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Description of two new species in the Neotropical *Pachycondyla foetida* complex (Hymenoptera: Formicidae: Ponerinae) and taxonomic notes on the genus

Itanna Oliveira FERNANDES, Marcio Luiz De OLIVEIRA & Jacques Hubert Charles DELABIE

Abstract

The genus *Pachycondyla* was recently revised for the New World by MACKAY & MACKAY (2010), and the *P. foetida* species complex is the second largest group in terms of number of species. We add two new species to this complex: *Pachycondyla bactronica* sp.n. and *Pachycondyla billemma* sp.n., and describe the previously unknown males of *P. curvinodis* FOREL, 1899 and *P. inversa* (F. SMITH, 1858). Furthermore, we designate lectotypes for *P. villosa* (FABRICIUS, 1804) and *P. inversa*. We also provide taxonomic keys for workers, queens and males of the species in the Neotropical Region, and add information on the distribution of this species complex in Brazil. The expanded complex now consists of seven species in Brazil and 13 species for the Neotropics.

Key words: Identification key, Brazil, ants, lectotypes, designations, new species.

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Itanna Oliveira Fernandes (contact author) & Marcio Luiz De Oliveira, Programa de Pós-Graduação em Entomologia – PPGENT, Instituto Nacional de Pesquisas da Amazônia – INPA, Av. André Araujo, 2936, Petrópolis, 69080-971, Cx. Postal 2223, Manaus – AM, Brazil. E-mail: itanna.fernandes@gmail.com

Jacques Hubert Charles Delabie, Centro de Pesquisas do Cacau – CEPEC, Laboratório de Mirmecologia, UESC / CEPLAC, Rod. Ilhéus / Itabuna, 45600-000, Cx. Postal 7, Ilhéus – BA, Brazil.

Introduction

Probably paraphyletic (SCHMIDT 2013) in its current status (KELLER 2011, MARIANO & al. 2012), the genus *Pachycondyla* F. SMITH, 1858 has a pantropical distribution, with 380 species and subspecies (BOLTON & al. 2007, MACKAY & MACKAY 2010) and is the largest genus in the subfamily Ponerinae. Its New World members were recently revised and divided into 18 species complexes by MACKAY & MACKAY (2010). The *P. foetida* species complex has eleven New World species, and it is the second largest in number of species within the genus.

The taxonomic status of the *Pachycondyla foetida* species complex remains unclear. One problem is that it contains two undescribed species similar to *P. villosa* (FABRICIUS, 1804) and *P. inversa* (F. SMITH, 1858). These species, which have been generally confused by many authors in the last two decades, have served as subjects of comparative studies (HEINZE 1993, HEINZE & al. 2001, TRUNZER & al. 1998, KOLMER & HEINZE 2000, KOLMER & al. 2002, LUCAS & al. 2002, MARIANO & al. 2006, D'ETTORRE & al. 2005).

The objective of this study is to improve the taxonomic resolution of the *Pachycondyla foetida* species complex by consulting the type material of *P. inversa* and two syntypes of *P. villosa* (one queen and one worker), redescribing some of the species, expanding the known geographical distributions of the species, describing two new species for Brazil and presenting an identification key for workers, queens and males occurring in the Neotropical Region.

Materials and methods

The type material of *Pachycondyla inversa* (worker) belonging to the BMNH (The British Museum of Natural History, London, U.K.), and two syntypes of *P. villosa* (one queen and one worker), belonging to the ZMUC (Zoological Museum University of Copenhagen, Denmark), were consulted. We examined material deposited in the following collections:

BMNH The British Museum of Natural History, London, U.K.
CPDC Coleção do Laboratório de Mirmecologia, Centro de Pesquisas do Cacau, Ilhéus, Bahia, Brazil.
DZUP Departamento de Zoologia da Universidade do Paraná, Curitiba, Brazil.
ESALQ Escola Superior de Agricultura "Luiz de Queiróz", Piracicaba, São Paulo, Brazil.
INPA Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil.
MPEG Museu Paraense Emílio Goeldi, Belém, Pará, Brazil.
MZSP Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil.
UFMG Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil.
UNICAMP Universidade de Campinas, São Paulo, Brazil.
ZMUC Zoological Museum University of Copenhagen, Denmark.

The type material of the newly described species was deposited in the following collections: CPDC, INPA, MPEG, MZSP, and NHMW (Natural History Museum Vienna, Austria).

Field collections were made in order to improve the representation in collections of the different castes of each species. These field collections were realized in Itacoatiara (state of Amazonas) (03° 06' 16.6" S, 58° 28' 44.0" W), and in the Reserva Florestal Adolpho Ducke - RFAD, Manaus (state of Amazonas) (02° 55' 46.9" S, 59° 58' 28.5" W) in Northern Brazil. Another field collection was made in Campinas (22° 49' 32.9" S, 47° 06' 17.7" W) in Mata de Santa Genebra (state of São Paulo) in southern Brazil. The material collected was deposited in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia – INPA (Brazil).

We examined 860 specimens of the *Pachycondyla foetida* species complex occurring in Brazil: *Pachycondyla bactronica* sp.n., *P. billemma* sp.n., *P. foetida* (LINNAEUS, 1758), *P. villosa*, *P. inversa*, and *P. curvinodis* FOREL, 1899, and 152 specimens of the *P. foetida* species complex of the Neotropical Region.

The species were identified using a Zeiss Discovery V12 stereoscopic microscope. All measurements were taken under various magnifications using a Leica M165C digital camera.

Digital color images were made using a Leica M165C stereomicroscope with a digital camera using various powers (1×, 2×, 6×, 8× and 10×) under a white light lamp. The measurements are given in millimeters, recorded to the nearest 0.001 mm and organized with Auto-Montage ZP (v. 5.0) software. The images (Figs. 1 - 115) were edited in Adobe Photoshop CS3. We follow the morphological terminology of SERNA & MACKAY (2010), MACKAY & MACKAY (2010) and YOSHIMURA & FISHER (2012) with the following abbreviations: (☿) worker, (♀) queen, (♂) male and (l) larva.

Measurements and indices:

HL Head length. In full-face view, the midline distance from level of maximum posterior projection of posterior margin of head to level of most anterior projection of anterior clypeal margin.

HW Head width. In full-face view, the maximum width of head posterior to compound eyes.

NHl Nodal height lateral. In lateral view, the distance from lower edge of petiolar sternite to apex of petiolar tergite (node), taken as a vertical measurement perpendicular to the longitudinal axis of the petiole.

NIl Nodal Index lateral. NLl / NHl × 100.

NLd Nodal length dorsal. In dorsal view, measured from anterior to posterior face of petiole.

NLl Nodal length lateral. In lateral view, the maximum longitudinal distance between anterior and posterior extremes of petiolar node, excluding anterior and posterior condyles.

NWd Nodal width dorsal. In dorsal view, maximum width of petiolar node in dorsal view, measured side to side.

PW Pronotal width. In dorsal view, the maximum width of pronotum, measured from side to side.

SI Scape Index. SL / HW × 100.

SL Scape length. In frontal view, measured from apex of first antennal segment to base.

WL Weber's length. In lateral view, the distance between anterior margin of pronotum to posterior margin of metapleura.

Results

Key to workers of *Pachycondyla foetida* species complex (adapted from MACKAY & MACKAY 2010)

1 Side of petiole with horizontal striae (Fig. 62). 2

– Side of petiole without horizontal striae (Figs. 21, 35, 69). 4

2 Dorsum of head with coarse striae, much different than surrounding sculpture; Mexico south to Panama. ..... *P. lineaticeps*

– Dorsum of head without coarse striae, if striae present sculpture similar across entire dorsum of head. 3

3 Posterior face of petiole completely covered with coarse, transverse striae (Fig. 63); Mexico south to Bolivia. ..... *P. foetida*

– Posterior face of petiole without striae, or with poorly defined striae; Costa Rica to Brazil. .... *P. theresiae*

4 Anterior face of petiole clearly concave (Figs. 21, 35, 69). 5

– Anterior face of petiole straight, vertical, or slightly curved at apex (Figs. 6, 89). 7

5 Posterior face of propodeum laterally without dentate edge (Figs. 64, 67); anterior face of petiole in lateral view strongly concave (Figs. 64, 69); anterodorsal part of petiolar node in dorsal view weakly marked (Fig. 70); SL < 2.39 mm; Mexico south to southern Brazil. ..... *P. inversa*

– Posterior face of propodeum laterally with dentate edge (Figs. 15, 19, 30, 33); anterior face of petiole in lateral view weakly concave (Figs. 15, 20, 30, 35); anterodorsal part of petiolar node in dorsal view strongly produced (Figs. 22, 36); SL > 2.40 mm. 6

6 Median portion of clypeus with strong transversal striation (Fig. 17); pronotal carina poorly developed (not reaching the mesonotum) (Figs. 18, 19); petiole with striae on anterior face (Fig. 20); northern to southeastern Brazil. .... *P. billemma* sp.n.

– Median portion of clypeus with strong longitudinal striation (Fig. 32); pronotal carina well developed (Fig. 33); petiole without striae on anterior face (Fig. 35); Nicaragua to southern Brazil. . ..... *P. curvinodis*

7 Pronotal carina inconspicuous (carina lacking); known only from Huánuco, Peru..... *P. zuparkoi*

– Pronotal carina sharp (Figs. 4, 5, 87, 88). 8

8 Clypeus covered by longitudinal striae; known only from Costa Rica. ..... *P. dismarginata*

– Clypeus striate on the anteromedial area (Figs. 3, 86). 9

9 Anteromedial area of clypeus with conspicuous horizontal striae; known only from Costa Rica. . ..... *P. insignis*

– Anteromedial area of clypeus with longitudinal striae or with fine striae obliquely angled (Figs. 3, 86). 10

10 Medial part of clypeus with longitudinal ditch or furrow surrounded by longitudinal striae; known only from Heredia, Costa Rica. ..... *P. solisi*

– Medial part of clypeus without longitudinal ditch or furrow surrounded by longitudinal striae. 11

11 Relatively small, head width < 2.00 mm, rarely collected; Nicaragua south to Ecuador. .... *P. bugabensis*

– Relatively large, head width > 2.00 mm. 12

12 Posterior face of the petiole convex (Figs. 89, 90); clypeus with coarse striae; anterior margin of clypeus concave medially (Fig. 86); southern United States to Paraguay. ..... *P. villosa*

– Posterior face of the petiole nearly convex (Figs. 6, 7); clypeus finely striate; anterior margin of clypeus rounded and moderately convex (Fig. 3); petiole longer than high in lateral view (Fig. 6); Costa Rica to southern Brazil. .... *P. bactronica* sp.n.

Key to queens of *Pachycondyla foetida* species complex (adapted from MACKAY & MACKAY 2010)

1 Anterior face of petiole vertical or slightly curved at apex (Fig. 97). 2

– Anterior face of petiole concave (Figs. 27, 41, 75). 8

2 Side of petiole with horizontal striae. 3

– Side of petiole without horizontal striae. 4

3 Posterior face of petiole completely covered with coarse, transverse striae; Mexico south to Bolivia. ..... *P. foetida*

– Posterior face of petiole without striae, or with poorly defined striae; Costa Rica to Brazil. .... *P. theresiae*

4 Pronotal carina inconspicuous (carina lacking); known only from Huánuco, Peru. ..... *P. zuparkoi*

– Pronotal carina sharp (Fig. 96). 5

5 Anteromedial area of clypeus with conspicuous horizontal striae; known only from Costa Rica. . ..... *P. insignis*

– Anteromedial area of clypeus with longitudinal striae, fine striae obliquely angled or without striae (Fig. 94). 6

6 Medial part of clypeus with longitudinal ditch or furrow surrounded by longitudinal striae; known only from Heredia, Costa Rica. ..... *P. solisi*

– Medial part of clypeus without longitudinal ditch or furrow surrounded by longitudinal striae (Fig. 94). 7

7 Relatively small, head width < 2.20 mm; clypeus without striae; anterior margin of clypeus broadly convex; rarely collected, Nicaragua south to Ecuador. ..... *P. bugabensis*

– Relatively large, head width > 3.00 mm (Fig. 91); clypeus with coarse striae; anterior margin of clypeus concave medially (Fig. 94); USA south to Paraguay. ..... *P. villosa*

8 Median portion of clypeus without striation; petiole strongly concave (Figs. 73, 75); Mexico south to southern Brazil. ..... *P. inversa*

– Median portion of clypeus with striation (Figs. 25, 39). 9

9 Median portion of clypeus with strong transversal striation (Fig. 25); petiole with striae on anterior face (Fig. 28); Northern to southeastern Brazil. ..... *P. billemma* sp.n.

– Median portion of clypeus with strong longitudinal striation (Fig. 39); petiole without striae on anterior face (Fig. 41); Nicaragua to southern Brazil. ..... *P. curvinodis*

Key to males of *Pachycondyla foetida* species complex (adapted from MACKAY & MACKAY 2010)

1 Head length > 1.30 mm; head width > 1.80 mm. 2

– Head length < 1.31 mm; head width < 1.81 mm. 3

2 Ocelli relatively small (maximum diameter of medial ocellus 0.18 mm), medial ocellus separated from lateral ocellus by slightly less than one diameter; Nicaragua south to Ecuador. .... *P. bugabensis*

– Ocelli large (maximum diameter of medial ocellus 0.25 mm), medial ocellus located less than one diameter from lateral ocellus, maximum diameter greater than greatest width of scape; Mexico south to Panama. ..... *P. lineaticeps*

3 Posteropropodeum with strong striation; USA south to Paraguay (Fig. 101). ..... *P. villosa*

– Posteropropodeum without striation (Figs. 10, 47, 52, 79). 4

4 Anterior face of petiole vertical, sternopetiolar process poorly developed; posteropropodeum strongly concave; Costa Rica to southern Brazil (Figs. 8, 10, 13). ..... *P. bactronica* sp.n.

– Anterior face of petiole concave, sternopetiolar process well developed; posteropropodeum slightly concave (Figs. 43, 48, 53, 55, 82). 5

5 Anterior face of petiole slightly concave, lateral face of petiole carinate; dorsopropodeum without striation; Nicaragua to south Brazil (Figs. 47, 48, 52, 55)..... *P. curvinodis*

– Anterior face of petiole strongly concave (Fig. 82); dorsopropodeum striate (Fig. 79). Mexico south to southern Brazil. ..... *P. inversa*

Diagnosis of *Pachycondyla foetida* species complex
(modified from MACKAY & MACKAY 2010)

Worker: Body surface entirely covered with dense pubescence and golden hairs; palps covered by sparse pubescence, with palpal formula 4:4; malar carina well-developed; eyes large and oval (0.77 - 0.82 mm) located on anterior half of head; lateral pronotal carina well developed with exception of *Pachycondyla zuparkoi* (lacking carina) and *P. billemma* sp.n. (not reaching the mesonotum); notopropodeal groove deep, well-marked on mesosomal dorsum; petiole subquadrate in lateral view, with anterior face vertical or concave, and posterior face broadly rounded; stridulatory file on abdominal pretergite IV well developed.

Queen: Very similar to worker, except for malar carina sharper than in worker; mandibles slightly opaque; sharp pronotal carina; well developed scutum and scutellum reduced; well marked mesometanotal and metanotal-propodeal grooves; gaster larger than in the worker.

