

**A New Species of Carpenter Ant (Hymenoptera: Formicidae:
Camponotus) from Paraguay with a Key to the New World
Members of the *maculatus* Species Complex**

by

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ABSTRACT

A new ant species, *Camponotus taniae*, is described from the semi-arid region of Paraguay. This species is very similar to the widespread and common *C. conspicuus zonatus*, but the minor workers can be separated as the head is narrowed posteriorly, not rectangular-shaped as in *C. conspicuus zonatus* minors. The major worker and female are essentially identical to those of *C. conspicuus zonatus*. The male is unknown. A key is provided to separate this new species from the other New World members of the *maculatus* species complex.

INTRODUCTION

Carpenter ants of the genus *Camponotus* are among the most common and important components in most terrestrial ecosystems of the world. Unfortunately identification is often difficult or impossible, due to the extensive variability within each species, the similarity of the minors and the males of many species and the large numbers of species (approximately 435 New World species). One of us (WPM) is revising the New World *Camponotus* fauna, and keys and other materials are available at <http://www.utep.edu/leb/antgenera.htm>. The biology of these ants is poorly known, and much of which is known of the New World species has been summarized by Hansen and Klotz (2005). We are describing this species at this time to make the name available for ecological studies one of us (TD) is doing on the ants of the semiarid region of Paraguay.

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METHODS AND MATERIALS

Specimens were measured using an ocular micrometer in a Zeiss dissecting microscope at either 40X or 64X. The following abbreviations are used (all measurements in mm.):

HL: Head length, anterior of median lobe of clypeus to mid point of posterior margin of head.

HW: Head width, maximum excluding eyes.

SL: Scape length, excluding basal condyle.

EL: Eye length, maximum dimension.

CL: Clypeal length, from anterior border to medial posterior edge.

CW: Clypeal width, distance between tentorial pits.

WL: Weber's length, anterior border of pronotum to posterior border of lobe of metapleural gland.

FFL: Front left femur length (maximum).

FFW: Front left femur width (maximum).

CI: Cephalic Index, $HW/HL \times 100$.

SI: Scape index, $SL/HL \times 100$ (note HL used instead of HW).

CLI: Clypeal index, $CW/CL \times 100$.

FFI: Front femur index, $FFW/FFL \times 100$.

