

New Species of *Pheidole* (Hymenoptera: Formicidae) From Guyana, With a List of Species Known From the Country

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ABSTRACT

Two new species of *Pheidole* from Guyana are described, *P. funki* LaPolla and *P. schultzi* LaPolla. One species, *P. funki*, belongs to the *scrobifera*-group and is only the second member of the species-group known from South America. The other species, *P. schultzi*, belongs to the *tachigaliae*-group. *P. tachigaliae* is also illustrated to identify morphological differences with *P. schultzi*. Modified versions of Wilson's (2003) key are provided. Recent biotic survey work across Guyana revealed that at least 86 *Pheidole* species are present in the country.

Keywords: Formicidae, Guyana, Myrmecinae, *Pheidole*, *scrobifera*-group, *tachigaliae*-group.

INTRODUCTION

The ant genus *Pheidole* is cosmopolitan, with nearly 900 species distributed around the world (Wilson 2003). *Pheidole* is a common component of most ant faunas. Wilson (2003) appropriately called *Pheidole* "hyperdiverse" with 624 species described from the New World alone in his recent monograph of the genus. *Pheidole* species are found in rainforests to deserts from habitats such the leaf litter to forest canopies. As Wilson (2003) stated, the genus has undergone an adaptive radiation into a wide array of ecological niches, and this in part explains their tremendous species diversity.

Wilson anticipated that new *Pheidole* species remained to be discovered in the New World. In fact, new species continued to come to him even as he finished his monograph. Recent biotic survey work in Guyana provides further evidence that more *Pheidole* species await discovery. Here we describe two new species of *Pheidole* from Guyana. We also provide a list of *Pheidole* currently known from Guyana, though many species could not be identified because they are known only from minors (see discussion). At least 86 *Pheidole* species are now known from Guyana (table 1). Wilson established 19 species-groups, though the groups await phylogenetic analysis to test questions of monophyly. The two new species here described are from two species-groups: one from the *scrobifera*-group (previously with 12 species) and the other from the *tachigaliae*-group (previously with 5 species).

MATERIALS AND METHODS

Specimens are deposited in the following institutions:

MCZC — Museum of Comparative Zoology, Cambridge, Massachusetts, USA

UGBC — Centre for the Study of Biological Diversity, University of Guyana,
Georgetown, Guyana

USNM — National Museum of Natural History, Washington, D.C., USA

Examination and measurement of specimens was completed at various magnifications using a light microscope (Leica Wild M10) and recorded to the nearest 0.001 mm. All measurements are given in millimeters, unless noted otherwise. Specimens were photographed using a JVC KY-F70B video camera mounted on a Leica M420 microscope and attached to an IBM Intellistation M Pro computer, on which composite images were assembled using Auto-Montage Version 3.04 software (Synoptics Ltd.). Morphological terminology employed throughout follows Bolton (1994), with modifications where noted. Anatomical abbreviations are elaborated here:

TL — Total Length: HL+ML+GL.

HL — Head length: the length of the head proper, excluding the mandibles; measured in full-face view from the midpoint of the anterior clypeal margin to a line drawn across the posterior margin from its highest points (to accommodate species where the posterior margin is concave).

HW — Head Width: the maximum width of the head in full-face view (excluding the portion of the eyes that extend past the lateral sides of the head).

SL — Scape Length: the maximum straight line of the antennal scape excluding the condylar bulb.

ML — Mesosoma Length: the length of the mesosoma (=alitrunk) in lateral view from the anterior most point of the pronotum (including the "neck" of the pronotum) to the posteriormost point of the metapleuron.

PW — Pronotal Width: the maximum width of the pronotum in dorsal view.

GL — Gaster Length: the length of the gaster in lateral view from the anteriormost point of first gastral segment (third abdominal segment) to the posteriormost point.

CI — Cephalic Index: $HW \cdot 100/HL$

SI — Scape Index: $SL \cdot 100/HW$

***Pheidole funki* LaPolla, new species**

Major worker (fig. 1)

Holotype.— Major worker, GUYANA: Iwokrama Forest Reserve, Whitewater Camp, elev. 60 m, 58°50.992' W, 4°43.89' N, 5 November 2002 (J.S. LaPolla et al.) (UGBC).

