada) and Reyes (Universidad de Córdoba) in Spain, who were equally uncertain of their identity. We therefore contacted Mr Barry Bolton and provided him with some specimens. Mr Bolton kindly examined them and informed us that the species was an undescribed member of the *simillimum*-group.

The following morphometrics were recorded for every individual:

Total Length (TL): Total length, from clypeal margin to apex of gaster.
Head Length (HL): Maximum head length, in median line, from occiput to front clypeal border.
Head Width (HW): Maximum head width taken from just above the eyes.
Scape Length (SL): Maximum scape length, excluding the basal condyle.
Eye Length (EL): Maximum length of eyes.
Pronotal Width (PW): Maximum width of the pronotum in dorsal view.

Alitrunk Length (AL): The diagonal length of the alitrunk in lateral view from the point at which the pronotum meets the cervical shield to the posterior base of the propodeal lobes.

All measurements were taken in millimetres, through a BSR stereomicroscope. Total Length was measured at 20x magnification. All other measurements were taken at 50x. Morphometrics were used to calculate the following indices:

Cephalic Index (CI): (HW x 100)/HL
Scape Index (SI): (SL x 100)/HW
Ocular Index (OI): (EL x 100)/HW

Indices were rounded off to the nearest whole number. Photographs were taken through a Meiji RZ stereomicroscope with a 1.5x objective, using a Nikon Coolpix P5100 with an adaptor. Images were compiled using the image stacking softwares 'Combine ZM' and 'Helicon Focus'.

Tetramorium parvioculum sp. n.

HOLOTYPE: worker from The Mount, Upper Rock Nature Reserve, Gibraltar, N36°07'401" W5°20'908", 101m a.s.l. Leg. R. Guillem 12.XI.2007, under stone. TL = 2.25, HL = 0.64, HW = 0.50, SL = 0.40, PW = 0.32, AL = 1.60, EL = 0.08, CI = 78, SI = 80, OI = 16.

PARATYPES: 1 ex. worker from The Mount, Upper Rock Nature Reserve, Gibraltar, N36°07'401" W5°20'908", 101m a.s.l. Leg. R. Guillem 12.XI.2007, under stone. 19 ex. worker & 7 ex. queens ♀♀ from Douglas Path, Upper Rock Nature Reserve, Gibraltar, N36°07'746" W5°20'690", 380m a.s.l. Leg. R. Guillem, K. Bensusan & C. Perez 19.VI.2008, sieving soil and leaf litter.

The holotype and three paratypes (2 workers, 1♀♀) are in the collection of the British Museum of Natural History (BMNH). 15 paratypes (12 workers, 3♀♀) are in the collection of Rhian Guillem (Gibraltar). In addition, paratypes have been deposited in the following collections: 2 workers & 1♀♀ in the collection of the Gibraltar Ornithological & Natural History Society (GONHS), 2 workers & 1♀♀ in the National Museum of Wales, Cardiff, 2 workers & 1♀♀ with Alberto Tinaut (Granada).

WORKER: Measurements and indices are summarised (Table I). Dorsal view, ventral view and head illustrated (Fig. 1). Colour uniformly reddish brown, the legs and antennae lighter. Head and mesosoma strongly and densely rugose reticulate. Gaster smooth and shining. Body covered in short erect yellow hairs, apically blunt. Antennae and tibiae covered in finer, short subdecumbent to decumbent pubescence. Mandibles shining with weak longitudinal rugulae. Anterior clypeal margin straight and entire, without a median notch. Clypeus shining with some feeble longitudinal carinae but a clearly marked median carina is present. Frontal carinae weak, divergent posteriorly from the apices of the frontal lobes and not extending beyond the posterior margin of the eyes, either becoming broken, or merging into the reticulate sculpture. Frons with more pronounced longitudinal rugae than rest of body. Dorsum of head finely weakly longitudinally rugulose; ground sculpture between the rugulae a fine superficial reticulate-punctulation. Antennal scrobes absent. Eyes small (OI 15-19) with five ommatidia in the longest row. Maximum width of the scape about ¾ the maximum diameter of the eye. Maximum diameter of the eye equal to, or only fractionally greater than the length of the longest hairs on the first gastral tergite. Propodeal spines straight and pointed in profile (length: 0.08-0.09mm), slightly shorter than, or equal to width (length/width ratio: 0.80-1.00). Propodeal spines roughly twice as long as propodeal lobes. Propodeal lobes triangular. Dorsal area between propodeal spines down to propodeal lobes strongly punctate. Alitrunk without a metanotal impression and quite flat in profile, giving a roughly rectangular appearance. Petiole node in profile rounded rectangular, concave posteriorly and sloping convexly anteriorly. Postpetiole rounded. When viewed dorsally, petiole and postpetiole sub-elyptical in shape, wider than long. Petiole and postpetiole weakly punctate and shining with dorsum smooth.

Table I. Minimum, maximum and mean measurements (mm) and indices for workers and queens ♀♀. Abbreviations are given in full in the Methods section.