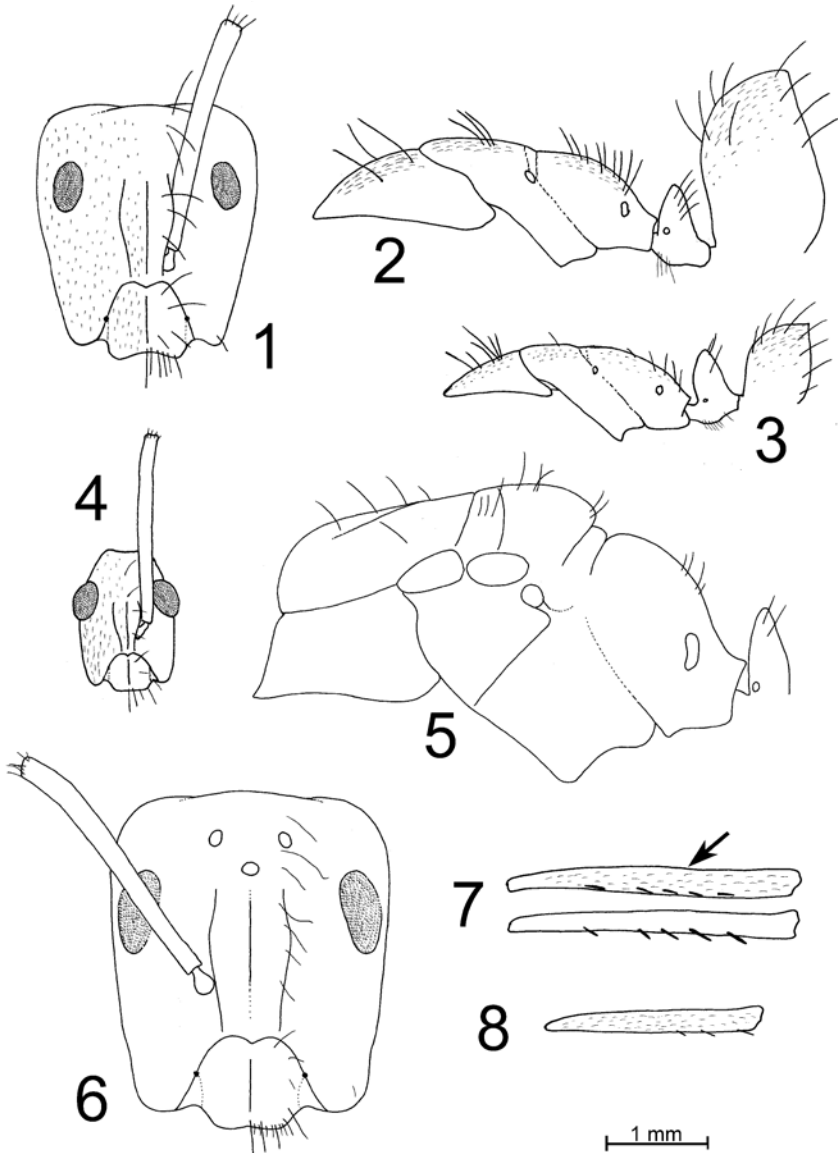
RESULTS

Camponotus (Tanaemyrmex) taniae new species

Figs. 1 - 8; Map 1

Diagnosis. The major is a large ant (total length 12 mm) with a large head, which is strongly narrowed anteriorly with a concave posterior border. Erect hairs are restricted to near the margins of the clypeus and two rows which extend posteriorly along the edges of the frontal carinae to the posterior border of the head. The eyes are relatively small and do not reach the sides of the head, the scapes extend well past the posterior border of the head. The head is dark brown, the mesosoma is light brown, and gaster is dark brown, with large lateral yellow splotches on each tergum.

The minor worker is a moderately sized (total length 7 mm), mostly yellowish-brown ant, with lateral yellow splotches on the gaster. The head is noticeably narrower posterior to the eyes than anterior to the eyes. The eyes



Figs. 1 - 8. *Camponotus taniae*. 1. Head of the holotype major worker; 2. Mesosoma, petiole and first gastral tergum of the holotype major worker; 3. Mesosoma, petiole and first gastral tergum of a paratype minor worker; 4. Head of a paratype minor worker; 5. Propodeum and petiole of a paratype female; 6. Head of a paratype female; 7. Posterior left tibia of the holotype major worker. The upper part shows the tibia as seen from the front, the lower part as seen obliquely from above (direction of arrow); 8. Posterior left tibia of a paratype minor worker, as seen from the front.

extend well past the sides of the head, and the scapes extend well past the posterior lateral corners of the head.

The female is also a large ant (total length 13 mm). The head is moderately narrowed anteriorly and the posterior border is only weakly concave. The eyes nearly reach the sides of the head and the scapes extend well past the posterior lateral corners of the head. The coloration is similar to that of the major and minor workers, with yellow splotches on the gaster.

The male is unknown.

Distribution. Paraguay (Boquerón; Presidente Hayes).

Description.

Major worker measurements (mm): HL 3.22 - 3.40, HW 2.72 - 2.96, SL 2.98 - 3.14, EL 0.69 - 0.73, CL 0.99 - 1.13, CW 0.98 - 1.04, WL 4.00 - 4.12, FFL 2.58 - 2.76, FFW 0.66 - 0.78. Indices: CI 85 - 87, SI 92 - 93, CLI 92 - 99, FFI 26 - 28.

Mandible with 7 teeth (only 5 visible on closed mandible); anterior border of clypeus concave, clypeal carina moderately well-developed; head strongly narrowed anteriorly, posterior border concave; eyes fail to reach sides of head by approximately $\frac{1}{2}$ minimum diameter; scape extends approximately first 2 funicular segments past posterior lateral corner of head; mesosoma elongated, broadly convex dorsally; dorsal face of propodeum longer than length of posterior face; petiole moderately thickened when viewed in profile, with anterior and posterior faces converging to apex.