Diagnosis.— Major worker. 12-segmented antennae; antennal scrobes present; overall color reddish brown; in full-face view, thick rugoreticulae cover head; scrobes long, roughly "S" shaped.

Description.— Major worker. Matching general characteristics of the *scrobifera*-group as defined by Wilson (2003). *Head*: Reddish-brown, darker anteriorly and along mandibular margins; in full-face view, thick rugoreticulae stretch from frontal lobes toward the posterior margin, though not reaching pos-

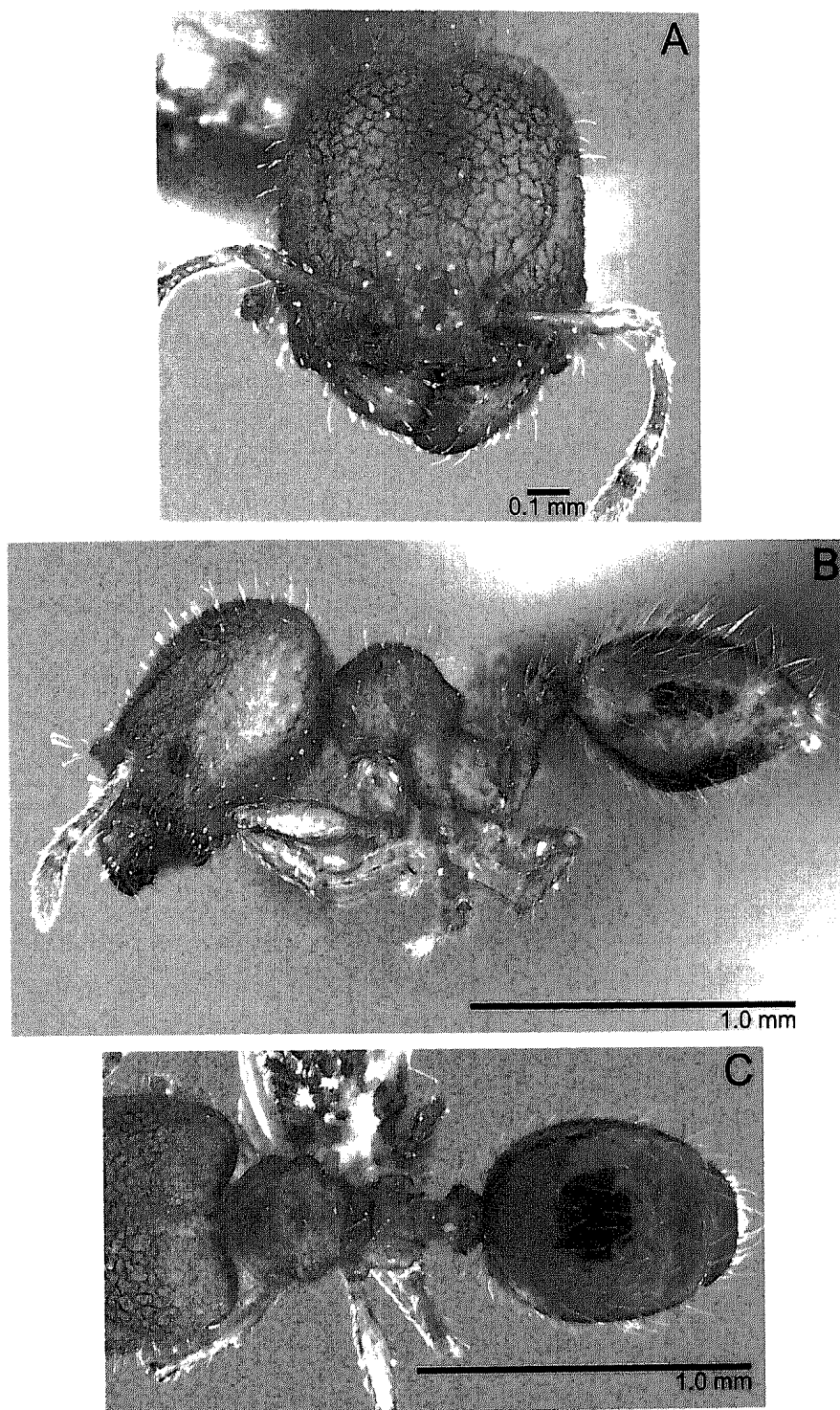


Figure 1. Holotype major of *Pheidole funki*. A) head in full frontal view; B) in lateral view; C) mesosoma in dorsal view.