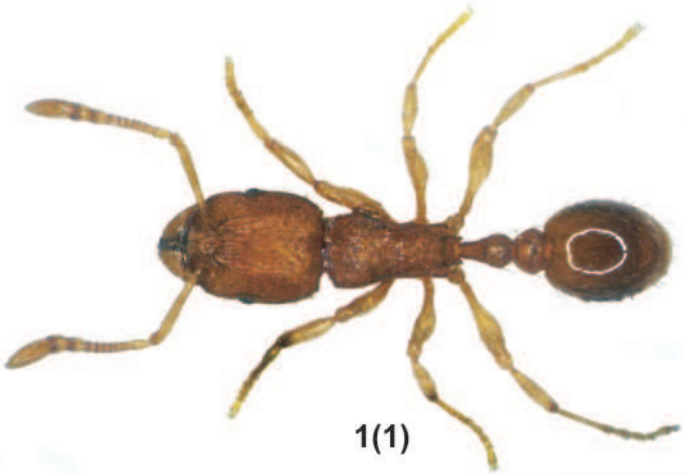
	Worker (n = 21)		Queen ♀♀ (n = 7)	
	range	mean	range	mean
TL	2.25-2.50	2.34	3.25-3.45	3.34
HL	0.62-0.68	0.65	0.72-0.78	0.75
HW	0.49-0.54	0.51	0.62-0.68	0.65
SL	0.40-0.44	0.41	0.48-0.52	0.49
PW	0.32-0.38	0.34	0.50-0.54	0.52
AL	1.60-1.80	1.67	0.55-0.75	0.69
EL	0.08-0.10	0.08	0.16-0.18	0.17
CI	76-82	79	85-89	87
SI	77-85	81	73-79	74
OI	15-19	16	24-27	26

QUEEN ♀♀: Measurements and Indices are summarised (Table I). Dorsal and ventral views are illustrated (Fig. 2). Head and thorax dark brown, gaster slightly lighter. Legs, antennae and mandibles a lighter brown. Gena and sides of pronotum reddish brown, the extent of which is slightly variable between individuals. Head and thoracic sculpture as in workers, dorsum of scutum and scutellum with strong unbroken longitudinal rugulae. Mandibles and clypeal sculpture as in workers. Propodeal spines straight, pointed and robust (length: 0.12-0.14mm), slightly longer than wide (length/width ratio: 1.17-1.20). Propodeal spines roughly three times as long as propodeal lobes. Propodeal lobes triangular, same size as workers. Body pilosity as in workers except on alitrunk, where slightly more dense. Petiole and postpetiole shape as in workers. Petiole and postpetiole punctate, including dorsum, with a slight rugosity around sides.

DERIVATIO NOMINIS. This species is named after its small eyes. '*Parvioculum*' means 'small eye'.

TAXONOMIC POSITION AND IDENTIFICATION

Tetramorium parvioculum sp. nov. belongs to the *simillimum*-group of species and is placed within the *powers*-complex, knowledge of the taxonomy of which remains incomplete due to a shortage of material (Bolton, 1977, 1980). Members of the *simillimum*-group are characterised by an SI of generally < 90, sculptured mandibles, the anterior clypeal margin entire, sting appendage triangular or dentiform, frontal carinae varying from absent to strongly developed, eyes ranging from small to very large, body with



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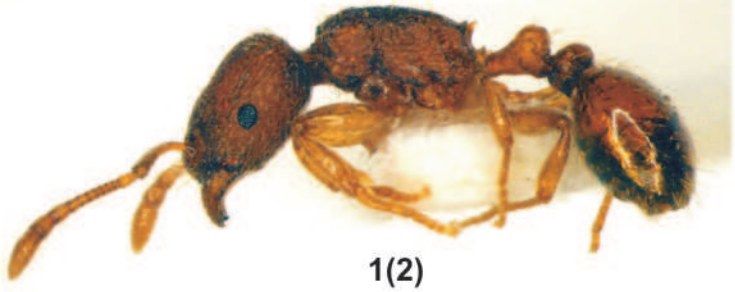

1(2)

1(3)

2(1)

2(2)

Fig. 1. (1) *Tetramorium parvioculum* nov. sp. worker, holotype. (2) Worker, lateral view. (3) Head of worker.

Fig. 2. (1) *Tetramorium parvioculum* nov. sp. queen, paratype. (2) Queen, lateral view.