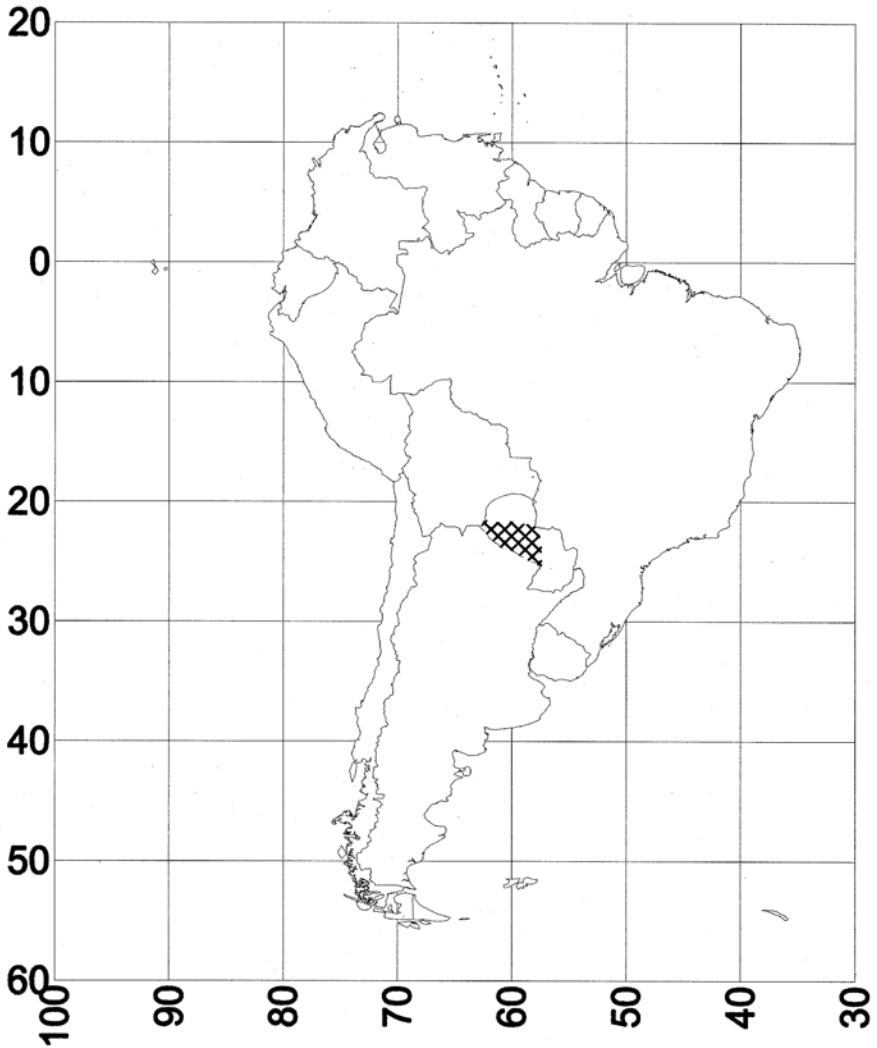
Erect hairs present on clypeus (but mostly restricted to margins, and only abundant along anterior border), single hair may be present on cheeks, hairs present in two rows extending from edges of frontal carinae to posterior border of head, hairs along posterior border sparse, scapes without erect hairs (except at apex), several erect hairs present on dorsum of mesosoma, dorsum of petiole, all surfaces of gaster, coxae, lower surfaces of femora, hairs on tibiae mostly appressed and suberect; fine appressed hairs scattered on most surfaces, especially head, mesosoma, and gaster.

Head and mesosoma mostly dull, sides of mesosoma weakly shining, head densely and evenly, but finely punctate, mesosoma mostly coriaceous, dorsum of gaster transversely striolate, moderately shining.

Head dark brown, mesosoma and legs lighter brown, gaster dark brown, with yellow splotches on each tergum.

Minor worker measurements (mm): HL 2.00 - 2.03, HW 1.06 - 1.10, SL 2.74 - 2.84, EL 0.53 - 0.55, CL 0.63 - 0.64, CW 0.74 - 0.75, WL 3.17 - 3.22, FFL 2.20 - 2.30, FFW 0.46. Indices: CI 52 - 55, SI 137 - 140, CLI 118, FFI 20 - 21.