terior margin; posterior corners with many foveolae as rugoreticulae fail to reach posterior margin; covered in scattered erect hairs; scrobes long, loosely "S" shaped; scapes reach posterior end of scrobes; scapes with many suberect to erect hairs; posterior margin concave medially. Ventral side of head relatively free of rugoreticulae, except anteroventrally toward mandibles. *Mesosoma and Gaster*: Reddish-brown, legs lighter; covered in foveolae; erect hairs largely on dorsum, with scattered hairs placed laterally; pronotal dorsum with slight rugulae; mesonotal

convexity slightly developed; propodeal spines at near right angles to propodeum; in dorsal view, postpetiole roughly diamond-shaped; gaster shining, darker than head and mesosoma, with erect hairs throughout.

Etymology.— Named in honor of Vicki A. Funk, botanist (USNM), who has worked tirelessly to promote the discovery, documentation, and conservation of the Guiana Shield's biological diversity.

Measurements.— Holotype major worker. TL: 2.29; HL: 0.798; HW: 0.783; SL: 0.391; ML: 0.673; PW: 0.391; GL: 0.814; CI: 98; SI: 50.

Comments.— This species clearly belongs to the *scrobifera*-group as defined by Wilson (2003). *P. funki* possesses 12-segmented antennae coupled with distinct scrobes. It is only the second species of the group to be found in South America. *P. peckorum* is known from a single locality in Ecuador. One species is found in Cuba (*P. cubaensis*), while the remainder of species are known only from Central America.

The single specimen known for this species was collected in a leaf litter sample extracted in a mini-Winkler. The leaf litter sample was collected in old-growth lowland rainforest. Other species in the *scrobifera*-group are known to be soil and rotting wood nesting species. *P. scrobifera* has been observed foraging at night. Another *scrobifera*-group species from Costa Rica, *P. simonsi*, has been found with seed caches in their nests, but they are not restricted to granivory, as workers readily recruited to different kinds of baits (Wilson 2003). Other than being collected from leaf litter, nothing is known of *P. funki*'s biology.

MODIFIED VERSION OF WILSON (2003) KEY

Pheidole funki would key out to *P. peckorum*. The key can be modified as below to include *P. funki*. Numbering of key follows Wilson (2003).

- 2 Major: in full-face view, posterior margin (= occiput) free of rugoreticulae, in contrast with rest of head capsule, which (exclusive of center of the clypeus) is entirely rugoreticulate **3**
- Major: posterior margin (= occiput) in full-face view rugoreticulate or longitudinally carinate **4** (couplet 3 in Wilson)
- 3 Major: in lateral view, most of dorsal profile of the head, from the anterior clypeal margin (= clypeal border) to the level of the posterior margin of the antennal scrobe, bears a dense row of very short, perfectly erect hairs, all approximately equal in length like the teeth of a comb *peckorum*
- Major: in lateral view, most of dorsal profile of the head, from the anterior clypeal margin (= clypeal border) to the level of the posterior margin of the antennal scrobe, bears erect hairs that become gradually longer toward posterior margin *funki*

***Pheidole schultzi* LaPolla, new species**

Major worker (fig. 2); minor worker (fig. 3)

Holotype.— Major worker, GUYANA: Mt. Ayanganna, *Dicymbe* Camp, Mount Ayanganna, 5°17.760'N, 59°54.632'W, elev. 717 m, 6 October 2002 (J.S. LaPolla et al.) (UGBC); 3 paratype majors, 3 paratype minors from same locality as holotype (MCZC, USNM); 5 paratype majors from GUYANA: Iwokrama Forest Reserve, Whitewater Camp, elev. 60 m; 58°50.992' W, 4°43.89' N, 5 November 2002 (J.S. LaPolla et al.) (USNM); 1 paratype major from GUYANA: Mt. Ayanganna Base Camp; elev. 732 m; 59°55.486' W, 5°20.063' N; 9 October 2002 (J.S. LaPolla et al.) (USNM).