Male: Body surface covered entirely with golden-silver pubescence and erect golden hairs; body black or brown; yellowish, brown or black legs; palps covered by sparse pubescence, with palpal formula 6:4; eye well developed and expanded dorsolaterally; fine carina present between insertion of antennae; malar carina absent; clypeus convex medially; lateral pronotal carina absent; parapsidal sutures and mayrian sutures present on the scutum; well-marked mesometanotal and metanotal-propodeal grooves; petiole rounded dorsally in lateral view, more smaller and slender than in workers; gaster black or yellowish; stridulatory file of abdominal pretergite IV well-developed; parameres well-developed with apex round and sparse hairs on surface; ventral margin of parameres concave; aedeagus with tiny teeth on ventral margin, and with hairs on dorsal margin; cuspis of volsella elongated and curving ventrally, with round apex and numerous hairs in ventral view; digitus meeting the teeth on ventral surface.

The workers and queens can be easily differentiated from those of the other species complexes by the combination of the following features: notopropodeal groove deep and well-marked on the mesosomal dorsum; pronotal carina well-developed; petiole subquadrate, with well-developed lateral carina; body surface entirely covered with dense pubescence and golden erect hairs. The males can be differentiated by the combination of the following features: carina present between the antennal insertions; pronotal carina absent; body surface entirely covered with dense pubescence and golden erect hairs. No significant differences in the morphology of male genitalia were observed among the species of the *Pachycondyla foetida* species complex.

Descriptions of species

***Pachycondyla bactronica* sp.n.** (Figs. 1 - 14, 106, 107)

Pachycondyla "*subversa*" LUCAS & al. 2002: 256, figs. 1c, 2, 3 (unavailable name); BOLTON & al. 2007 (provisional synonym of *P. inversa*); MACKAY & MACKAY 2010: 297 (unavailable name, material referred here, no types were designated as the authors did not intend to describe a new species, which was not listed in BOLTON & al. 2007).

Etymology: The specific name honors the field technician José Crispim Soares do Carmo who sympathetically referred to the whole *Pachycondyla* genus with his invented word "Bactronica".

Type material: Holotype (worker, MZSP): **Brazil:** Bahia, Ilhéus, CEPEC Genética, PI24 bis Phenotype 2, XI.1998, leg. D. Fresneau. **Paratypes:** Brazil: Bahia, Ilhéus, CEPEC Genética, PI24 bis Phenotype 2, XI.1998, leg. D. Fresneau, 1 ☿ (INPA); Ilhéus, #4905, 17.I.1995, leg. Arouca J., 1 ☿ (NHMW); Ilhéus, CEPEC#4587, 15.X.1986, leg. P. Terra, 1 ♂ (MZSP); Ilhéus, CEPEC#4587, 23.II. 1988, leg. P. Terra, 1 ♂ (INPA); Bahia, Ilhéus, CEPEC, XI.1998, leg. D. Fresneau, 1 ♂ (CPDC); Ilhéus, CEPEC, XI.1998, leg. D. Fresneau, 2 ☿☿ (CPDC); Ilhéus, CEPEC, 6.XI.2007, leg. A.F.R. Carmo & I. C. Nascimento, 1 ☿ (MPEG).

Additional material examined: Costa Rica: Zent Limon, AA444, 01.IX.1958, leg. F. Larae, 2 ☿☿ (MZSP). **Panama**: San Lorenzo Forest, Ibisca, Forest FTT-R1-5, 27.-28.X.2003, leg. anonymous, 1 ☿ (CPDC). **French Guiana**: Petit Saut, 08.VII.1998, leg. A. Dejean, 12 ☿☿; Petit Saut, XII.1998, leg. A. Dejean & J. Orivel, 8 ☿☿; Petit Saut, VII.1998, leg. A. Dejean, 8 ☿☿. **Brazil:** Amapá, 21.X. 1978, M.F. Torres col., 1 ☿ (CPDC). – Pará, Itaituba, Parque Nacional da Amazônia, Km 75, 17.XI.1978, leg. W.L. Overal, 1 ☿ (MPEG). – Piauí, Rio Urucui Preto, 20.II.1976, leg. R. Negrett, 2 ☿☿ (MZSP). – Sergipe, São Cristovão #5141, UFSE, 1995, leg. R. Féneron, 1 ☿; Santa Cruz dos Abais, 13.XII.1997 - 1.I.1998, leg. E.C.G. Couto, 2 ☿☿; Santa Cruz dos Abais, 8.X.1993, leg. J.H.C. Delabie, 2 ☿☿ (CPDC). – Distrito Federal, APA Gama Cabeça de Veado, II.-III.2000, leg. P. Mirelle, 2 ☿☿ (CPDC). – Bahia, Andaraí, Lençois, Fazenda Paraná, I.1993, leg. C.R. Almeida, 2 ☿☿; Andaraí, 16.III.2001. leg. J.R.M. Santos, 2 ☿☿; Barra do Rocha, 16.VIII.2000, leg. J.R.M. Santos, 2 ☿☿; Itapebi, Fazenda Guarani, 11.IV.1980, leg. F.P. Benton, 2 ☿☿; Itapebi, 30.IV.1993, leg. F. Benton, 2 ☿☿; Ilhéus, CEPEC, 15.X.1986, leg. P. Terra, 5 ☿☿; Ilhéus CEPEC, 15.X.1995, leg. A.J. Rouca, 4 ☿☿; Ilhéus, CEPEC 5261-14, 28.X.1999, leg. D. Fresneau, 4 ☿☿; Ilhéus, CEPEC, VIII.2000, leg. B. Jahyny, 4 ☿☿; Ilhéus, Praia do Norte, 7.V. 2005, leg. J.H.C. Delabie, 2 ☿☿; Ilhéus, CEPEC, II.2005, leg. W. Watkins & M. Cobb, 4 ☿☿; Ilhéus, CEPEC, 6.XI. 2007, leg. A.F.R. Carmo & I.C. Nascimento, 4 ☿☿; Itabuna, P.C.Q. da Saudade, XI.2002, leg. J.R.M. Santos, 2 ☿☿; Iatapebi, Fazenda Guarani, 11.IV.1980, leg. F.P. Benton, 1 ☿; Pau Brazil, Fazenda Indaiá, 04.XI.1988, leg. J.R.M. dos Santos, 4 ☿☿; Poções, 25.-26.I.2004, leg. E. Mariano, 2 ☿☿; Porto Seguro, 11.VIII.1998, leg. anonymous, 1 ☿; São José, Chapada Diamantina, 22.III.2001, leg. J.R.M. Santos, 1 ☿; Serra Bonita, Camacã, 12.-15.VIII.2009, leg. F.D. Santana, 2 ☿☿ (CPDC). – São Paulo, São Paulo, Ilha dos Pescadores, Ilha da Vitória, 24.III.1964, leg. anonymous, 2 ☿☿ (MZSP). – Paraná, Foz do Iguaçu, 20.-24.VIII.2000, leg. J.H.C. Delabie, 1 ☿☿ (CPDC); Morretes, IAPAR, 3.-10.XII.1984 / 10.-17.XII.1984 / 21.-8.I.1985 / 4.-11.II.1985 / 17.V.1985, leg. C.I.I.F., 10 ☿☿ (DZUP). – Santa Catarina, Florianópolis, 19.VIII.2005, leg. V. Schmidt, 1 ☿ (DZUP).

Diagnosis of worker: Head strongly punctate on frontal face; notopropodeal groove strongly marked on dorsum; petiole without striae and longer than high in lateral view (NIl > 118.00).

Description of worker: Measurements (holotype in parenthesis), paratypes, and non-types (n = 108): SL: 2.06 - 3.26 (2.96); HW: 2.25 - 3.05 (2.85); HL: 2.03 - 3.50 (3.20); PW: 1.47 - 2.17 (1.87); WL: 3.63 - 5.15 (4.93); NLd: 0.60

Figs. 1 - 7: *Pachycondyla bactronica* sp.n. (holotype worker): (1) lateral view; (2) head in frontal view; (3) clypeus and mandibles in frontal view; (4) mesosoma in lateral view; (5) mesosoma in dorsal view; (6) petiole in lateral view; (7) petiole in dorsal view.

Figs. 8 - 14: *Pachycondyla bactronica* sp.n. (paratype male): (8) lateral view; (9) head in frontal view; (10) propodeum in posterior view; (11) mesosoma in lateral view; (12) mesosoma in dorsal view; (13) petiole in lateral view; (14) petiole in dorsal view. **(next page)**


5 mm
8
1 mm
9
1 mm
10
1 mm
11
1 mm
12
0.5 mm
13
0.5 mm
14

- 1.20 (1.10); NWd: 0.96 - 1.56 (1.26); NHl: 1.00 - 1.50 (1.30); NLl: 1.27 - 1.77 (1.67); NIl: 118.00 - 127.00 (128.46); SI: 91.55 - 106.88 (103.86).

Head (Figs. 1 - 3): antennal scape relatively long (SI > 91.55 mm); mandible with nearly 15 teeth on masticatory margin; posterior margin of head moderately concave in full-face view; posterior border of head convex in lateral view; eye situated near of the anterolateral margin of head; well developed malar carina; clypeus with fine longitudinal striations medially.

Mesosoma (Figs. 1, 4, 5): tarsus of mid and hind legs brown with row of golden setae on ventral surface; pronotal carina sharp and very well developed; mesonotum broadly ovate, half the width of the pronotum; notopropodeal groove deep and developed on dorsum; well developed propodeal carina.

Petiole (Figs. 1, 4, 6, 7) longer than high in lateral view, subquadrate and robust, with basal region wider than apical in lateral view; dorsum broadly rounded in posterior view, anterior face slightly concave at apex; sternopetiolar process forming anterior bilobed keel separated by carina.

Gaster (Fig. 1): sternopostpetiolar process bilobed and not separated from postpetiole.

Sculpture, pilosity and color (Figs. 1 - 7): integument of head black and with punctations on frontal surface; golden pubescence, long and short hairs mixed on frons; antennal scape covered by golden pubescence; masticatory border black-opaque and scarcely punctate; masticatory borders of mandible with short golden hairs; integument of mesosoma black, scarcely punctate; anterior basitarsus and tarsus of the foreleg with dense golden pubescence on ventral surface; arolium brown; integument of petiole brown and scarcely punctate; integument of gaster brown and punctate; tergites covered with golden pubescence and long golden hairs; hypopygidium and pygidium with long golden hairs and weakly punctate. Appressed golden pubescence abundant on most surfaces, especially on mesosoma, petiole and gaster; erect hairs abundant on most surfaces, including dorsal and ventral surfaces of head, antennal scapes, posterior border of head, dorsum of mesosoma, dorsum of petiole, all surfaces of gaster. Hairs on legs either erect or suberect.

Queen: unknown.

Diagnosis of male: Clypeus strongly convex and punctate; posteropropodeum strongly concave; petiole subquadrate, longer than high (NIl > 150.00); sternopostpetiolar process without carina; dense golden pubescence covering surface.

Description of male: Measurements (n = 03): HW: 2.10 - 2.17; HL: 1.50 - 1.54; PW: 1.66 - 1.70; WL: 4.60 - 4.65; NLd: 0.93 - 0.95; NWd: 0.89 - 0.91; NLl: 1.25 - 1.26; NHl: 0.81 - 0.84; NIl: 150.00 - 154.00.

Head (Figs. 8 - 9): mandibles tiny and poorly developed; median face of clypeus strongly convex and punctate.

Mesosoma (Figs. 8, 10, 11, 12): tarsal claws with median tooth and golden pubescence; arolium brown; pronotum reduced with pronotal carina absent; parapsidal sutures present on scutum; Mayrian sutures with Y form on dorsum, with deep central region between Mayrian sutures; deep suture separating scutum from scutellum; axial region concave and covered by oblique striae; metanotum reduced; posteropropodeum strongly concave.

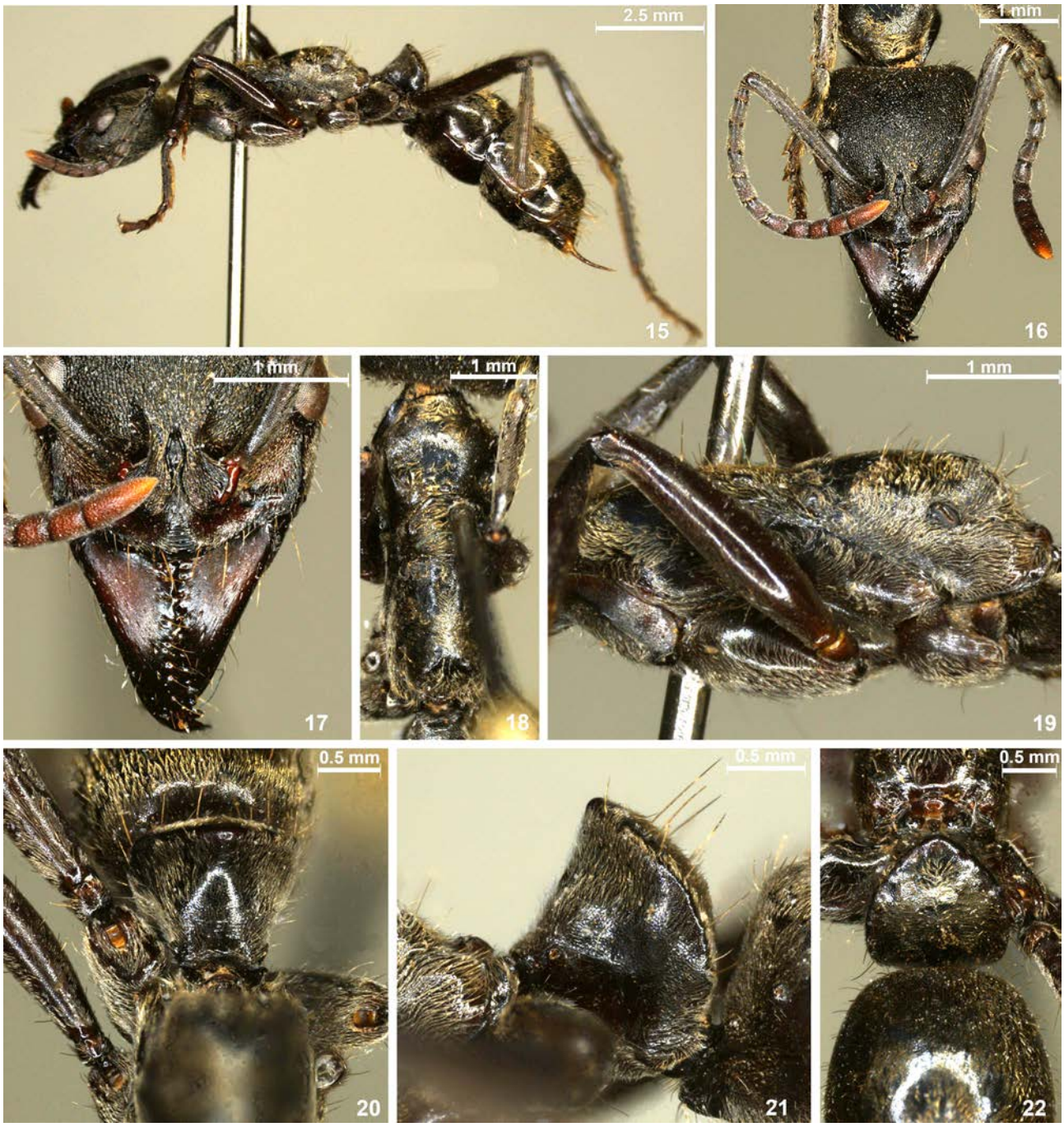
Petiole (Figs. 8, 13, 14): dorsal face shiny, with long and short golden hairs; integument brown; petiole longer than high (NHl: 0.81; NLl: 1.25), without lateral carina, with apex slightly oval in dorsal view; sternopetiolar process poorly developed, forming anterior keel.

Gaster (Fig. 8): sternopostpetiolar process consisting of lobate projection without carina; pygidial spine and cercus exposed; pygidial spine down-turned and well developed.