Mandible with 6 teeth (5 visible when mandible closed); anterior margin of clypeus slightly convex, carina moderately well-developed; head strongly



Map 1. Distribution of *Camponotus taniae*.

narrowed posteriorly, posterior margin concave; eyes extend well past sides of head; scape extends approximately $\frac{1}{2}$ length past posterior lateral corner of head; mesosoma and petiole similar to that of major.

Erect hairs and decumbent pubescence similar to that of major worker, except generally with fewer erect hairs on the dorsum of the mesosoma, occasionally 1 - 3 fine erect hairs present on cheeks, erect hairs may be located posteriorly to eyes along sides of head.

Head predominantly coriaceous, with scattered punctures, mesosoma coriaceous, both weakly shining, gaster similar to that of major.

Head and mesosoma medium brown, mandible and antennae darker, gaster dark brown, with large lateral yellow splotches on each tergum.

Female measurements (mm): HL 3.16 - 3.30, HW 2.58 - 2.84, SL 2.82 - 2.88, EL 0.81 - 0.83, CL 0.96 - 1.05, CW 1.06 - 1.10, WL 4.94 - 5.32, FFL 2.76 - 2.82, FFW 0.68 - 0.76. Indices: CI 82 - 86, SI 85 - 91, CLI 105 - 110, FFI 24 - 27.

Mandible with 7 teeth; anterior margin of clypeus concave, carina moderately well-developed, especially posteriorly; head narrowed anteriorly, posterior margin weakly concave; eyes fail to reach sides of the head by approximately $\frac{1}{4}$ minimum diameter; scape extends approximately first 2 funicular segments past posterior lateral corner of head; mesosoma large, muscular, winged; petiole moderately thickened as seen in profile, with anterior and posterior faces converging towards apex.

Erect hairs and decumbent pubescence similar to that of major worker.

Head dull, finely and densely punctate, dorsum of mesosoma mostly dull and striolate, sides of mesosoma mostly smooth and moderately shiny, gaster transversely striolate, moderately shining.

Mandibles and antennae dark brown, head mostly pale brown, except for darker brown region surrounding ocelli and small areas anterior and medial to eyes; mesosoma nearly yellow in lateral view, scutum and scutellum darker, gaster similar in color to that of major worker.

Male: Unknown.

Type series. Holotype worker: PARAGUAY. BOQUERÓN: Parque Nacional Teniente Enciso, 21.13747°S 61.50945°W, 24-25 ix 2003, T. Delsinne. Dry Chaco in pitfall trap (deposited in the Royal Belgian Institute of Natural Sciences - RBINS, Brussels) and Paratypes: PARAGUAY. Boquerón: Parque

Nacional Teniente Enciso, 21.13747°S 61.50945°W, 24-25 ix 2003, T. Delsinne [29 paratype minor workers, 17 paratype major workers, 1 paratype queen, (deposited in RBINS; Museo Nacional de Historia Natural del Paraguay, San Lorenzo, Paraguay; American Museum of Natural History, British Museum of Natural History, California Academy of Sciences, Harvard Museum of Comparative Zoology, Los Angeles County Museum, Mackay collection, Museu de Zoologia da Universidade de São Paulo, United States National Museum of Natural History, Alex Wild collection)].

Additional material examined: 1963 specimens (164 majors, 1796 minors, 3 females). PARAGUAY. Boquerón: Nueva Asunción, 20.69528°S 61.92877°W, Siracua 21.04616°S 61.75151°W, Estancia María Vicenta 20.9213°S 61.39321°W, Parque Nacional Teniente Enciso 21.13747°S 61.50945°W, Parque Nacional Teniente Enciso-Southern side 21.2059°S 61.65762°W, Garrapatal 21.44661°S 61.48749°W, Mariscal Estigarribia 21.99097°S 60.63583°W, Fortín Mayor Infante Rivarola 21.67146°S 62.41312°W; PRESIDENTE HAYES: Cruce de Los Pioneros 22.69014°S 59.77186°W, Río Verde 23.21785°S 59.20294°W).

Etymology. Named in honor of Tania Milena Arias-Penna, our close friend and fellow myrmecologist.