Diagnosis.— Major worker. 11-segmented antennae; antennal scrobes present; in full-face view head roughly heart-shaped; Minor worker. Head and mesosoma covered in foveolae.

Description.— Matching general characteristics of the *tachigaliae*-group (11-segmented antennae and antennal scrobes) as defined by Wilson (2003). Major worker. *Head*: light brown, scapes yellowish-brown; in full-face view, head covered by parallel longitudinal carinulae; foveolae in between carinulae; head roughly heart-shaped; covered in scattered erect hairs; posterior margin concave medially. *Mesosoma and Gaster*: light brown, legs yellowish-brown; mesosoma, petiole, postpetiole, and gaster covered in foveolae; sparse erect hairs on mesosomal dorsum, more concentrated on pronotal dorsum; propodeal spines short, directed backwards; in dorsal view, postpetiole subrectangular; gaster shining, covered in a scattered layer of erect hairs; gaster yellowish-brown, with darker band encircling center.

Minor worker. Head: yellow; covered in foveolae; with scattered erect hairs; scapes reach to slightly surpass posterior margin. *Mesosoma and Gaster*: yellow; covered in foveolae; with scattered erect hairs; gaster shining, yellowish-brown.

Etymology.— Named in honor of Ted R. Schultz for his many contributions to myrmecology.

Measurements.— Holotype major worker. TL: 1.78; HL: 0.579; HW: 0.642; SL: 0.344; ML: 0.563; PW: 0.344; GL: 0.642; CI: 111; SI: 54.

Paratype minor worker. TL: 1.156; HL: 0.375; HW: 0.376; SL: 0.344; ML: 0.391; PW: 0.250; GL: 0.390; CI: 100; SI: 91.

Comments.— Within the *tachigaliae*-group, *P. schultzi* is only likely to be confused with *P. tachigaliae* (all other species have 11-segmented antennae and transverse carinulae)(compare figs. 2 and 4). This species can be distinguished from *P. tachigaliae* based on overall head shape: *P. schultzi*'s roughly heart-shaped head is very distinct. Additionally, the species is less hairy than *P. tachigaliae* and the major of *P. schultzi* lacks carinulae on the anterior pronotum. Finally, the scrobes of *P. schultzi* are much more weakly defined than in *P. tachigaliae*.

Wilson (2003) suggested that the *tachigaliae* species-group consists of two lineages: *P. tachigaliae* and the remaining species (*P. dorsata*, *P. gibbata*, *P. mendicula*, and *P. pedana*) each forming clades. *Pheidole schultzi* appears to be closely related to *P. tachigaliae* because it is the only other species in the group that possesses longitudinal carinulae. All other species possess transverse carinulae.