Genitalia (Figs. 106, 107): as the diagnosis for *P. foetida* complex.

Sculpture, pilosity and color (Figs. 8 - 14): most surfaces finely covered with coarse punctures and moderately shining; integument of head black, nearly brown, surface covered with long and short golden erect hairs; dense silver and golden pubescence near the eyes, antennae and clypeus; labial palps covered by sparse golden pubescence; mandible with basidorsal area brown; integument of mesosoma black, nearly brown, surface densely covered with silver and gold pubescence; wings brown and opaque; legs brown, covered with silver and golden pubescence; anterior, median and posterior basitarsus and tarsus brown with dense golden pubescence on ventral surface; median and posterior tarsus with row of golden setae on ventral surface; integument of petiole black, nearly brown; integument of gaster black, nearly brown; tergites and sternites covered by golden and silver pubescence mixed with long golden hairs. Surfaces covered with dense golden pubescence, and erect golden hairs are abundant on the head, mesosoma, petiole and gaster. Appressed golden pubescence on most surfaces.

Discussion: The worker of *Pachycondyla bactronica* sp.n. is easily separated from other species of the *P. foetida* complex by its petiole, which is broad, thickened, and slightly curved at the apex. *Pachycondyla villosa* can be differentiated from *P. bactronica* sp.n. by the vertical anterior face and the broadly convex dorsum of the petiole; both characters are absent in *P. bactronica* sp.n. Another useful character enabling separation is the anterior margin of clypeus, concave medially, without striae in *P. villosa*, while in *P. bactronica* sp.n. it is striate and convex. LUCAS & al. (2002), using morphometrics such as the length and height of the petiole, were able to separate three different species (provisionally named by them Pvv, Pvi1, Pvi2). After the analyses LUCAS & al. (2002) considered Pvi2 as a new species provisionally named *P. subversa*, but this species was not described. Here we describe this species as *P. bactronica* sp.n. since MACKAY & MACKAY (2010) referred the unavailable *P. subversa* (nomen nudum) to *P. curvinodis*. *Pachycondyla bactronica* sp.n. and *P. curvinodis* are very different. *Pachycondyla curvinodis* has the anterior petiolar face strongly curved, mandibles smooth and shiny and the clypeus with strong longitudinal striations, while *P. bactronica* has the mandibles opaque with small punctures and the clypeus has fine striation. Other useful characters for the separation of the males of the two species are the petiolar carina: *P. curvinodis* has a carina on the posterolateral edges of the petiole and in *P. bactronica* sp.n. the carina is absent. The second character is the rounded nature of the petiole. While the sternopetiolar and sternopostpetiolar processes consist of an acute well-developed keel in *P. curvinodis*, in *P. bactronica* sp.n. this trait is reduced. In addition, the pubescence found in males of *P. bactronica* sp.n. is denser than that of *P. curvi-*



Figs. 15 - 22: *Pachycondyla billemma* sp.n. (holotype worker): (15) lateral view; (16) head in frontal view; (17) clypeus and mandibles in frontal view; (18) mesosoma in dorsal view; (19) mesosoma in lateral view; (20) petiole in anterior view; (21) petiole in lateral view; (22) petiole in dorsal view.

nodis and the gaster is yellow, which was not observed in *P. bactronica* sp.n. The genitalia were dissected from dried males, and for this reason some parts are dark and broken. *Pachycondyla bactronica* sp.n., has a wide distribution, being found from Costa Rica to southern Brazil. The species shows little variation in color, although individuals collected closer to the equator circle are darker brown.

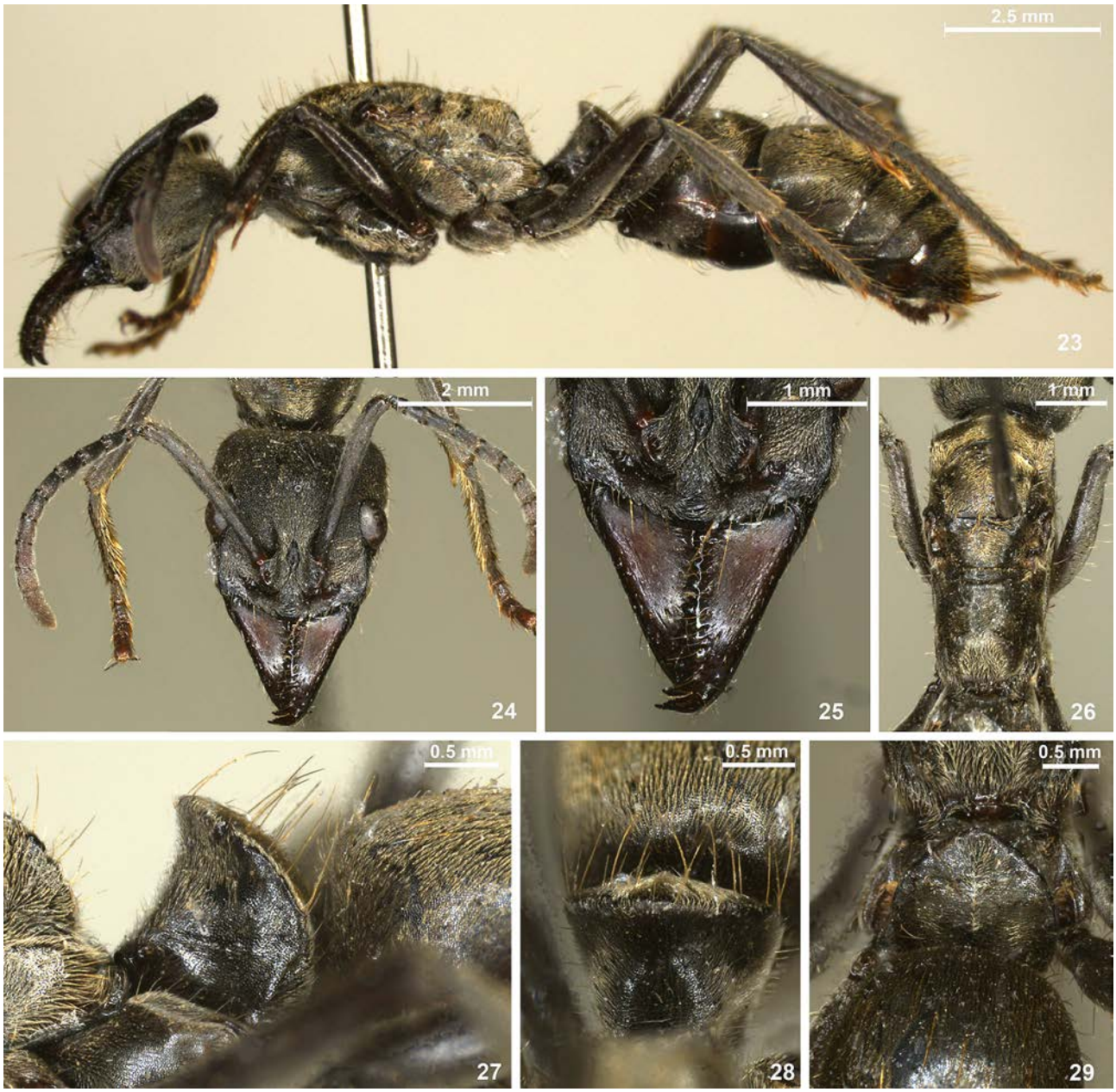
Biology: unknown.

Distribution: Costa Rica; Panama; French Guiana; Brazil: Amapá, Pará, Piauí, Sergipe, Bahia, Distrito Federal, São Paulo, Paraná, and Santa Catarina.

***Pachycondyla billemma* sp.n.** (Figs. 15 - 29)

Etymology: The specific epithet honors our colleagues and friends Bill (William) and Emma Mackay, in acknowledgment of their contributions to knowledge of Neotropical *Pachycondyla*.

Type material: Holotype (worker, MZSP). **Brazil:** Pará, Benevides, Morelândia, 16.VI.1988, leg. Bittencourt. **Paratypes. Brazil:** Goiás, 1980, leg. K. Redford, 1 ☿ (INPA). – Goiás, 1980, leg. K. Redford, 1 ♀ (NHMW). São Paulo, Rio Claro, 22.VIII.2000, leg. D. Fresneau, 1 ♀ (CPDC).



Figs. 23 - 29: *Pachycondyla billemma* sp.n. (paratype queen): (23) lateral view; (24) head in frontal view; (25) Clypeus and mandibles in frontal view; (26) mesosoma in dorsal view; (27) petiole in lateral view; (28) petiole in anterior view; (29) petiole in dorsal view.

Diagnosis of worker: Strong transverse striae on the clypeus; anterior face of petiole lightly striate below and concave.

Description of worker: Measurements (holotype in parentheses), paratypes = 1: SL: 2.94 (2.96); HW: 2.84 (2.85); HL: 3.16 (3.15); PW: 1.93 (1.92); WL: 5.05 (5.03); NLd: 0.91 (0.90); NWd: 1.27 (1.26); NLl: 1.45 (1.47); NHl: 1.31 (1.30); NIl: 110.68 (113.07); SI: 103.52 (103.86).

Head (Figs. 15 - 17): antennal scape relatively long, extending about two funicular segments past the lateral border of the head and covered by golden pubescence; mandibles with approximately 15 teeth on masticatory border, posterior border of head slightly concave; dorsum of head moderately convex in lateral view; malar carina well developed, reaching eye; clypeus with strong transverse striae; anterior edge of clypeus convex, smooth and rounded with short and long golden hairs.

Mesosoma (Figs. 15, 18 - 19): pronotal carina sharp and well developed, extending over side of pronotum; mesonotum broadly ovate, ⅓ the width of the pronotum; notopropodeal groove deep; well-marked metanotal-propodeal groove; propodeal carina well developed.

Petiole (Figs. 15, 20 - 22): anterior face clearly concave, slightly striate below; posterior lateral carina of petiole sharp and developed, extending to apex in lateral view; sternopetiolar process consisting of anterior bilobed keel separated by carina.

Gaster (Fig. 15): sternopostpetiolar process bilobed, without carina; tergites covered with golden pubescence

and long golden hairs; hypopygidium and pygidium punctate and with long golden hairs.

Sculpture, color and pilosity (Figs. 15 - 22): integument of head black and strongly punctate, punctures somewhat aligned in rows; mandibles with striae sparse and little punctate, margins near teeth smooth and shiny with short golden hairs; golden pubescence covering antennal scape and funicular segments; appressed golden pubescence mixed with silver, short and long golden hairs distributed over entire surface of the head; integument of mesosoma black with sparse punctations; surfaces not hidden by appressed pubescence, shiny; erect golden hairs abundant on dorsal region of mesosoma; legs black, covered with mixed silver and golden pubescence; anterior basitarsus and tarsus with dense golden pubescence on ventral surface; median and posterior tarsus brown, with row of golden setae on ventral surface; arolium brown; integument of petiole black and finely punctate; anterior face clearly striate, with surfaces not hidden by appressed pubescence, shining and punctate; surface of petiole covered with golden and silver pubescence, with long and short golden hairs; integument of gaster black and punctate, surfaces covered with appressed golden pubescence and erect golden hairs present on dorsal surface; hairs on legs either erect or suberect.

Diagnosis of queen: Strong transverse striae on clypeus; anterior face of petiole lightly striate below.

Description of queen: Similar to the worker, with the following differences:

Measurements of paratypes (n = 2): SL: 2.92 - 2.96; HW: 2.89 - 2.90; HL: 3.12 - 3.15; PW: 2.40 - 2.42; WL: 5.40 - 5.48; NLd: 1.18 - 1.20; NWd: 1.59 - 1.61; NLl: 1.56 - 1.57; NHl: 1.33 - 1.35; NIl: 116.29 - 117.29; SI: 101.03 - 102.06.

Head (Figs. 23 - 25): anterodorsal ocelli well developed.

Mesosoma (Figs. 27, 28): arolium white; pronotal carina poorly developed; scutum large and thickened; scutellum and metanotum reduced; propodeal carina well developed, posterior region concave between carinae in dorsal view.

Petiole (Figs. 23, 27 - 29): anterior face strongly concave, slightly striate below; carina sharp and well developed, extending to the apex in lateral view.

Gaster (Fig. 23): hypopygidium and pygidium strongly punctate.

Sculpture, pilosity and color (Figs. 23 - 29) similar to the worker.

Male: unknown.

Biology: unknown.

Discussion: Although the number of examined species was small, morphological differences were found to separate this species of *Pachycondyla curvinodis*, which has longitudinal striae on clypeus and no striae on anterior face of petiole, while *P. billemma* sp.n. has transversal striae on clypeus and anterior face of petiole striate. *Pachycondyla insignis* of Costa Rica also is similar to *P. billemma* sp.n. but it has the anterior face of the petiole nearly vertical, while in *P. billemma* sp.n. it is strongly concave, a character well marked in the queen and worker. The striation found on the clypeus is stronger and larger in *P. billemma* sp.n. while in *P. insignis* the striae are poorly developed. The striation on the anterior face of petiole is absent in *P. insignis*. In workers, the head length does not exceed HL 2.38 mm, nor does the head width exceed HW 2.24 mm in *P. insignis*, while in *P. billemma* sp.n. HL exceeds 3.15 mm and HW exceeds 2.84 mm. The scape index (SI) of the *P. insignis* workers does not exceed 97.22 mm, while in workers of *P. billemma* sp.n. it exceeds 103.52 mm.

Distribution: Brazil: Pará, Goiás and São Paulo.

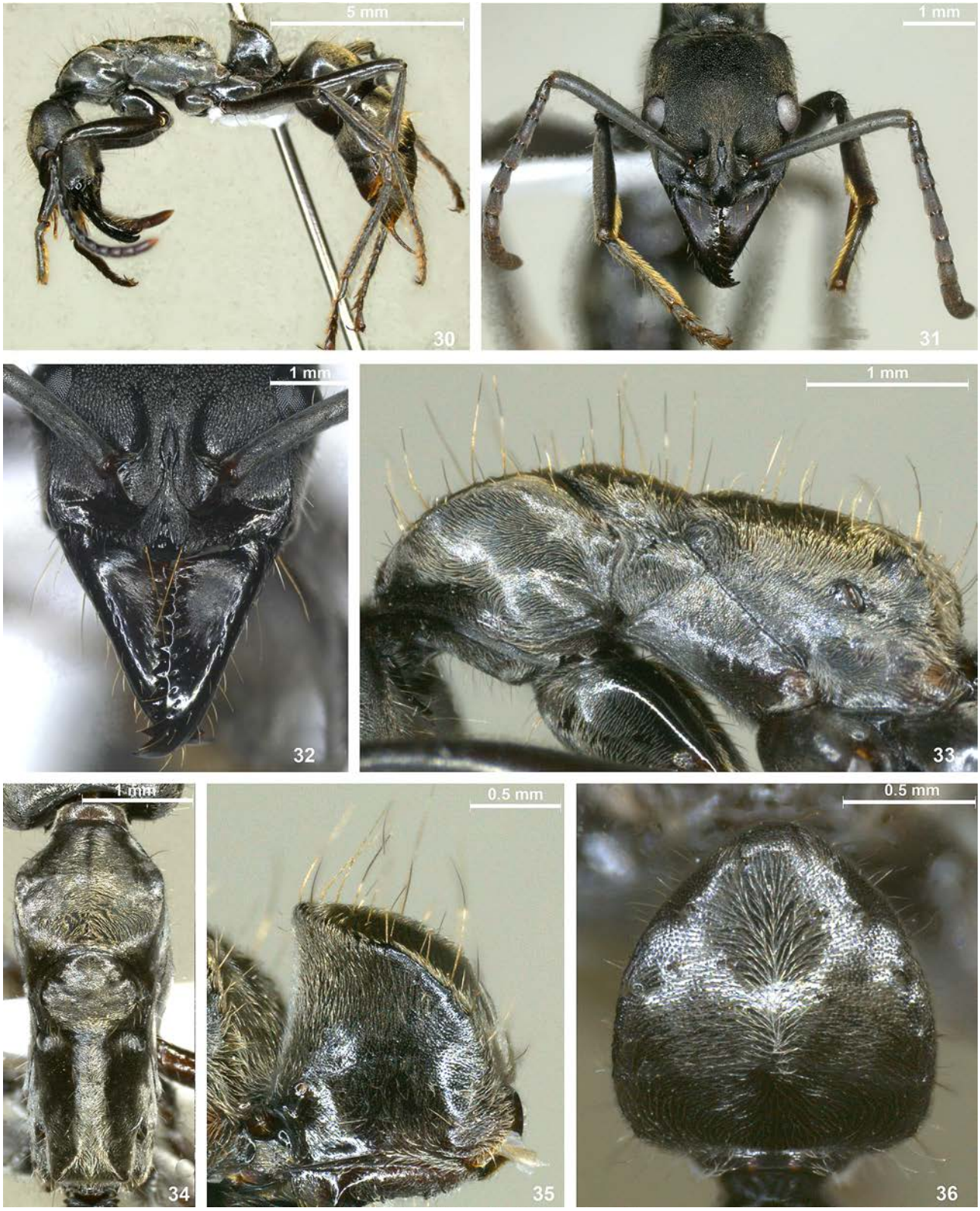
***Pachycondyla curvinodis* FOREL, 1899** (Figs. 30 - 56, 108 - 111)

Pachycondyla villosa r. *curvinodis* FOREL, 1899: 15, pl. 1, fig. 12 (☿), Guatemala: Las Mercedes, Torola; Panama: Bugaba, Volcán de Chiriquí. [Type material not examined.]