Comparison. The major, minor and female could be separated from most of the other species of the *maculatus* species complex by the lack of erect hairs on the cheek (up to 3 may rarely be present) and the lack of hairs on the antennal scape (except at the apex). The minors can be separated from those of the New World species *C. maculatus* (North America), *C. simillimus indianus* (México to Bolivia), and to the very similar *C. conspicuus zonatus* (United States to Brasil) as the head of *C. taniae* is narrowed posteriorly and not with parallel sides as in the other three species. There are apparently no reliable characters to separate the majors and females of *C. taniae* from those of *C. conspicuus zonatus* or *C. maculatus* (New World form). Both majors and females of *C. taniae* tend to be larger than those of the other two species, but the differences in size probably overlap. Fortunately neither *C. conspicuus zonatus* nor *C. maculatus* are known from Paraguay (we would expect *C. conspicuus zonatus* to be found in Paraguay). *Camponotus simillimus indianus* majors and females can be easily separated from those of *C. taniae*, as they are

completely black (or at least dark reddish brown), and *C. simillimus indianus* has not been found in Paraguay.

Biology. *Camponotus taniae* has been collected in xeromorphic forests of the dry Paraguayan Chaco (see Mereles, 2005 for vegetation characterization). Localities have a large range of precipitation (350 to 1000 mm mean annual rainfall) and soils (silty to loamy sandy soils). Workers were observed foraging at night on the soil surface and in the vegetation. Some workers were observed tending Coccoidea. This species probably nests in the soil.

DISCUSSION

The *maculatus* species complex is principally an Old World group, with a few representatives in the New World (www.utep.edu/leb/antgenera.htm). Some of the species may have been introduced, specifically *C. maculatus* and possibly *C. conspicuus zonatus*, but the remaining species are probably native to this hemisphere.

The majors of most species in the *maculatus* species complex are large, brown ants, often with black gasters, and with lateral yellow splotches on each gastral tergum. The heads of most species are elongated, with the sides nearly straight, and strongly narrowed anteriorly. The mandibles are large and usually have seven or more teeth. The anterior border of the clypeus is usually convex, or at least straight, and rarely weakly concave. The clypeal carina is usually well developed. The scapes are long, and usually extend about the first two funicular segments past the posterior lateral corners of the head. The posterior border is usually concave. The mesosoma is elongated, and relatively slender, and the petiole is usually slender when viewed in profile. Most species have abundant erect hairs on most surfaces, especially the head, the mesosoma, petiole, and the gaster. The scapes may or may not have erect hairs, but always have a few erect hairs at the apex. The tibiae lack erect hairs and suberect hairs are rarely present. Appressed hairs are sparse and scattered on many surfaces, especially the head, mesosoma and gaster.

The minor workers are difficult to characterize. Most species have seven mandibular teeth, and the anterior border of the clypeus is usually straight or convex. The head is rectangular shaped or may be widened anterior to the eyes. The scapes extend at least $\frac{1}{2}$ length past the posterior lateral corner of the head.

The females are similar to the major workers, except the anterior border of the clypeus is usually concave. There are approximately 50 species complexes of *Camponotus* present in the New World (www.utep.edu/lep/antgenera.htm). Separation of members of the *maculatus* species complex from other complexes should not present difficulties except separation from the *atriceps*, *picipes* and *bonariensis* species complexes.

Separation of this species complex from the *atriceps* species complex would be fairly easy, based on the concave anterior border of the clypeus of the majors of the *atriceps* species complex, and the relatively short, flattened scapes of the majors of the *atriceps* species complex. Separation of members of the *maculatus* species complex from the others *Camponotus* species complexes of the New World should not present difficulties, except separation from the *picipes*, *atriceps* and *bonariensis* species complexes. Separation of members of the *maculatus* species from other *picipes* species complex is difficult, and some of the species in the *maculatus* complex were named as subspecies of *C. picipes*. The major workers can usually be recognized by the convex or straight anterior clypeal border, which is definitely concave in members of the *picipes* species complex. Additionally, the head is more elongated in members of the *maculatus* species complex. The identification of the minors or the females without the associated major workers would be difficult or impossible. It may not be possible to reliably separate the two species complexes, and they could be combined into a single complex in the future.

Members of the *maculatus* species complex can be confused with those of the *bonariensis* species complex. They are nearly always larger ants (about 10 mm total length or larger) than the smaller majors of the *bonariensis* species complex (usually less than 10 mm total length).