Not much is known of the biology of *tachigaliae*-group species. *P. schultzi*

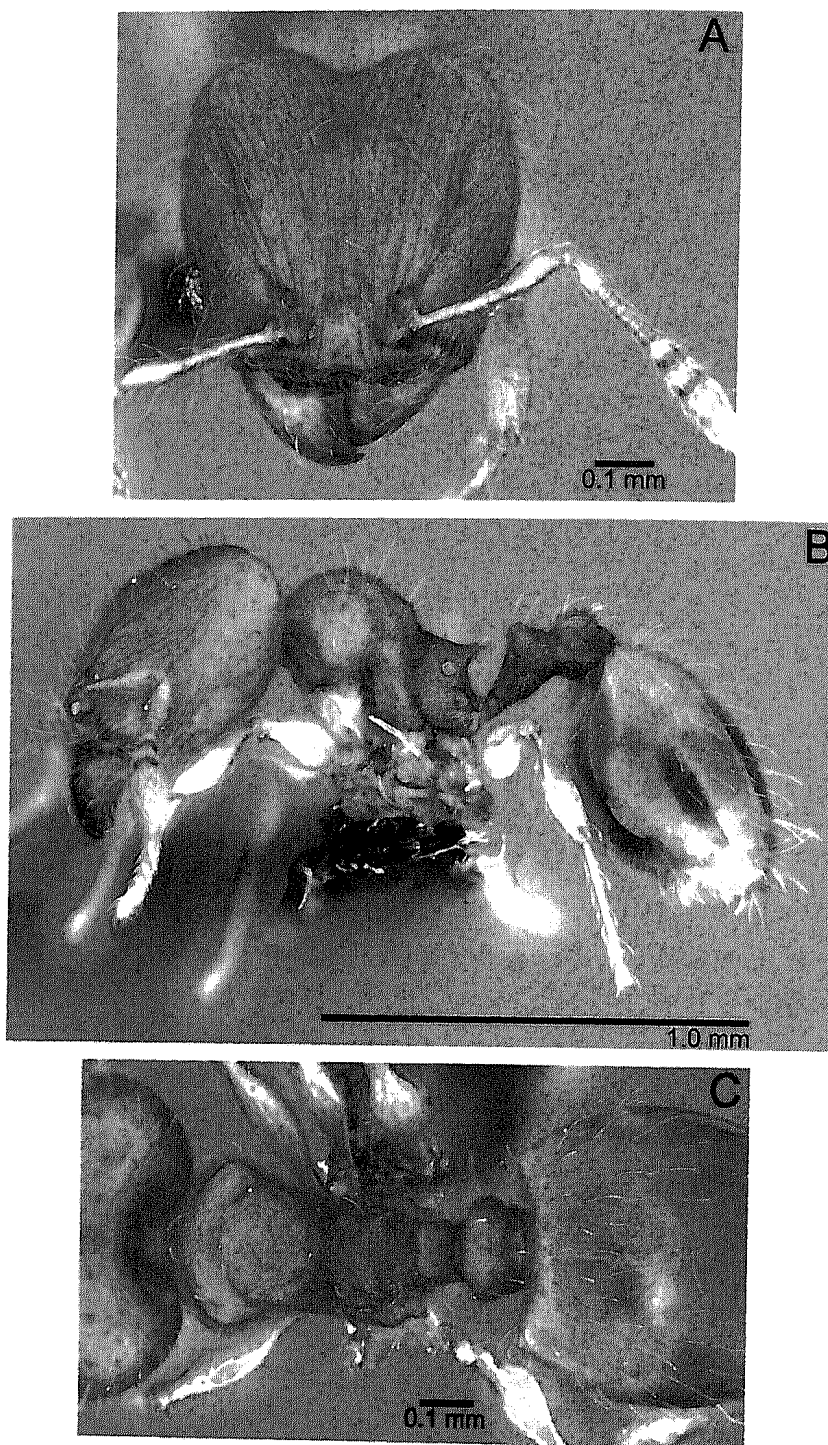


Figure 2. Holotype major of *Pheidole schultzi*. A) head in full frontal view; B) in lateral view; C) mesosoma in dorsal view.

were collected from leaf litter samples extracted in mini-Winkler bags. *P. gibbata* and *P. pedana* have both also been collected from leaf litter samples from Guyana (LaPolla et al., in review). *P. tachigaliae* is reported to nest in the leaf petioles of *Tachigalia* plants (Wheeler 1921). *P. mendicula* has been reported from an extrafloral nectary, but it is also known to occur in rotten wood and in soil (Wilson 2003).

MODIFIED VERSION OF WILSON (2003) KEY

Numbering of key follows Wilson (2003).

- 1 Major: dorsal surface of head covered by parallel longitudinal carinulae **2** (keys to *tachigaliae* in Wilson)
 — Major: dorsal surface of head covered by parallel transverse carinulae **3** (2 in Wilson)
 2 Major: In full-face view, lateral margins of head parallel-sided, giving head a rectangular appearance ***tachigaliae***
 — Major: In full-face view, lateral margins of head not parallel-sided, instead head is roughly heart-shaped ***schultzi***