Neoponera villosa curvinodis: EMERY 1901: 47 (combination); EMERY 1911: 73 (synonym of *N. villosa* ssp. *inversa*).

Pachycondyla curvinodis: MACKAY & MACKAY 2010: 297 - 298 (♀) (revived from synonymy and raised to species).

Material examined: Mexico: Motozintla, Chiapas, Finca de La Vitoria, 6.V.1962, leg. M.A. Vulcano, 2 ☿☿ (MZSP). **Guatemala:** Vera Paz, Chacoj., Champion, B. C. A. Hymen., 1 ♀ (BMNH). **Panama:** Colon Province, San Lorenzo Forest, Ibisca, Forest-NP MT-C1-C3C1, 12. - 23.X.2004, leg. anonymous, 2 ☿☿; San Lorenzo Forest, Ibisca, Forest FL-11A28, 15.IV.2004, leg. anonymous, 2 ☿☿; San Lorenzo Forest, Ibisca, Forest MT-R2-07-R2, 25.V. - 4.VI.2004, leg. anonymous, 1 ☿; San Lorenzo Forest, 5.X.2003, leg. R. Kitching, 2 ☿☿; San Lorenzo Forest, S 09° 17' 79° 58' W, X.2003, leg. Dejean & al., 6 ☿☿, 2 ♂♂ (CPDC). **Venezuela:** San Esteban, 12.XII.1939, leg. anonymous, 1 ☿ (MZSP); – El Limon, Aragua, 450 m a.s.l., Venezuela Inst. Zool. Agronomia Univ. Central, 15.XII.1955, leg. S. Guevara, 1 ☿ (MPEG). **Ecuador:** Quito, Pichincha, Centro Científico R. Paienque, 29.XII.1980, leg. S. Sandoval, 1 ☿ (MZSP). **Brazil:** Amapá, 22.X.1978, leg. M.F. Torres, 1 ♀ (MPEG). – Amazonas, Manaus, 21.I.1994, leg. A.C. Batista, 1 ☿ (CPDC). – Pará, Belém, 8.X.1969, leg. N. Rosa, 1 ☿ (MZSP); Belém, Mocambo, 18.IV.1997, leg. A. Rocha, 1 ♀; Belém, Parque Ambiental, 15.X.2004, leg. A.L. Nunes & al., 1 ♀; Benevides, PA 408 KM 06, 27.VII.1982, leg. M.F. Torres, 1 ☿; S. S. Boa Vista, 5.IV. 1982, leg. W. Overal, 1 ☿, 1 ♀ (MPEG). – Rondônia, Jí-Paraná, 15.VII.1984, leg. W. Overal, 1 ♀ (MPEG); Jí-Paraná, Gleba G, Sítio Novo Horizonte, 20. - 23.II.1983, leg. J. Arias & al., 3 ☿☿, 2 ♂♂, 1 ♀ (INPA); Ouro Preto do Oeste, Linha 212 Gleba 21.0525, 7. - 8.IV.1985, leg. W. França, 1 ♀ (MPEG); Ouro Preto do Oeste, Reserva do INPA 215, 29.III.1985, leg. F.F. Ramos, 2 ☿☿ (MPEG). – Bahia, Andaraí, 16.III.2001, leg. J.R.M. Santos, 3 ☿☿, 1 ♀; Barrolândia, Fazenda Nova Canaã, 26.IV.1988, leg. J. Crispim, 4 ☿☿; Guaratinga, Fazenda Amaralina, 25.VIII. 1993, leg. O.A. Paula, 4 ☿☿; Guaratinga, Fazenda Amaralina, 24. - 28.VIII.1993, leg. Paula & Michella, 2 ☿☿, 1 ♀; Guaratinga, bait, 6.XII.2002, leg. J.R.M. Santos, 4 ☿☿, 1 ♀; Guaratinga, Cacau Pitfall, 5.XII.2002, leg. J.R.M. Santos, 1 ♀; Itaguara, 17.III.1997, leg. A.J.S. Argolo, 1 ☿, 1 ♀; Ilhéus, 3.XI.1986, leg. anonymous, 2 ♂♂; Ilhéus, 3.XI.1986, leg. anonymous, 2 ☿☿, 1 ♀; Ilhéus, 21.IX.1993, leg. J.E. Silveira, 1 ♀; Ilhéus, CEPEC, 28.IX.1993, leg. A.M. Encarnação, 1 ♀; Ilhéus, CEPEC, 28.I.1997, leg. J.H.C. Delabie, 2 ☿☿; Ilhéus, CEPEC, 8.X.1998, leg. J.H.C. Delabie, 1 ♀; Ilhéus, II.1999, CEPEC, leg. J.D. Majer & al. 1998,



Figs. 30 - 36: *Pachycondyla curvinodis* (worker): (30) lateral view; (31) head in frontal view; (32) clypeus and mandibles in frontal view; (33) mesosoma in lateral view; (34) mesosoma in dorsal view; (35) petiole in lateral view; (36) petiole in dorsal view.

1 ☿; Itagi, Fazenda Roseno, 13.VII.1988, leg. J. Crispim, 1 ☿; Itamarajú, 21.I.1994, leg. I. Cardoso, 1 ☿; Jequié, Fazenda Silêncio, 2.XII.1997, leg. A.J.S. Argolo, 1 ☿; Lençois, 16.X.1996, leg. J. Jardim, 1 ☿; Mucuri, 24.IX.1995, leg. Argolo A.S. 1 ♀; Vitória da Conquista, 28.I.1994, leg. F. Cardoso, 1 ♀; Vitória da Conquista, Mata Quatis, 14.VII.2003, leg. J.C.S. do Carmo, 1 ♀ (CPDC). – S e r g i p e , Crasto, Santa Luzia do Itanhi, 5. - 10.X.1993, leg.

Figs. 37 - 42: *Pachycondyla curvinodis* (queen): (37) lateral view; (38) head in frontal view; (39) clypeus and mandibles in frontal view; (40) mesosoma in dorsal view; (41) petiole in lateral view (42) petiole in dorsal view.

J.H.C. Delabie, 2 ☿☿; São Cristóvão (#5141), Universidade Federal de Sergipe, 1995, leg. R. Féneron, 2 ☿☿ (CPDC). – Mato Grosso, Chapada dos Guimarães, 27.XI.1983, leg. Exp. Dep. Zoo. Universidade Federal do Paraná, 2 ☿☿, 1 ♀; Chapada dos Guimarães, 27.XII.1983 leg. Exp. Dep. Zoo. Universidade Federal do Paraná, 2 ☿☿, 1 ♀; Chapada dos Guimarães, 4.XII.1983, leg. Exp. Dep. Zoo. Universidade Federal do Paraná, 2 ☿☿ (DZUP); Corumbiara, Serra do Urucum, 30.XI.1960, leg. K. Lenko, 1 ☿, 1 ♀ (MZSP); Utiariti (325 m a.s.l.), Rio Papagaio, VIII.1961, leg. K. Lenko, 2 ☿☿ (MZSP). – Distrito Federal, APA Gama, Cabeça de Veado, II. - III.2002, leg. Mireille Pic, 1 ☿, 2 ♀♀; Fazenda Água Limpa #5528, 24.V.2007, leg. J. Maravalhas, 1 ☿, 1 ♀ (CPDC). – Goiás, Campinas 4512, 16.VIII.1928, leg. Borgm., 1 ☿, 1 ♀; Jataí, Fazenda Cachoeirinha, 29.X.1962, leg. Exp. Dep. Zool., 1 ☿ (MZSP). – Minas Gerais, Pedra Azul, Fazenda Recife, Mata seca com cipó, 21.VII.1989, leg. R. Paiva, 1 ☿, 1 ♀ (MZSP). – São Paulo, Campinas, Mata de Santa Genebra, trilha principal, 21.VIII.2009, leg. P.S. Oliveira, 6 ☿☿ (INPA); Baurú, 23.X.1953, leg. R.L. Araújo, 1 ♀ (MZSP); Campinas, Mata de Santa Genebra 22° 49' 32.9" S 47°06' 17.7" W, 1.XI.2009, leg. I.O. Fernandes, 85 ☿☿, 9 ♂♂, 1 ♀ (INPA); Ilha de Búzios, 3.IV.1964, leg. anonymous, 1 ☿; Ilha Queimada, IV.1920, Exp. Butantan, leg. Borgm., 1 ☿, 1 ♀; Itanhaem (4470), III.1928, leg. Borgm., 1 ☿, 1 ♀, (MZSP); Mogi Guaçú, cerrado Mogi-Guaçu, I.1979, leg. P.S. Oliveira, 1 ☿, 2 ♀♀ (CPDC); Piracicaba, Casa Branca, 7.IV.2000, leg. R. C. Siloto, 2 ☿☿ (ESALQ); Ribeirão Preto, 15.VII.1988, leg. W. Overal, 2 ☿☿ (MPEG); Rio Claro, UNESP, XI.1998, leg. D. Fresneau, 2 ☿☿, 1 ♂, 1 ♀; Rio Claro, 22.VII.2000, leg. D. Fresneau, 2 ☿☿; Severina, 12.IX.1995, leg. H.G. Fauster, 2 ☿☿ (CPDC). – Paraná, Morretes IAPAR, 3. - 10.XII.1984, 6. - 7.XII.1984, 10. - 17. XII.1984, 27.XII.1984 - 6.I.1985; 25.II - 4.III.1985, 13. - 20.V.1985, 17.V.1985, leg. C.I.I.F, 6 ☿☿, 4 ♀♀ (DZUP). – Santa Catarina, Naufragados, 4.X.1988, leg. anonymous, 2 ☿☿ (MZSP).

Diagnosis of worker (Figs. 30 - 36): Median portion of clypeus with strong longitudinal striae; propodeum with sharp carina forming small projections; dorsal surface of petiole forming an acute apex.

Measurements of worker (n = 182): SL: 2.63 - 2.70; HW: 2.50 - 2.59; HL: 2.76 - 2.81; PW: 1.60 - 1.68; WL: 4.39 - 4.48; NLd: 0.90 - 0.97; NWd: 1.10 - 1.16; NLl: 1.40 - 1.45; NHl: 1.18 - 1.23; NIl: 117.88 - 118.64; SI: 104.24 - 105.20.

Diagnosis of queen: Similar to worker (Figs. 37 - 42).

Measurements of queen (n = 38): SL: 3.10 - 3.17; HW: 3.11 - 3.15; HL: 3.40 - 3.45; PW: 2. 34 - 2.40; WL: 5. 45 - 5.54; NLd: 1.19 - 1.24; NWd: 1.43 - 1.52; NLl: 1.50 -1.68; NHl: 1.36 - 1.44; NIl: 110.29 - 116.66; SI: 99.67 - 100.63.

Diagnosis of male: Anterior face of petiole concave, lateral face carinate; posterior face of propodeum slightly concave.

Description of male: Measurements of males with black gaster (n = 10): HW: 1.96 - 1.99; HL: 1. 51 - 1.54; PW: 1.38 - 1.42; WL: 4.02 - 4.08; NLd: 0.50 - 0.58; NWd: 0.80 - 0.91; NHl: 0.59 - 0.67; NLl: 0.72 - 0.80; NIl: 119.40 - 122.03. Measurements of males with yellow gaster (n = 6): HW: 1.95 - 2.01; HL: 1. 51 - 1.55; PW: 1.42 - 1.48; WL: 4.00 - 4.12; NLd: 0.60 - 0.70; NWd: 0.75 - 0.83; NHl: 0.54 - 0.60; NLl: 0.86 - 0.93; NIl: 155.00 - 159.26.

Head (Figs. 43 - 44, 50 - 51): mandibles tiny and poorly developed; medial face of clypeus strongly convex and punctate.

Mesosoma (Figs. 43, 45 - 47, 50, 52 - 54): pronotum reduced with highest elevation at shoulders; Mayrian sutures in form of Y, reaching scutum in dorsal view; central face deep between Mayrian sutures; scutellum with axial face concave and with oblique striae; metanotum reduced; posteropropodeum slightly concave.

Petiole (Figs. 43, 45 - 50, 53 - 56): anterior face concave forming apex almost ovate, with lateral carina well developed; sternopetiolar process well developed forming anterior sharp keel.

Gaster (Figs. 43, 50): sternopostpetiolar process consisting of lobate projection without carina; stridulatory file present on second pretergite.