The New World species tentatively placed in the *maculatus* species complex include: *C. abunanus* Mann, *C. conspicuus zonatus* Emery, *C. fuscocinctus* Emery, *C. lucayanus* Wheeler, *C. maculatus*, *C. picipes guatemalensis* Forel, *C. picipes plombyi* Wheeler and Mann, *C. pullatus* Mayr, *C. santosi* Forel, *C. simillimus indianus* Forel, *C. substitutus coloratus* Forel, *C. taniae* and *C. tortuganus* Emery. *Camponotus variegatus* (Smith) does not occur in the New World nor Hawaii (see Hansen & Klotz 2005:98-99 and Kirschenbaum & Grace 2007) and specimens are here referred to as *C. maculatus*, until the Old World species can be clarified.

The following key will separate the majors and often the minors of the New World members of the *maculatus* species complex:

1. Cheek and shaft of scape lacking erect or suberect hairs (rarely 1 or 2 may be present on cheek near base of mandible, and even on shaft of scape, especially in specimens from the Carribean).2
 - Cheek with erect or suberect hairs, at least near base of mandible; shaft of scape often with erect hairs 6
- 2(1). Antennal scape of major extending well past posterior lateral corner; widely distributed and common3
 - Antennal scape of major barely reaching posterior lateral corner; known only from type locality in Rondônia, Brasil *abunanus* Mann
- 3(2). Florida, México, south to Brasil 4
 - Washington, Oregon and Hawaii *maculatus* (Fabricius)
- 4(3). Head of minor (above it is written that the key will allow to separate majors. not noticeably narrower posteriorly (except posterior to eyes); widely distributed from Florida south to southern Brasil, not reported from Paraguay 5
 - Head of minor noticeably narrowed posteriorly; known only from Paraguay *taniae* Mackay and Delsinne
- 5(4). Mostly brown, gaster usually with lateral yellow splotches or transverse bands on each tergum; USA (Florida) south to Brasil, Caribbean
 -*conspicuus zonatus* Emery
 - Concolorous very dark reddish brown to black; México south to Brasil and Bolivia *simillimus indianus* Forel
- 6(1). Shaft of scape without erect hairs (few present at apex) 7
 - Shaft of scape with at least a few erect hairs, often with abundant erect hairs 9
- 7(6). Side of pronotum and dorsum of gaster moderately smooth and glossy 8
 - Side of pronotum and dorsum of gaster sculptured and dull to weakly shining; México south to Guatemala *pullatus* Mayr
- 8(7). Areas between punctures on mandibles smooth and glossy; México, Guatemala and Colombia*picipes guatemalensis* Forel

- Areas between punctures on mandibles finely striated and dull; México south to Argentina, Cuba, Aruba..... *substitutus coloratus* Forel 9(6). Shaft of scape with more than 20 erect or suberect hairs 10
- Shaft of scape with fewer than 20 such hairs 11
- 10(9). Area between punctures near base of mandibular teeth weakly sculptured, smooth and moderately shining; Bahamas *tortuganus* Emery
- Area between these punctures striated and sculptured; Hispaniola, Bahamas *lucayanus* Wheeler
- 11(9). Clypeal carina sharp, well defined; continental South America *fuscocinctus* Emery
- Clypeal carina poorly defined, dull and interrupted; Caribbean Islands 12
- 12(11). Propodeum depressed and flattened below level of mesonotum; Bahamas, Cuba, Hispaniola *picipes plombyi* Wheeler and Mann
- Propodeum at same level and continuous with mesonotum 13
- 13(12). Mesonotum and dorsal face of propodeum flattened, in nearly same plane; Cuba *santosi* Forel
- Mesonotum and dorsal face of propodeum broadly arched; México south to Argentina, not reported from Cuba *substitutus* Emery

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REFERENCES

- Hansen, L. D. & J. H. Klotz. 2005. Carpenter Ants of the United States and Canada. Comstock Publishing Associates, xiii + 204 pp.
- Kirschenbaum, R. & J. K. Grace. 2007. Dominant ant species in four habitats in Hawaii (Hymenoptera: Formicidae). *Sociobiology* 50:1069-1073.

Mereles, M. F. 2005. Una aproximación al conocimiento de las formaciones vegetales del Chaco boreal, Paraguay. *Rojasiana* 6: 5-48.