Table 1. *Pheidole* species currently known from Guyana

<i>P. ademonia</i> # ²	<i>P. subarmata</i> *
<i>P. allarmata</i> # ^{1, 2, 8}	<i>P. synarmata</i> *
<i>P. aripoensis</i> # ^{1, 2, 4, 5, 6, 8}	<i>P. tachigaliae</i> *
<i>P. biconstricta</i> ^{1, 2, 3, 4, 6, 7}	<i>P. transversostria</i> *
<i>P. carapuna</i> *	
<i>P. cataractae</i> *	(*) from Wilson (2003)
<i>P. cephalica</i> *	(#) new record for Guyana
<i>P. cocciphaga</i> *	Unmarked (with either * or #) indicates re-
<i>P. cramptoni</i> ²	corded in Wilson (2003) and also collected
<i>Pheidole</i> sp. <i>distorta</i> group# ³	during 2002 expedition.
<i>P. exigua</i> *	
<i>P. fimbriata</i> ^{4, 7}	¹ Calm Water Creek, 6°28.06'N,
<i>P. flavens</i> ^{2, 6, 7}	58°37.16'W, elev. 20 m;
<i>P. funki</i> #	² Twokrama Forest Reserve, Whitewater
<i>P. gibbata</i> # ^{1, 2, 3}	Camp, 4°43.890'N, 58°50.992'W, elev.
<i>P. mamore</i> ²	60 m;
<i>P. meinerti</i> *	³ Kanuku Mountains, near Moca-Moca,
<i>P. meinertopsis</i> # ^{2, 8}	3°17.297'N, 59°38.376'W, elev. 224 m;
<i>P. microgyna</i> *	⁴ Base Camp, Mount Ayanganna,
<i>P. minutula</i> ^{5, 7}	5°20.063'N, 59°55.486'W, elev. 732 m;
<i>P. nigricula</i> # ^{2, 5, 7}	⁵ Upper Forest, Mount Ayanganna,
<i>P. nitella</i> # ²	5°22.483'N, 59°57.969'W, elev. 1300
<i>P. pedana</i> # ^{1, 2, 5, 6, 8}	m;
<i>P. perpusilla</i> ⁴	⁶ Dicymbe Camp, Mount Ayanganna,
<i>P. prostrata</i> # ^{1, 8}	5°17.760'N, 59°54.632'W, elev. 717 m;
<i>P. rugiceps</i> # ⁷	⁷ Falls Camp, Mount Ayanganna,
<i>P. ruida</i> # ^{1, 2, 3, 4, 5, 6, 7, 8}	5°22.332'N, 59°57.563'W, elev. 1134;
<i>P. schultzi</i> # ^{2, 4, 6}	⁸ Mabura Hill; 5°09.313'N, 58°41.982'W;
<i>P. scolioceps</i> # ³	elev. 64 m.
<i>P. socrates</i>	
<i>P. sospes</i> # ²	

There are a further 51 *Pheidole* species known from Guyana known only from the minor caste. Most of these more than likely represent described species, but due to the difficulty and uncertainty in identifying the minors of many species, they could not be given a name. Some species, however, undoubtedly represent additional new species, but will need to await the discovery of nest series with associated majors to properly describe them. Another possibility being investigated by one of us (JSL) is the use of DNA barcoding (Hebert et al. 2003) to identify minors with barcodes from majors.