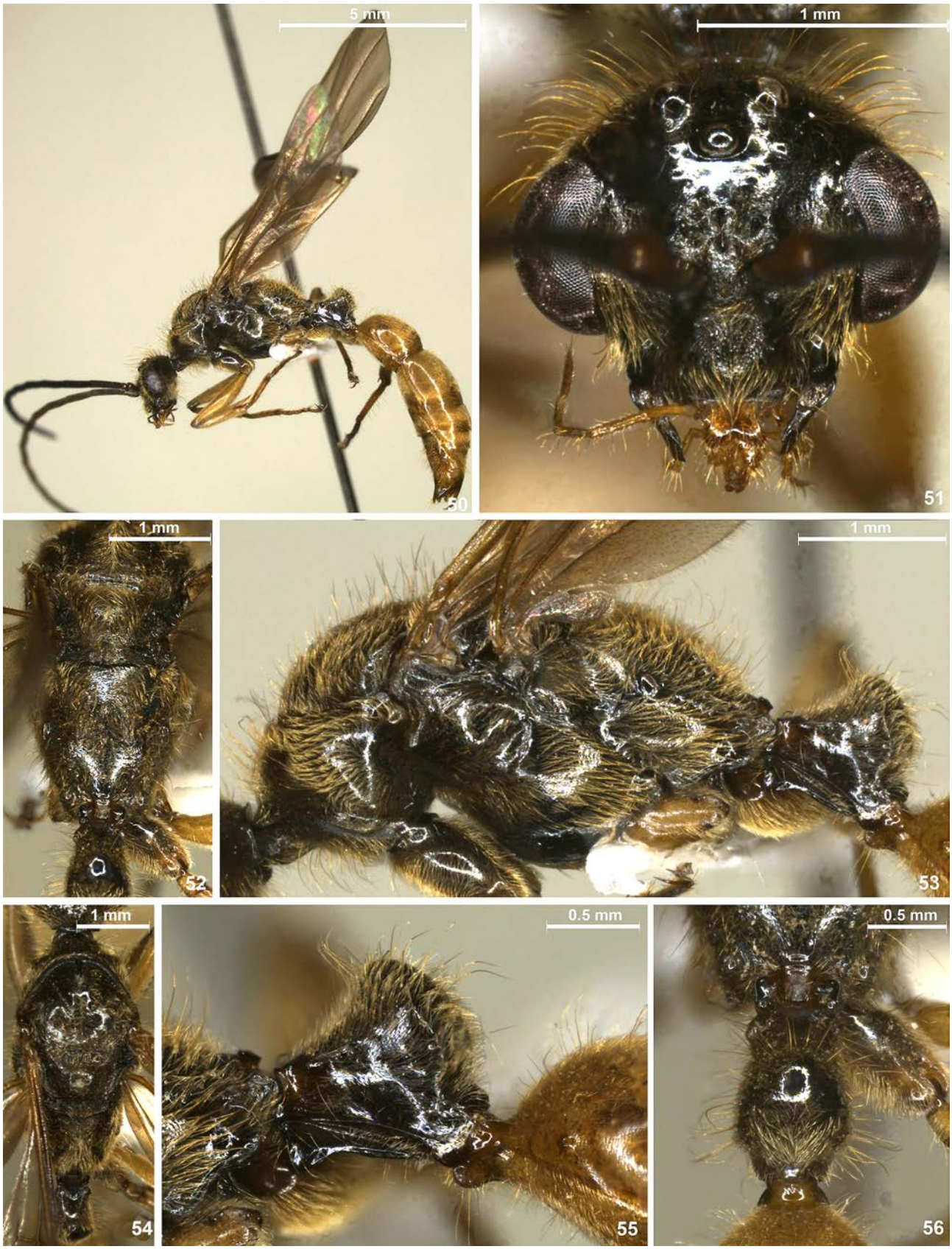
Genitalia (Figs. 108 - 111): as the diagnosis for *Pachycondyla foetida* complex.

Sculpture, pilosity and color (Figs. 43 - 56): integument of head punctate and black; surface covered with long and short golden hairs; golden pubescence on antennae and clypeus; mandibles with basodorsal region brown; palps covered by silver and golden sparse pubescence; antenna with sparse golden pubescence; wings brown and shiny; legs yellow or black covered with silver and golden pubescence; median and posterior tibiae with two apical golden spurs; anterior, median and posterior basitarsi and tarsi brown, with dense golden pubescence on ventral surface; median and posterior tarsi brown with row of golden setae on ventral surface; tarsal claw with median tooth and golden pubescence; arolium brown; surface of mesosoma covered with golden pubescence; integument of petiole shiny, black or brown, with golden pubescence distributed on surface, and long golden hairs; integument of gaster black or yellow with surface punctate; tergites and sternum covered by golden pubescence, and long golden hairs. Erect hairs are abundant on the head, mesosoma, petiole and gaster and appressed golden pubescence is dense on most surfaces.

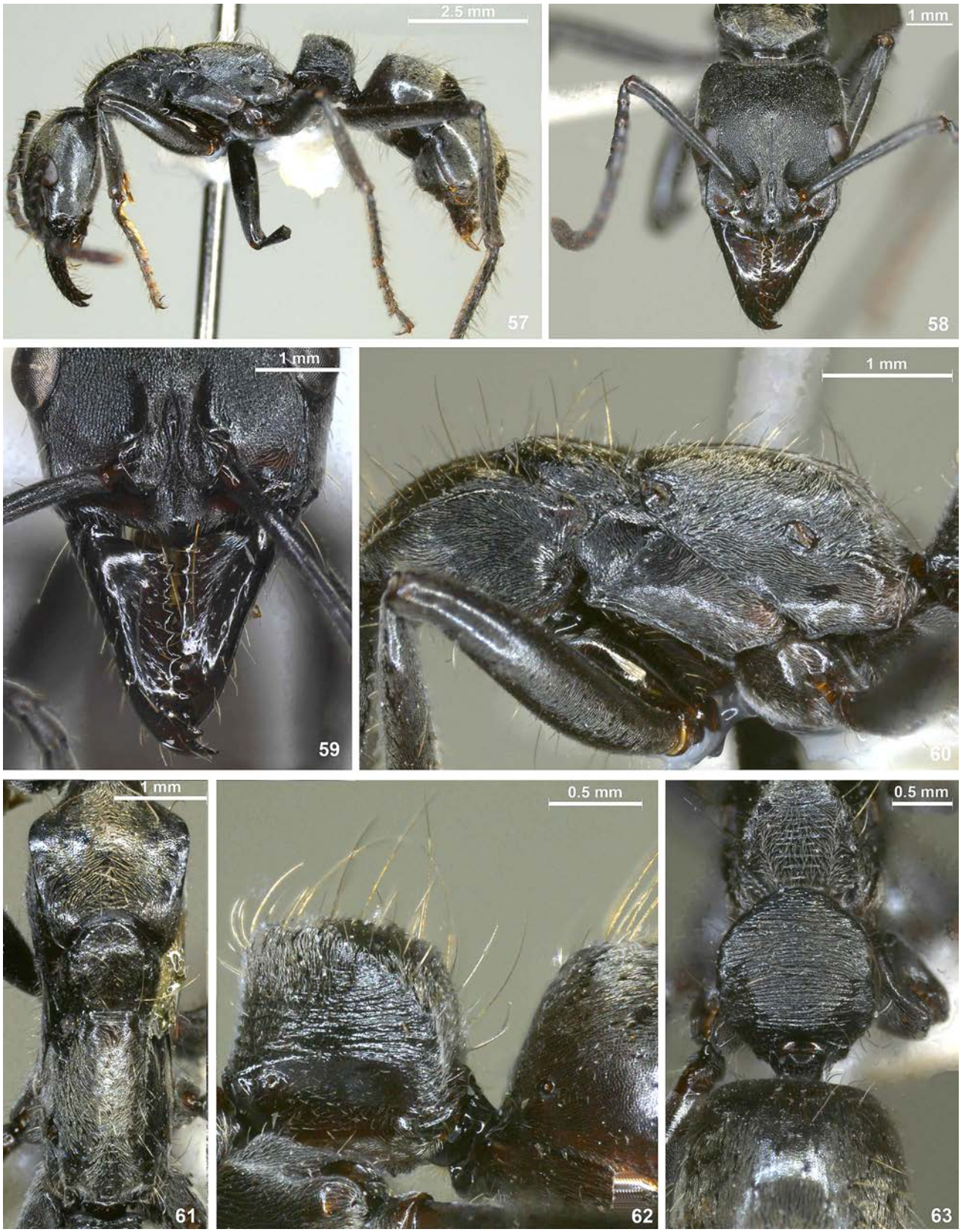
Biology: According to MACKAY & MACKAY (2010), individuals of *Pachycondyla curvinodis* from Nicaragua were collected behind a nest of *Nasutitermes* DUDLEY, 1890 in the rotted area of a living tree. Some specimens were collected in hollow stems of *Cecropia* sp. in Costa Rica and in a tree canopy sprayed with insecticide in Peru (MACKAY & MACKAY 2010). This species occurs in wet to moist forest habitats, from sea level to mid-montane forests around 1200 m a.s.l. MACKAY & MACKAY (2010) also report dealate females collected in May and June (Costa Rica), July (Peru), July and August (Colombia) and December (Costa Rica), and small nests in cavities. A total of 95 individuals of *P. curvinodis* were obtained of one nest from Mata of Santa Genebra (São Paulo, Brazil), located about one meter above the ground in the cavity of a palm of the genus *Syagrus* (CHAM.) Glassman (I.O. Fernandes, M.L. De Oliveira & J.H.C. Delabie, unpubl.). The ants did not show any aggressive behavior during the opening of their nest.

Discussion: The nest sample of *Pachycondyla curvinodis* enabled the description of the previously unknown males of this species, including describing their color variation. From the same nest, we collected five males with a brown petiole and yellow gaster and legs, and four males

Figs. 43 - 49: *Pachycondyla curvinodis* (male with black gaster): (43) lateral view; (44) head in frontal view; (45) mesosoma in dorsal view; (46) mesosoma in lateral view; (47) propodeum in posterior view; (48) petiole in lateral view; (49) petiole in dorsal view.



Figs. 50 - 56: *Pachycondyla curvinodis* (male with yellow gaster): (50) lateral view; (51) head in frontal view; (52) propodeum in posterior view; (53) mesosoma in lateral view; (54) mesosoma in dorsal view; (55) petiole in lateral view; (56) petiole in dorsal view.



Figs. 57 - 63: *Pachycondyla foetida* (worker): (57) lateral view; (58) head in frontal view; (59) clypeus and mandibles in frontal view; (60) mesosoma in lateral view; (61) mesosoma in dorsal view; (62) petiole in lateral and (63) dorsal view.

with black petiole, gaster, and legs (I.O. Fernandes, M.L. De Oliveira & J.H.C. Delabie, unpubl.), a character hitherto observed only in males of *P. villosa* by MACKAY & MACKAY (2010). In the same nest we obtained 85 workers, one queen and some prepupae, and pupae of both male forms (yellow and black gaster). The males with the two

color patterns are morphologically identical. The genitalia are also identical in both male forms, and do not vary significantly in morphology to those of males of other species in the *P. foetida* complex. MACKAY & MACKAY (2010) did not report *P. curvinodis* from Brazil, but it was reported from the states of Espírito Santo and Rio de Janeiro by FOREL (1901, 1907) and occurs in several other Brazilian states and countries of the Neotropical Region.

Distribution: Mexico; Guatemala; Nicaragua; Costa Rica; Panama; Venezuela; Colombia; Ecuador; Peru; Brazil: Amapá, Amazonas, Pará, Rondônia, Sergipe, Bahia, Mato Grosso, Distrito Federal, Goiás, Minas Gerais, São Paulo, Paraná and Santa Catarina.

***Pachycondyla foetida* (LINNAEUS, 1758)** (Figs. 57 - 63)

Formica foetida LINNAEUS, 1758: 582, "America Meridionali" (♀). [Type material not examined.]

Ponera foetida F. SMITH, 1858: 95 (combination); ROGER 1860: 312 (☿); MAYR 1863: 448 (catalog).

Pachycondyla foetida: ROGER 1863: 18 (combination); DALLA TORRE 1893: 33 (catalog); FOREL 1899: 11 (catalog).

Neoponera foetida: EMERY 1901: 47 (combination); EMERY 1911: 72 (catalog).

Neoponera (*Neoponera*) *foetida*: EMERY 1911: 72.

Pachycondyla foetida: BROWN, in BOLTON 1995: 305 (combination); MACKAY & MACKAY 2010: 332 (catalog).

Formica lobata DE GEER, 1773: 602, pl. 31, figs. 6 - 8; RETZIUS 1783: 75 (synonymy); OLIVIER 1792: 502 (☿); LATREILLE 1802: 206 (☿).

Material examined: Panama: Colon Province, San Lorenzo Forest, X.2003, leg. Dejean & al., 4 ☿☿; San Lorenzo Forest, FO-F2-06re, 13.V.2004, Leg. J Schmidt & J. Bail, 1 ☿; San Lorenzo Forest, Ibisca, C13298 T159-09, V.2005, leg. anonymous, 2 ☿☿; San Lorenzo Forest Ibisca, MT11DSI1, 5. - 15.V.2004, leg. anonymous, 2 ☿☿; San Lorenzo Forest, Ibisca, MTR306R3, 15. - 25.V.2004, leg. anonymous, 1 ☿; San Lorenzo Forest, Ibisca, MT-IKOS09IK, 23.X - 2.XI.2004, leg. anonymous, 1 ☿; San Lorenzo Forest, Ibisca, NP MT-R3-08, 12. - 23.X.2004, leg. anonymous, 1 ☿; San Lorenzo Forest, Ibisca, NP MT-IKOS-11, 12. - 23.X.2004, leg. anonymous, 2 ☿☿ (CEPEC). **French Guiana:** Cayenne, Mont. Kaw, Relais de Patawa 300 m a.s.l., Malaise trap. FRGY/2005021, XI.2005, leg. J.A. Lacerda, 2 ☿☿; – Sinnamary, Paracou, XI. 1996, leg. anonymous, 4 ☿☿. **Brazil:** Roraima, Rio Uraricoera, Ilha de Maracá, 18. - 28.VII.1987, leg. J.A. Rafael & al., trap Shannon, 1 ☿ (INPA). – Amazonas, Manaus, Reserva Florestal Adolpho Ducke - RFAD, Terra Firme 2° 55' S 59° 59' W, 21.II.1992, leg. Adis & al., 1 ☿; Manaus, Reserva Florestal Adolpho Ducke, 24.IX. 1981, leg. J. A. Rafael, 1 ☿; Manaus, ZF 2, Km 19, 18. - 19.VIII.1979, leg. J. Adis & al., 1 ☿; Novo Aripuanã, Lago Xadá, 05° 15' 39" S 60° 42' 32" W, IV.2005, leg. F. Xavier & al., 1 ☿ (INPA). – Rondônia, Jí-Paraná, Gleba G II, Perdida, 25. - 28.II.1983, leg. J. Arias & al., Malaise trap, 1 ☿ (INPA).

Diagnosis of worker (Figs. 56 - 63): Sides of propodeum striate; anterior face of petiole straight, convex dorsally, sides strongly striate on upper half, anterior, dorsal and posterior face striate.

Measurements of worker (n = 26): SL: 2.30 - 2.37; HW: 2.40 - 2.43; HL: 2.60 - 2.64; PW: 1.68 - 1.72; WL: 4.21 - 4.39; NLd: 1.10 - 1.15; NWd: 1.30 - 1.35; NLl: 1.10 - 1.15; NHl: 0.80 - 0.85; NIl: 135.29 - 137.50; SI: 95.83 - 97.53.

Diagnosis of queen (based on literature): As worker.

Male: unknown.

Biology: Workers were collected by John T. Longino in Santa Rosa National Park, in scrubby vegetation along the road to Monteverde, in open pasture areas around Rara Avis, and in isolated trees in young secondary growth areas of La Selva Biological Station. One nest occurred in a recently felled tree of the species *Hieronyma oblonga* (TUL.) MULL. ARG. The tree had a small nest entrance hole only a little larger than a worker, leading to a large cavity in a knot, where there were abundant workers. The tree was in a pasture in an area of active clearing of rainforest at 500 m elevation just south of La Selva (http://academic.evergreen.edu). Dealate females were collected as single foragers on the ground in February (Brazil), in a malaise trap in August (Colombia), and as single foragers on the ground in October (Bolivia). Specimens have been collected in canopy fumigation samples MACKAY & MACKAY (2010).

Discussion: *Pachycondyla foetida* has striae on the upper side face of petiole, while *P. theresiae* FOREL, 1899 has them on the lower lateral surface. *Pachycondyla foetida* is reported only from some northern Brazilian states and countries in northern South and Central America.

Distribution: Mexico; Costa Rica; Panama; Colombia; Venezuela; Trinidad; Guyana; Suriname; French Guiana; Ecuador; Peru; Bolivia; Brazil: Roraima, Amazonas and Rondônia.