short, blunt pilosity, petiole nodiform in profile and the propodeum with a pair of short triangular teeth or denticles which at most are only as long as the propodeal lobes (Bolton, 1980). Twenty-two species of this group are endemic to the Afrotropical region, whilst two are found only in the Malagasy region (Bolton, 1980). Members of the *powerii*-complex within the *simillimum*-group are characterised by weak or absent frontal carinae, a maximum eye diameter of 0.27 x HW, and a lack of antennal scrobes. The only known species from this group with eyes as small as *T. parvioculum* is *Tetramorium pauper* Forel, 1907, which is very different morphologically (Bolton, 1980 and *pers. comm.*). Propodeal lobes are shorter than propodeal spines in all workers of *T. parvioculum*, whereas a diagnostic feature of members of the *simillimum*-group according to Bolton (1980) is that at most, propodeal spines are as long as the propodeal lobes and usually shorter. One species belonging to this group is found in Iberia: *T. caldarium*, which is a successful tramp species with a wide distribution (Reyes & Espadaler, 2005). *T. parvioculum* can readily be distinguished from other Iberian species within this genus due to its distinctive sculpturing and very small eyes. *T. caldarium*, which belongs to the same species group, has larger eyes with 7-8 ommatidia in the longest row. The maximum diameter of the eye is also much greater than the maximum width of the scape in *T. caldarium*, and similarly the maximum diameter of the eye is also much greater than the length of the longest hairs on the first gastral tergite. In addition, none of the Iberian *Tetramorium* species have a body sculpture which is rugose reticulate.

DISTRIBUTION AND ECOLOGY

Tetramorium parvioculum is most likely an exotic species to Gibraltar. The species belongs to the *simillimum*-group, which is tropical and predominantly African (Bolton, 1980) and includes a tramp species, *T. caldarium*, that has become established in Iberia (Reyes & Espadaler, 2005). Ant species have sometimes been described from outside their native range, including members of the genus *Tetramorium* and the widespread ponerine *Hypoponera punctatissima* (Roger, 1859) (Roger, 1859; Bolton, 1980). It is possible that *T. parvioculum* was imported to Gibraltar with exotic plants.

T. parvioculum was first collected in 'The Mount' gardens in Gibraltar: old colonial grounds established in 1779 hosting a collection of exotic plants, but now in a state of neglect. The gardens back onto a small patch of native woodland (practically the only woodland left in Gibraltar) dominated by *Olea europea* L., *Celtis australis* L. and *Laurus nobilis* L. The understorey is dominated by *Acanthus mollis* L., with *Vinca difformis* Pourr. and *Rubus ulmifolius* Schott. This is the only location within the site where *T. parvioculum* has been found. It is interesting to note that it is either rare or absent in the garden area. The population at The Mount seems small and the gardens and woodland are dominated by the invasive Argentine ant *Linepithema humile* (Mayr, 1868). Other ant species coexisting with *T. parvioculum* at this site are *Temnothorax recedens* (Nylander, 1856), *Temnothorax kraussei* Emery 1916, *Temnothorax racovitzai* Bondroit, 1918, *Hypoponera punctatissima* and *Crematogaster scutellaris* (Olivier, 1792). The site seems exceptionally poor in ant species, no doubt due to the presence of *L. humile* at an extremely high density. For example, *Aphaenogaster senilis* Mayr, 1853 and *Pheidole pallidula* (Nylander, 1849) are absent even though these species are otherwise ubiquitous in Gibraltar.

The habitat at Douglas path is located well within the Upper Rock Nature Reserve, an area that is largely composed of rocky, high maquis (Perez & Bensusan, 2005). At 380m in elevation, it is close to the top of the Rock. The ants were found on a steep, rocky slope that has fairly deep pockets of soil. Dominant components of the vegetation at this site are *Olea europaea* L., *Rhamnus alaternus* L., *Quercus coccifera* L., *Chamaerops humilis* L., *Calicotome villosa* (Poiret) Link, *Osyris quadripartita* Salzm. ex Decne. and *Asparagus albus* L. Other ant species present are *Aphaenogaster senilis*, *Pheidole pallidula*, *Anochetus ghilianii* (Spinola, 1851), *Camponotus ruber* Forel, 1894 and *Temnothorax kraussei*.

T. parvioculum has partially endogenous habits, with workers rarely being observed above the soil surface. Observations of a colony in the laboratory confirm this. This could be the reason why the species has such small eyes. Nests are small, with around 100-200 workers and 1-2 queens (similar in composition to the colonies of *Temnothorax* species). We have found nests under stones and within leaf litter. Workers and queens have frequently been captured sieving soil and leaf litter (the paratype workers and queens are an example). The species seems timid, preferring to hide or feign death when provoked.

T. parvioculum has so far only been found in habitats that are in a natural state. This contrasts with the habits of exotic *Tetramorium* species in Iberia, all of which have been found in parks and gardens only (Reyes & Espadaler, 2005). Interestingly, exotic species present in Gibraltar such as *Linepithema humile*, *Paratrechina longicornis* (Latreille, 1802) and *Paratrechina jaegerskioeldi* (Mayr, 1904) find it difficult to penetrate the Upper Rock Nature Reserve, where they are either absent or restricted to man-made structures (walls, roads and buildings) and gardens. Although it is likely that *T. parvioculum* is of Afrotropical origin, its habits make it worth noting that some native ant species around the Strait of Gibraltar belong to genera that have otherwise tropical distributions (Guillem & Bensusan, 2008).

Acknowledgements

Many thanks are due to Barry Bolton, Alberto Tinaut and Joaquin Reyes for examining the species. Barry Bolton also offered invaluable advice throughout the process and revised this manuscript. We are very grateful to Charlie Perez (Gibraltar Botanic Gardens) for his keen assistance in photographing specimens.

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