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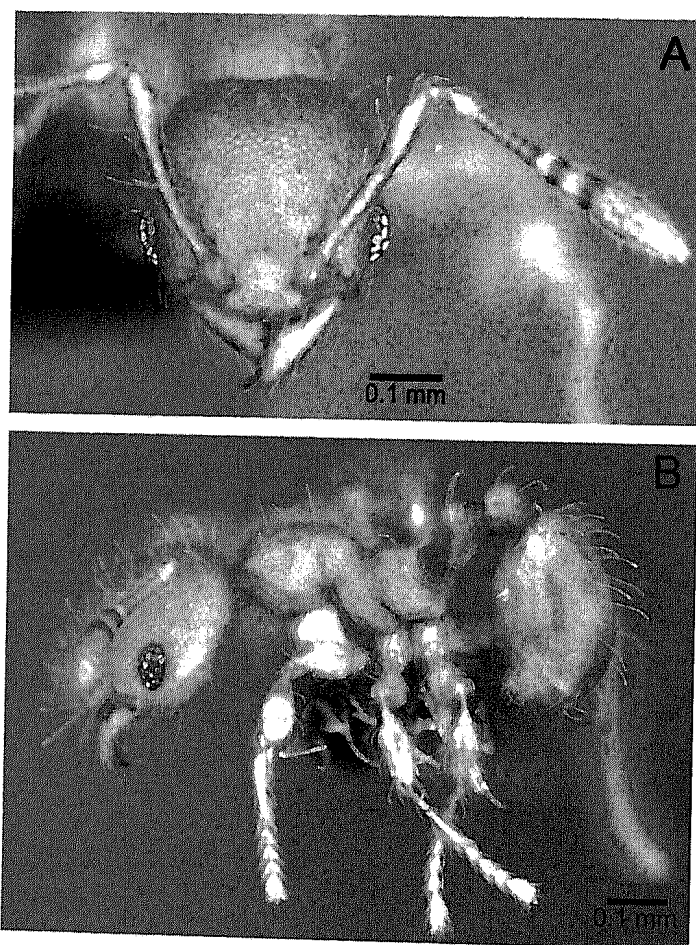


Figure 3. Paratype minor of *Pheidole schultzi*. A) head in full frontal view; B) in lateral view.