***Pachycondyla inversa* (F. SMITH, 1858)** (Figs. 64 - 83, 112, 113)

Ponera inversa F. SMITH, 1858: 96-97, (☿), South America, Ecuador, Napo; MAYR 1863: 448 (catalog). [type material examined.]

Pachycondyla inversa: MAYR 1886: 358 (combination); DALLA TORRE 1893: 34 (catalog).

Pachycondyla (*Pachycondyla*) *inversa*: EMERY 1901: 45 (new status).

Neoponera villosa inversa: EMERY 1904: 598 Fig. D (c-d) (combination and new status); MANN 1922: 7 (distribution and biology); WHEELER & WHEELER 1952: 615 (l).

Neoponera (*Neoponera*) *villosa inversa*: EIDMANN 1936: 34 (new status).

Pachycondyla villosa inversa: BROWN in BOLTON 1995: 306 (combination).

Pachycondyla inversa: MACKAY & MACKAY 2010: 409-410 (♀) (raised to species).

Type material examined (Figs. 64 - 70): Lectotype by present designation: worker (BMNH), labeled "S. Amer. [Ecuador] Napo". We were informed by the Museum that the other syntype is presumedly lost.

Additional material examined: Guyana: Oderneeming, 11. - 14.XII.1915, leg. G.E. Boldkin, 2 ☿☿ (BMNH). **French Guiana:** Petit Saut, V.1997, leg. J. Orivel, 2 ☿☿; Petit, Saut, V.1997, leg. J. Orivel & A. Dejean, 1 ☿; Petit Saut, Basse Vie, VI. - VII.2000, leg. S. Durou & al., 2 ☿☿; Petit Saut, Basse Vie, VII.1999, leg. S. Durou, 2 ☿☿; Petit Saut, Pesquisa Venin, III. - IV.2003, leg. J. Orivel, 11 ☿☿; Petit Saut, 25.VI.2002, leg. Dejean & al., 1 ☿; – Marripassoula, Fougéres Arborescentes, 22.IV.2000, Dejean & al., 1 ☿ (CPDC). **Ecuador:** Prov. Napo, Limoncocha 00° 24' S 76° 36' W, 30.VI.1972, leg. P.L.

Kazan, 1 ☿ (MZSP). **Brazil:** A m a p á , Oiapoque, 02.V. 1979, leg. W.L. Overal, 1 ☿; Serra do Navio, 07.II.1980, leg. Paulo Celso, 1 ☿, 1 ♀ (MPEG). – A m a z o n a s , Manaus, ZF-3, Km 24, Colosso - Fazenda Esteio, 19.III. 1983, leg. A.Y. Harada, 1 ☿ (INPA); Manaus, Reserva Florestal Adolpho Ducke, 3.VII.2010, leg. I.O. Fernandes, 8 ♂♂ (INPA). Maraã, Rio Japurá, Santa Rita, 12. - 15.XI.1988, leg. J. Dias, 1 ☿ and 1 ♀ (MPEG); Itacoatiara, Sitio São Francisco, 06.IX.2009, leg. E.L. Belmont, 6 ☿☿ (INPA). – P a r á , Alter do Chão, 30.IV.2002, leg. J.M. Vilhena, 1 ☿ (INPA); Belém, APEG, 27.XI.1969, leg. N. Rosa, 1 ♀ (MZSP); Benevides, PA 408, KM 06, 26. VII.1982, leg. M.F. Torres, 1 ☿; Belém, Fazenda Velha, 14.V.1977, leg. M.F. Torres, 2 ☿☿; Belém, Mocambo, 5.III.1977, leg. N. Guimarães, 1 ☿; Belém, Mocambo, 4.IV. 1978, leg. anonymous, 1 ☿; Belém, Mocambo, 17.III.1978, leg. anonymous, 1 ☿; Belém, Utinga, 17.V.1978, leg. R. Ferreira, 1 ☿; Benevides, Morelândia, 14.VI.1988, leg. N. Bittencourt, 1 ☿; Melgaço, Caxiuana ECFPN, 30.X. - 5.XI. 2002, leg. I. Andrade, 1 ♀; São Francisco, 2.VI.1979, leg. R.B. Neto, 2 ☿☿; Tucuruí, Rio Tocantins, Chiqueiras, 2.IV. 1984, leg. M.F. Torres, 1 ♀; Tucuruí, rio Tocantins, Saúde, 1. - 3.I.1984, leg. anonymous, 1 ☿ (MPEG). – C e a r á , Guaramiranga PQ. TR, 21.VII.2002, leg. Y. Quinet, 3 ☿☿; Pacoti, Mata do Hotel Remanso, mata secundária, 2001, leg. N. Hites, 3 ☿☿ and 1 ♀ (CPDC). – A c r e , Rio Branco, Mata de Terra Firme, 25.X. - 8.XI.1991, leg. F. Ramos & al., 2 ☿☿ (MPEG). – R o n d ô n i a , Guajará Mirim, P. E. Guajará-Mirim, #5256, Malaise trap, 2.III.1998, leg. J.M.R. Santos, 3 ☿☿ (CPDC). – B a h i a , Arataca, C. Luzitania, 11.XII.1987, leg. M.C. Alves, 3 ☿☿; Belmonte, 10.IV.1980, leg. F. Benton, 3 ☿☿, 1 ♀; Buerarema, 30.X.1980, leg. F. Benton, 4 ☿☿; Buerarema, Fazenda Cosme & Damião, 3.X.1980, leg. Forbes, 3 ☿☿, 1 ♀; Barra do Rocha, 24.I. 1988, leg. J. Crispim, 4 ☿☿; Canavieiras, C. São José, 21.IV. 1988, leg. J.C. do Carmo, 3 ☿☿; Camacan, 27.I.1988, leg. J.H.C. Delabie, 3 ☿☿, 1 ♀; Camacan, 15.III.1991, leg. Niella, 3 ☿☿; Floresta Azul, Fazenda Santa Delia, 22.II. 1988, leg. J. Crispim, 3 ☿☿; Ibirapitinga, Fazenda Paraíso, 6.IV.1988, leg. J. Crispim, 3 ☿☿; Ibicaraí, Fazenda Venturosa, 9.V.1997, leg. J.A. Da Silva, 4 ☿☿; Ilhéus, CEPEC / CEPLAC, B. Light trap, 14.XI.1968, leg. anonymous, 1 ♂; Ilhéus / Itabuna CEPEC Q H', 28.X.1992, leg. A.B. Casimiro, 2 ♂♂; Ilhéus CEPEC, XI.1998, leg. D. Fresneau, 1 ♂; Ilhéus, CEPEC 5261-19, 29.X.1999, leg. D. Fresneau, 2 ♂♂; Uruçuca, 8.XII.1967, leg. A.C. Niella, 1 ♂; Ilhéus, CEPEC / CEPLAC, B. Light trap 14.XI.1968, leg. anonymous, 3 ☿☿; Ilhéus, 4.XII.1980, leg. F. Aeton, 3 ☿☿, 1 ♀; Ilhéus CEPEC, 11.VIII.1980, leg. A.C. Niella, 4 ☿☿; Ilhéus CEPEC (G), 23.II.1995, leg. A.L.E. Souza, 4 ☿☿; Ilhéus CEPEC, X.1990, leg. A.V.M. Encarnação, 3 ☿☿; Ilhéus / Itabuna CEPEC Q H', 28.X.1992, leg. A.B. Casimiro, 3 ☿☿; Ilhéus CEPEC, 19.V.1993, leg. A.B. Casimiro, 4 ☿☿, 1 ♀; Ilhéus, 16.IX.1993, leg. R.M.F. Cordeiro, 3 ☿☿; Ilhéus / Olivença #6104, 06. - 24.I.1995, leg. J.R.M. Santos, 1 ♀; Ilhéus CEPEC #5119, X.1996, leg. J.R.M. Santos, 3 ☿☿; Ilhéus, CEPEC #5119, X.1996, leg. J.C.S. do Carmo, 2 ☿☿; Ilhéus, CEPLAC, 25.X.1997, leg. D. Fresneau, 3 ☿☿; Ilhéus, CEPEC, XI.1998, leg. D. Fresneau, 4 ☿☿; Ilhéus, CEPEC 5261-19, 29.X.1999, leg. D. Fresneau, 4 ☿☿; Itabuna, 16.X.1965, leg. Cassiano, 1 ♀; Itacaré, Fazenda Engenho Velho, 20.VII.2000, leg. S. Lacau, 4 ☿☿; Itajuipe, Fazenda Nazaré, 27.III.1980, leg. F.P. Benton, 3 ☿☿; Itamaraju, 15.IV.1981, leg. F.P. Benton, 3 ☿☿ and 1 ♀; Itamari, 14.V.1981, leg. A.C. Niella, 2 ☿☿; Itamari, 11.V. 1981, leg. A.C. Niella, 3 ☿☿; Mascote, 1980, leg. F.P. Benton, 2 ☿☿, 1 ♀; Mascote, Fazenda Santa Luzia, 20.IV. 1988, leg. J. Crispim, 3 ☿☿, 1 ♀; Mucuri, 24.X.1995, leg. A.S. Argolo, 1 ☿; Santa Luzia, Fazenda Santa Rita, 20.VI. 1988, leg. J. Crispim, 4 ☿☿; Santa Terezinha, Serra da Jiboia, 3.-4.IV.2001, leg. I.M.F. Soares, 2 ☿☿, 1 ♀; Serra da Jiboia, 21.VI.2004, leg. R.M. Rodrigues, 3 ☿☿, 1 ♀; Una, Unacau, Fazenda Brazilândia, XI.1987, leg. M.C. Alves, 2 ☿☿; Una, Fazenda Piedade, XI.1987, leg. M.C. Alves, 3 ☿☿, 1 ♀; Una, VI.2003, leg. J.R.M. Santos, 2 ☿☿, 1 ♀; Una, Beira da Mata, 12.VI.1997, leg. H.I. Santos, 4 ☿☿; Uruçuca, 17.V.1944, leg. P. Silva, 4 ☿☿; Uruçuca, 17.V. 1944, leg. M.R. Barbosa, 3 ☿☿; Uruçuca, Q.3 1 - 10, 19.IX. 1967, leg. J.H.C. Delabie, 1 ☿; Uruçuca, 8.XII.1967, leg. A.C. Niella, 3 ☿☿; Uruçuca, 08.XI.1967, leg. A.C. Niella, 4 ☿☿; Uruçuca, 6.VIII.1987, leg. J.H.C. Delabie, 1 ♀; Uruçuca, 16.XII.1997, leg. J.R.M. Santos, 2 ☿☿; Uruçuca, CEPLAC 70 m a.s.l., 23.VII.1997, leg. J.H.C. Delabie, 4 ☿☿ (CPDC). – M a t o G r o s s o , Sinop, X.1974, leg. Alv. & Roppa, 2 ☿☿ (MPEG). – E s p i r i t o S a n t o , Aracruz, Fazenda Verde, 23.I.1984, leg. I. Cardoso, 2 ☿☿; Linhares, 15.X.1966, leg. Abreu & Niella, 3 ☿☿; Linhares, Fazenda São Sebastião, 14.VIII.1991, leg. C.A. Araújo, 1 ♀; Linhares, 22.X.1991, leg. A.C. de Araújo, 4 ☿☿; Linhares, 26.XI.1991, leg. A.C. Spaggiari, 1 ☿ (CPDC). – R i o d e J a n e i r o , Rio de Janeiro, Jardim Botânico G. B. Bandeira Número 1725, 25.IX.1927, leg. Borgm., 2 ☿☿ (MZSP). – S ã o P a u l o , Caraguatatuba, Reserva Flor, 40 m a.s.l., leg. Expedição do Departamento de Zoologia, 22.V. - 1.VI.1962, leg. K. Lenko, 2 ☿☿ (MZSP).

Diagnosis of worker: Propodeum punctate with sharp lateral carina; anterior face of petiole strongly concave, with sharp lateral carina.

Measurements of worker (n = 164): SL: 2.30 - 2.38; HW: 2.43 - 2.50; HL: 2.60 - 2.78; PW: 1.70 - 1.78; WL: 3.96 - 4.30; NLd: 0.97 - 1.30; NWd: 1. 29 - 1.39; NLl: 1.16 - 1.23; NHl: 1.00 - 1.17; NIl: 105.12 - 116.00; SI: 94.65 - 95.20.

Redescription of lectotype: Measurements: SL: 2.39; HW: 2.45; HL: 2.67; PW: 1.72; WL: 4.23; NLd: 1.28; NWd: 1.38; NHl: 1.00; NLl: 1.15; NI: 115.00; SI: 97.55.

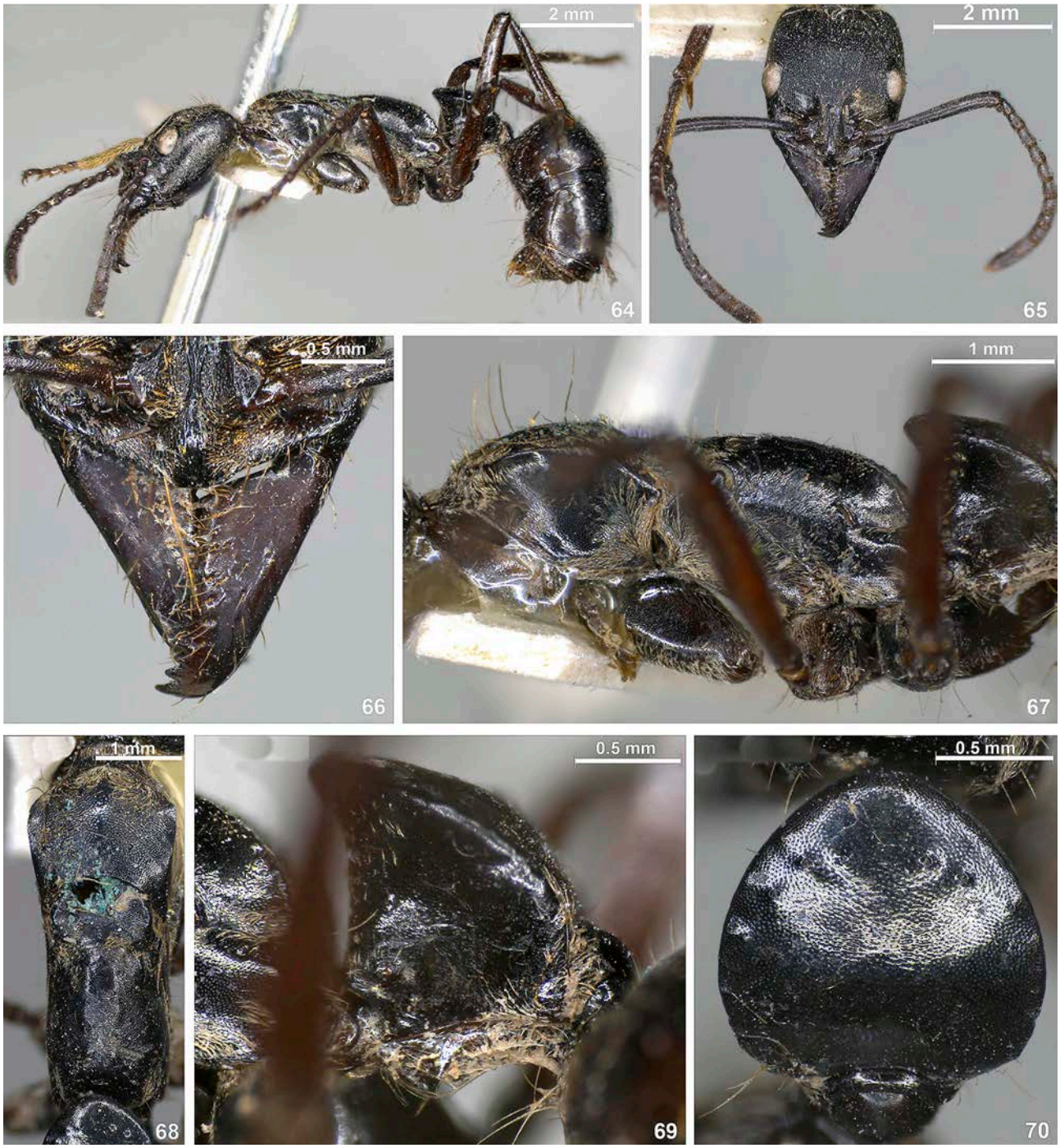
Head (Figs. 64 - 66): mandibles with 14 teeth, posterior border of head slightly convex, with short erect golden hairs; eye well developed, positioned near anterior lateral margin of head; malar carina well developed and reaching eye; median portion of clypeus elevated and shiny.

Mesosoma (Figs. 64, 67, 68): pronotal carina very sharp, integument finely punctate; mesonotum nearly circular and finely punctate; notopropodeal groove deep, breaking sculpture on dorsum; propodeum elevated dorsally, with rounded shape and propodeal carina well developed.

Petiole (Figs. 64, 67, 69, 70): anterior face strongly concave and meeting posterior face above, apex of posterior face slightly oval-shaped, sharp carina on posterolateral edges; sternopetiolar process consisting of anterior keel separated by carina.

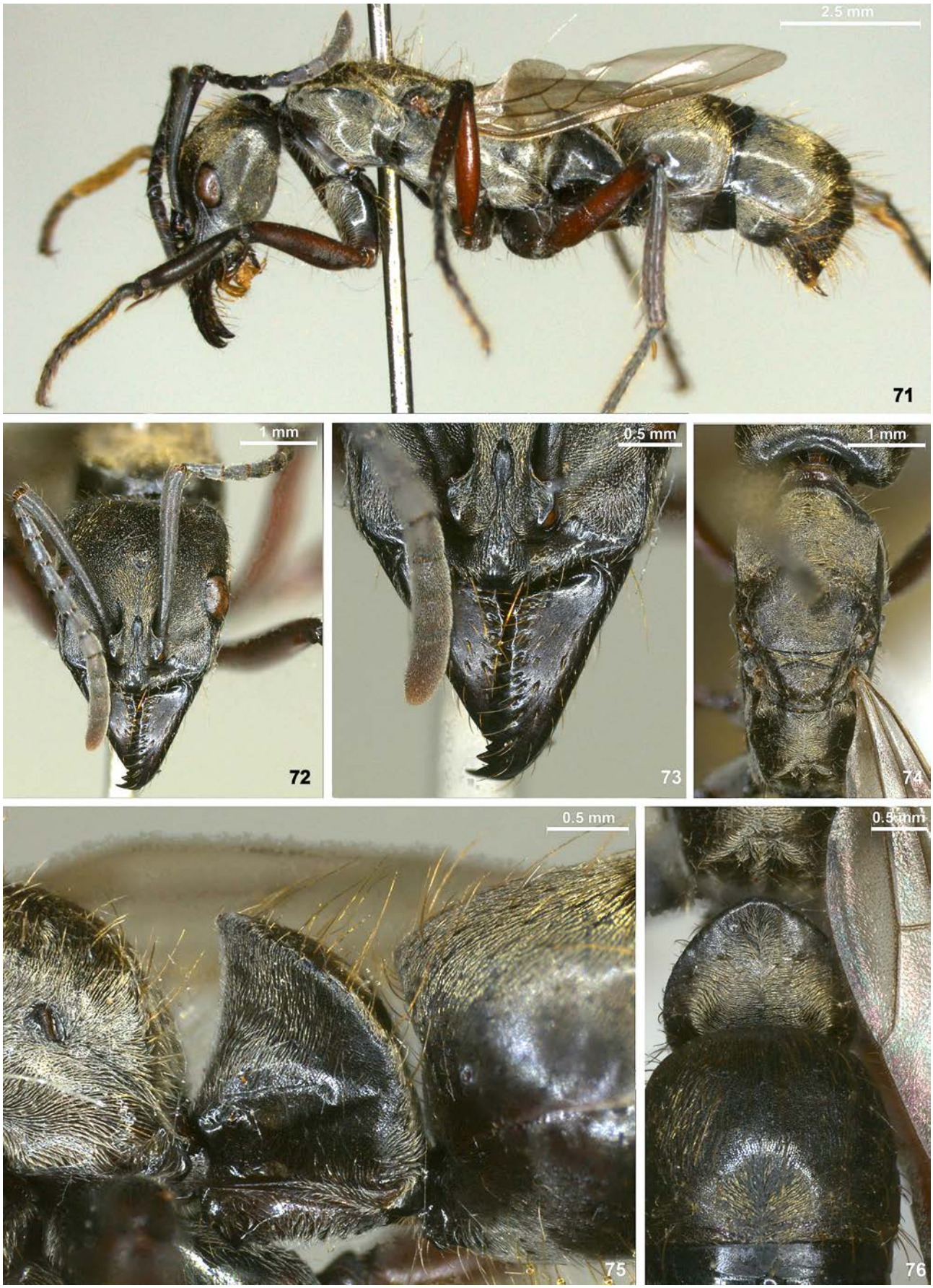
Gaster (Fig. 64): sternopostpetiolar process poorly developed;

Sculpture, pilosity and color (Figs. 64 - 70): integument of head black finely punctate, golden pubescence and erect hairs are present on all surfaces; mandibles with row

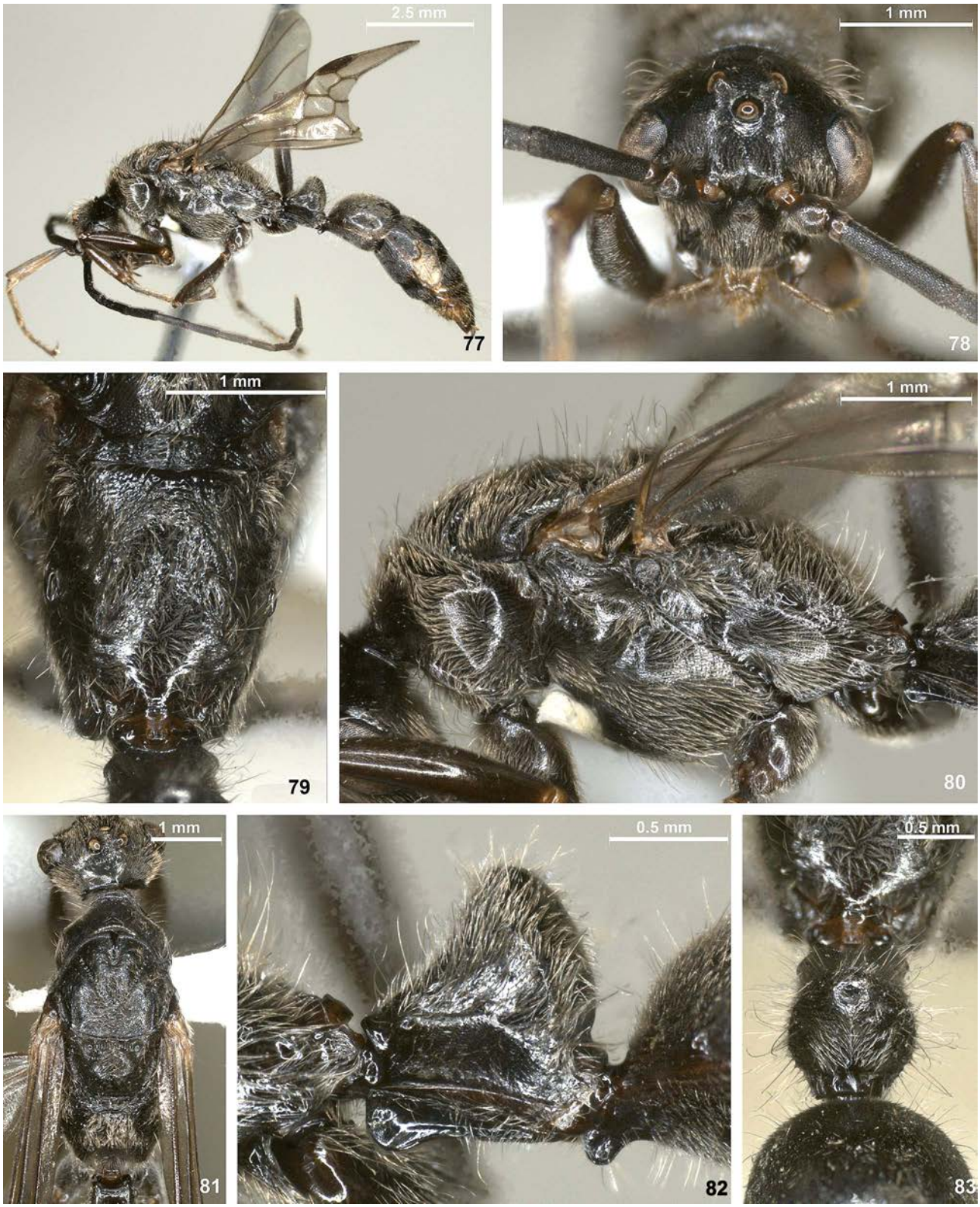


Figs. 64 - 70: *Pachycondyla inversa* (lectotype worker): (64) lateral view; (65) head in frontal view; (66) clypeus and mandibles in frontal view; (67) mesosoma in lateral view; (68) mesosoma in dorsal view; (69) petiole in lateral view; (70) petiole in dorsal view.

of short golden hairs near to the teeth; anterior border of the clypeus with row of short and long golden hairs; antennal scape covered by golden pubescence; funiculus covered with golden pubescence and erect golden hairs; integument of mesosoma black, finely punctate, covered with sparse golden pubescence and long golden hairs distributed on dorsum; legs with silver and golden pubescence; anterior basitarsus and tarsus with golden pubescence on ventral surface; median and posterior tarsus black with row of golden setae in ventral surface; tarsal claws not armed with tooth; arolium brown; integument of petiole black, finely punctate, with sparse golden pubescence distributed on surface, the sides finely punctate and glossy, the dorsal surface smooth and shiny with fine punctations and erect golden hairs; integument of gaster black, finely punctate and weakly shining, erect hairs present on the dorsum; tergites and pretergites covered with sparse golden pubescence and long golden hairs; hypopygidium and pygidium strongly punctate. Appressed golden pubescence present on all surfaces and especially obvious on the head, dorsum and side of the mesosoma, posterior face of the petiole and dorsum of the gaster.



Figs. 71 - 76: *Pachycondyla inversa* (queen): (71) lateral view; (72) head in frontal view; (73) clypeus and mandibles in frontal view; (74) mesosoma in dorsal view; (75) petiole in lateral view (76) petiole in dorsal view.



Figs. 77 - 83: *Pachycondyla inversa* (male): (77) lateral view; (78) head in frontal view; (79) propodeum in posterior view (80) mesosoma in lateral view; (81) mesosoma in dorsal view; (82) petiole in lateral view; (83) petiole in dorsal view.

Diagnosis of queen: As worker (Figs. 71 - 76).

Measurements of queen (n = 22): SL: 2.50 - 2.60; HW: 2.73 - 2.85; HL: 2.93 - 3.01; PW: 2.20 - 2.29; WL: 4.63 - 4.74; NLd: 1.09 - 1.12; NWd: 1.55. - 1.61; NLl: 1.30 - 1.38; NHl: 1.38 - 1.42; NIl: 94.20 - 97.18; SI: 91.22 - 91.57.

Diagnosis of male: Anterior face of petiole strongly concave, dorsal region forming an apex medially; dorso-propodeum strongly striate.

Description of male: Measurements (n = 15): HW: 1.92 - 2.01; HL: 1.50 - 1.56; PW: 1.60 - 1.65; WL: 4.01 -

4.09; NLd: 0.65 - 0.70; NWd: 0.80 - 0.84; NHl: 0.78 - 0.80; NLl: 0.85 - 0.90; NIl: 108.97 - 112.50.

Head (Figs. 77, 78): mandibles poorly developed; median region of clypeus convex and punctate.

Mesosoma (Figs. 77, 79 - 81): pronotum with swelling at shoulder and pronotal carina not developed; Mayrian sutures Y-shaped, not reaching scutellum in dorsal view; axial region concave and covered by oblique striae; dorsopropodeum strongly striate and slightly concave posteriorly.

Petiole (Figs. 77, 82, 83): dorsal face with apex concave; anterior face strongly concave, and sides with fine carina; sternopetiolar process well developed forming anterior projection.

Gaster (Fig. 77): sternopostpetiolar process consisting of projection without keels.

Genitalia (Figs. 112, 113): as the diagnosis for *P. foetida* complex (genitalia dissected on dried specimens).

Sculpture, pilosity and color (Figs. 77 - 83): integument of head black, with fine punctations, and surface covered with long golden and silver hairs; mandibles with basodorsal area white; palpal segment covered by silver and golden sparse pubescence; silver and golden pubescence near the eyes, antennae and clypeus; integument of mesosoma black and punctate, with surface covered by golden and silver pubescence; wings light brown and shiny; legs black, covered with golden and silver pubescence; median and posterior tibia with golden pubescence on surface; anterior, median and posterior basitarsi and tarsi brown with dense golden pubescence in ventral region; median and posterior tarsi brown with row of golden setae on ventral surface; tarsal claws with median tooth and golden pubescence; arolium brown; integument of petiole black, with the dorsal face shiny and with long silver hairs; integument of gaster black finely punctate; tergum and sternum covered by golden and silver pubescence and long silver hairs; erect golden hairs present on head, mesosoma, petiole and gaster. Appressed silver and golden pubescence present in all surfaces.

Biology: *Pachycondyla inversa* nests have been found in rotten cocoa pods and knot holes in cocoa trees of *Theobroma cacao* L. and their rotten fruits lying in the litter (KOLMER & HEINZE 2000, HEINZE & al. 2001). Workers have been found foraging under sheets of *Byttneria aculeata* JACQ. (Sterculiaceae). Several studies have indicated that colonies of *P. inversa* may be founded by a single queen (haplometrosis) or several (pleometrosis) and may also result in polygynous colonies (HEINZE 1993, TRUNZER & al. 1998, KOLMER & HEINZE 2000, HEINZE & al. 2001, TENTSCHERT & al. 2001, KOLMER & al. 2002, D'ETTORRE & al. 2005). Pleometrosis, secondary monogyny and cannibalism were observed for the species *P. inversa* (I.O. Fernandes, M.L. De Oliveira & J.H.C. Delabie, unpubl.). In many ant species, newly mated queens associate with other queens to establish new colonies, independent of parentage (I.O. Fernandes, M.L. De Oliveira & J.H.C. Delabie, unpubl.).

Discussion: The petiole of *Pachycondyla inversa* has a strongly curved anterior face in lateral view and the dorsum does not form an acute apex, while *P. curvinodis* has a more pronounced curve in the upper half of the petiole. The species also differ in size, *P. inversa* has SL < 2.39 mm, while that of *P. curvinodis* has SL > 2.63, and the scape index of *P. inversa* has SI < 94.65 mm, while that of *P. curvinodis* has SI > 104.24. According to MACKAY & MACKAY (2010) the taxon called Pvi2 (*Pachycondyla villosa inversa* 2) by LUCAS & al. (2002) is currently *P. curvinodis*. To clarify the status of this taxon we compared *P. curvinodis* (original description and plate) with the type of *P. inversa* and we concluded that Pvi2 belongs to a new species we call *P. bactronica* sp.n. The male of *P. inversa* here described can be easily recognized by the shape of its petiole, strongly curved on the anterior face, and by a striate dorsopropodeum. Like other species of the *P. foetida* complex, *P. inversa* has a wide distribution throughout the Neotropics, occurring from Mexico to Paraguay. The species shows little variation in color, although specimens collected closer to the equator circle are more brown in color. Body size is another variable character, but is not correlated with any changes in morphological characters. Diet and age of nest are known to influence body size in many ant species.