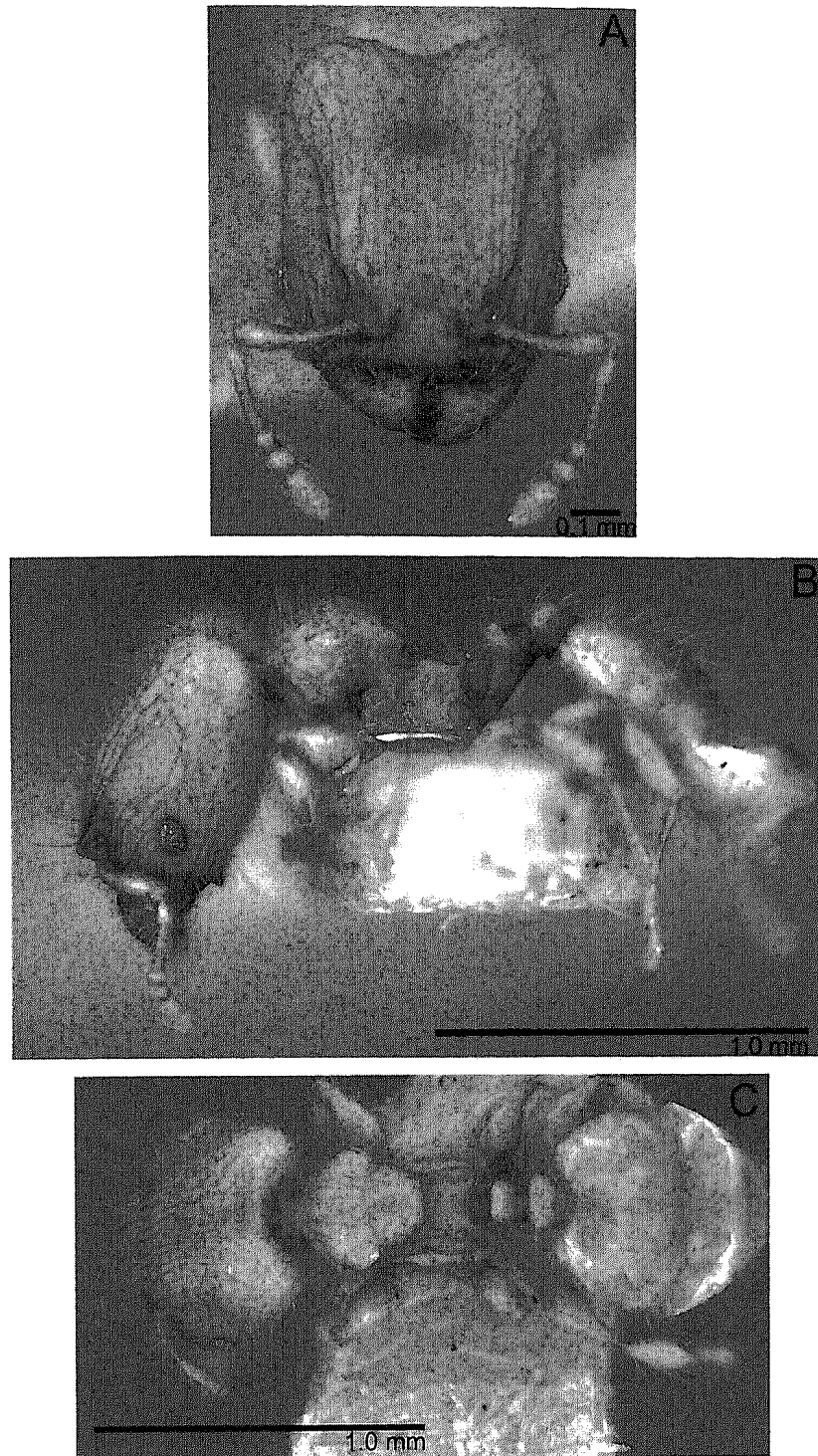


Figure 4. Major of *Pheidole tachigaliae* (part of former syntypic series). A) head in full frontal view; B) in lateral view; C) mesosoma in dorsal view.

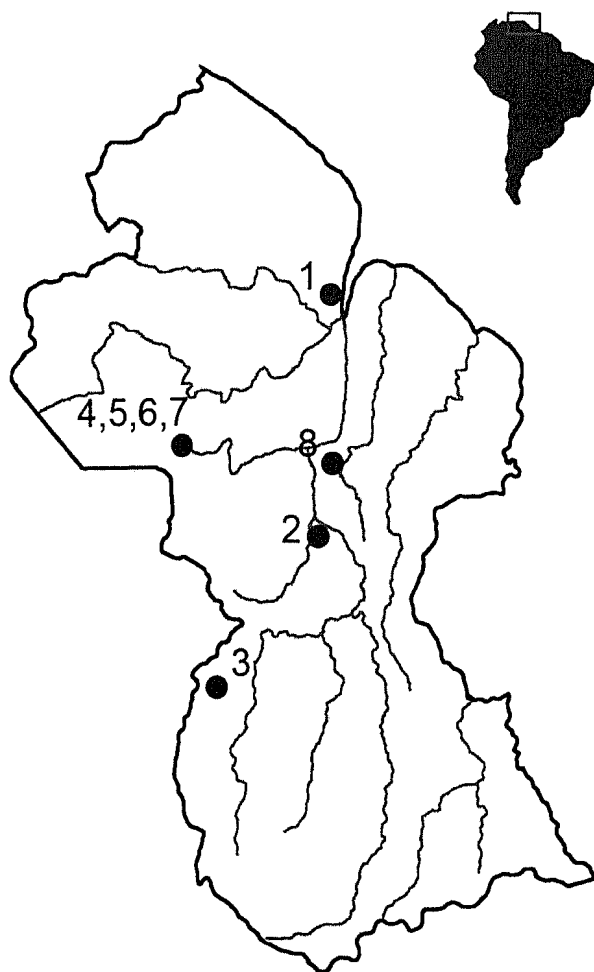


Figure 5. Map of Guyana indicating collecting localities.

- 1) Calm Water Creek, 6° 28.06'N, 58°37.16'W, elev. 20 m;
- 2) Iwokrama Forest Reserve, Whitewater Camp, 4° 43.890'N, 58°50.992'W, elev. 60 m;
- 3) Kanuku Mountains, near Moca-Moca, 3° 17.297'N, 59°38.376'W, elev. 224 m;
- 4, 5, 6 and 7) Base Camp, Mount Ayanganna, 5° 20.063'N, 59°55.486'W, elev. 732 m;
Upper Forest, Mount Ayanganna, 5°22.483'N, 59°57.969'W, elev. 1300 m; *Dicymbe*
Camp, Mount Ayanganna, 5°17.760'N, 59°54.632'W, elev. 717 m; Falls Camp,
Mount Ayanganna, 5°22.332'N, 59°57.563'W, elev. 1134;
- 8) Mabura Hill; 5°09.313'N, 58°41.982'W; elev. 64 m.