Distribution: Mexico; Guatemala; Honduras; Costa Rica; Panama; Venezuela; Guyana; French Guiana; Colombia; Ecuador; Peru; Brazil: Amapá, Amazonas, Pará, Ceará, Rondônia, Acre, Bahia, Mato Grosso, Espírito Santo, Rio De Janeiro and São Paulo; Bolivia; Paraguay.

Pachycondyla theresiae FOREL, 1899

Pachycondyla theresiae FOREL, 1899: 13 - 14, pl. 1, fig. 11 (☿). Panama, Bugaba.

Neoponera theresiae: EMERY, 1901: 47 (combination).

Neoponera (*Neoponera*) *theresiae*: EMERY, 1911: 72 (combination).

Pachycondyla theresiae: BROWN in BOLTON 1995: 310 (combination); MACKAY & MACKAY 2010: 549 - 550.

Type material examined: Lectotype and 1 paralectotype from Panama, Bugaba, Volcan de Chiriqui (MHNG). One "paratype" in MCZC, seen by MACKAY & MACKAY (2010), was not examined.

Diagnosis of worker (based on literature): Fine horizontal striae on the lower half of the front face of the petiole, as well as on the lower half of the back and of the side of the petiole.

Queen and male unknown.

Biology (based on literature): *Pachycondyla theresiae* occurs in wet forest habitats. Workers forage in the low arboreal zone and have been collected in extrafloral nectaries of *Passiflora* (Passifloraceae) (http://academic.evergreen.edu).

Discussion (based on literature): *Pachycondyla theresiae* is similar to *Pachycondyla villosa* and *Pachycondyla foetida*. But the side of petiole in *P. theresiae* has fine transverse striations in the lower half, absent in *P. villosa* and, in *P. foetida*, present in the front, in the upper half, and laterally across the extension of the dorsal and posterior sides of petiole. *Pachycondyla theresiae* can also be confused with *P. bugabensis*, due to its size, though this latter species also has no striae on the petiole.

Distribution (based on literature): Costa Rica; Panama; Peru; Brazil: Amazonas.

Pachycondyla villosa (FABRICIUS, 1804) (Figs. 84 - 105, 114, 115)

Formica villosa FABRICIUS, 1804: 409, America Meridionali.

Ponera villosa: ROGER 1861: 1 - 3 (♀, ♂).

Pachycondyla villosa: MAYR 1862: 720 (combination); MAYR 1863: 440 (catalog); DALLA TORRE 1893: 35 (catalog); FOREL 1899: 14; PETRALIA & VINSON 1980: 378 Figs. 7 - 9 (l.)

Neoponera villosa: EMERY 1901: 47 (combination); MANN 1916: 412 (distribution); GALLARDO 1918: 56 (catalog); WHEELER & WHEELER 1952: 615 (l.).

Neoponera (*Neoponera*) *villosa*: EMERY 1911: 72-73.

Pachycondyla villosa: BROWN in BOLTON 1995: 311 (combination); MACKAY & MACKAY 2010: 571 - 579.

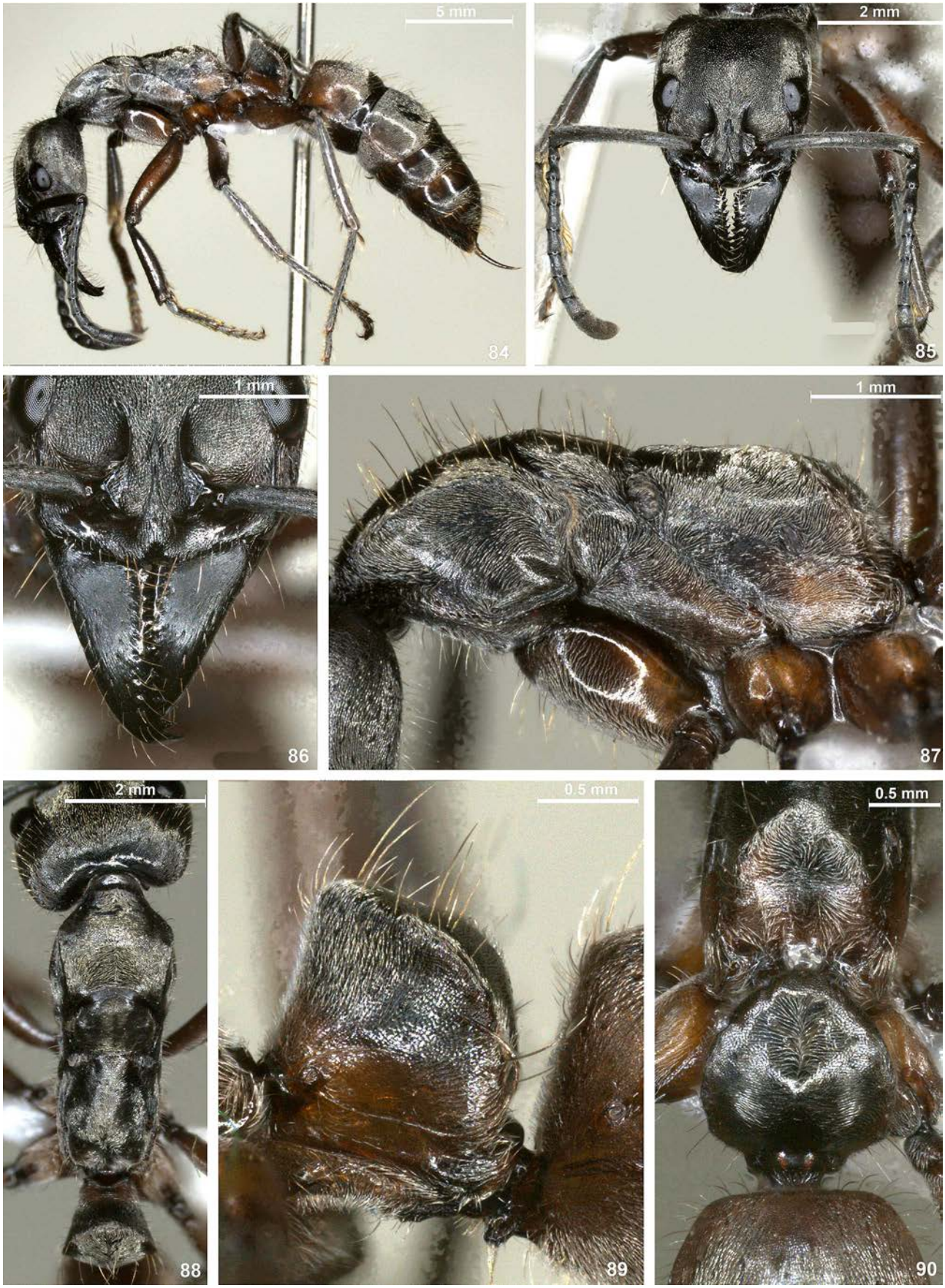
Ponera bicolor GUÉRIN-MÉNEVILLE, 1844: 424 (♀) (synonymy by ROGER 1861: 1).

Ponera pilosa SMITH, 1858: 95 (♂) (synonymy by ROGER 1861: 1).

Ponera pedunculata SMITH, 1858: 96, pl. 6, Fig. 25 (☿) (synonymy by ROGER 1861: 1).

Type material examined (Figs. 91 - 98): Lectotype of *Formica villosa* (queen, ZMUC, present designation) labeled "Essequibo, Smidt, Mus. Sehestedt, *Formica villosa*".

Additional material examined: United States: Texas, Brownsville, Cameron Co-Texas, VIII.1962, leg. P.A. Glick, 1 ♂ (BMNH); **Mexico:** La Mancha, 10.VII. 1997, leg. L. Quirino, 1 ☿; La Mancha, 6.V.1998, leg. D. Fresneau, 6 ♂♂ (CPDC); – Los Tuxtlas, 27.VI.1992, leg. L. Quirino, 1 ☿; Los Tuxtlas, VII.2001, leg. A. Pezon, 8 ☿☿; – Oaxaca, 2 km E. La Gruta, 30.XI.1985, leg. L. Quirino, 2 ☿☿ (CPDC); – Palma, V.C.R. Palma Sola numero 10988, 30.IX.1973, leg. J. Mateu, 1 ☿ (MZSP); – Tapachula, 5.X.1992, leg. D. Fresneau, 2 ☿☿ and 2 ♂♂ (CPDC); – Yucatán, Chichen Itza, 25.VII.1987, leg. D. Taejo, 1 ☿. **Nicaragua:** Managua, El Cruzeiro, 14.VI.1984, leg. J.M. Maes, 1 ☿ (MZSP). **Costa Rica:** Heredia, Porto Viejo, 25.V.1974, leg. R.L. Jeanne, 1 ☿ (MZSP); Heredia, La Selva Res., IX.1985, leg. J. Proster, 2 ☿☿ (BMHN); Santa Rosana, Nacional Parque NP, VI. 1985, leg. I.D. Gauld, 1 ☿, 1 ♀ (BMHN). **Panama:** Barro Colorado I.C.Z. numero 768, 24.VII.1924, leg. W.M. Wheeler, 1 ☿ (MZSP). **French Guiana:** Sinnamary, Basse Vie-RTE, Sinnamary-PK101 (*Philodendron solimoesense*), 15.VIII.1999, leg. S. Durou, 1 ☿; – Yalimapo, Awdéa ref: 15#5530, 17.V.2008, leg. S. Groc, 2 ☿☿ (CPDC). **Venezuela:** El Limon, Aragua 1100 m a.s.l., Venezuela Inst. Zoo. Agronomia Univ. Central, 21.XI.1966, leg. Romero, 2 ☿☿ (MPEG). **Peru:** Loreto, Jenaro Herrera, 22.X.1989, leg. G. Couturier, 5 ☿☿ (CPDC); – Tingo Maria, 650 m a.s.l. numero 564, leg. anonymous, 1 ☿ (MZSP). **Brazil:** Amapá, Mazagão, Fazendinha, 9.IX. 1978, leg. W. França, 1 ☿; Mazagão, 8.XII.1982, leg. P. Tadeu, 1 ☿, 1 ♀ (MPEG). – Pará: Belém, Acará, 7.XII. 1977, leg. W.L. Overal, 2 ☿☿; Belém, Alenquer, 5.VIII. 1979, leg. F.F. Ramos, 2 ♀♀; Benevides, Morelândia, 14. VI.1988, leg. W. França, 1 ☿, 1 ♀; Maruda, 29.IV.1979, leg. W. França, 2 ☿☿ (MPEG); Santarem, Fazenda Taperiaba, II.1968, Exp. Perm Ama., leg. anonymous, 2 ☿☿ (MZSP); Tucuruí, Margem esquerda, 13.III.1979, leg. R.B. Neto, 2 ☿☿; Tucuruí, Margem esquerda, 13.III.1979, leg. W.L. Overal, 1 ♀; Tucuruí, Beira D'água, 18.VIII.1979, leg. W.L. Overal, 2 ☿☿ (MPEG). – Amazonas, Porto de Anavilhanas, Margem esquerda do Rio Negro, Expedição do Departamento de Zoologia, 10.IV.1967, leg. anonymous, 2 ☿☿ (MZSP); Balbina, 1992 - 1994, leg. M. Queiroz, 2 ♀♀ (CPDC); Barcelos, Piaçabal, 26.VIII.2009, leg. Gersonval, 6 ☿☿; Codajás, 27.IX.2003, leg. J.M.S. Vilhena, 2 ☿☿ (INPA); Itacoatiara, Sítio São Francisco, ninho coletado, 2.X.2009, leg. I.O. Fernandes, 41 ☿☿, 1 ♀, 25 ♂♂ (INPA); Manaus, Colônia Santo Antônio, 7.II.1962, leg. F. Antônia, 2 ☿☿ (MPEG); Manaus, VII.1962, leg. K. Lenko, 2 ☿☿ (MZSP); Manaus / Itacoatiara, km 50, 24.VIII. 1962, leg. W.L. Brown, 1 ☿, 1 ♀; Manaus, Colônia Santo Antônio, 7.VIII.1962, leg. P. Antônio, 2 ☿☿ (INPA); Manaus, Convenio DZSP-GOELD, IX.1962, leg. K. Lenko, 1 ☿ (MZSP); Manaus, Reserva Florestal Adolpho Ducke, V.1968, leg. Faustino, 2 ☿☿; Manaus, Estrada AM 01, Km 155, 11.VII.1968, leg. E.V. Silva & A. Faustino, 2 ☿☿; Manaus, Estrada AM 01, Km 155, 13.VIII.1968, leg. E.V. Silva & A. Faustino, 2 ☿☿, 1 ♂; Manaus, Estrada BR 174, Km 38, 7.VIII.1969, leg. E.V. da Silva, 1 ♂; Manaus, INPA, Estrada para o Aleixo, 30.VII.1975, leg. Julmar, 1 ☿; Manaus, INPA, 29.IV.1976, leg. Mario Dantas, 1 ☿, 1 ♂; Manaus, Reserva Biológica Campina, 27.VIII.1975, leg. L. Albuquerque, 2 ☿☿; Manaus, Km 31, Estrada Manaus / Caracarai, NAF6, 30.IV.1976, leg. Nilce, 2 ☿☿, 1 ♂; Manaus, Km 30, Estrada Manaus / Caracarai, NAF6, 30.IV. 1976, leg. J.M. dos Santos, 2 ☿☿; Manaus, Reserva Florestal Adolpho Ducke, 04.V.1976, leg. C. Gondim, 1 ☿, 1 ♀; Manaus, NAF6, BR 174, 21.V.1976, leg. C. Gondim, 1 ☿; Manaus, INPA, 10.V.1976, leg. M. Dantas, 2 ☿☿; Manaus, Fazenda NAF6, Estrada Manaus / Caracarai, Km 31, 21.V. 1976, leg. Eduardo, 2 ☿☿; Manaus, Reserva Florestal Adolpho Ducke, Km 26, Estrada AM 10, 12.VI.1977, leg. L. Albuquerque, 2 ☿☿; Manaus, INPA, 15.VI.1977, leg. A.P. Luna Dias, 2 ☿☿; Manaus, Bairro Raiz, 13.VIII.1977, leg. E. da Silva, 1 ♀; Manaus, BR 174, Km 45, EEST, 25.V. 1978, leg. A.Y. Harada, 2 ♀♀; Manaus, Lago Amaná, 8.IX.1979, leg. R. Best, 6 ♂♂; Manaus, Paraná / Amaná, 28.IX.1979, leg. R. Best, 4 ☿☿; Manaus, BR 174, Km 41, 18.VI.1981, leg. A.Y. Harada, 2 ☿☿; Manaus, Reserva Florestal Adolpho Ducke, 13.X.1981, leg. J.A. Rafael, 1 ☿, 1 ♀; Manaus, BR 174, ZF-3, Km 24, Fazenda Esteio, Colosso, Reserva da WWF 1202, 15.IX.1987, leg. A.Y. Harada, 2 ☿☿; Manaus, AM 10, Reserva Florestal Adolpho Ducke, 18.VIII.1991, leg. P.L.W. Nevel, 2 ☿☿, 1 ♀; Manaus, Reserva Florestal Adolpho Ducke, 21.VIII.1991, leg. J. Adis, 2 ☿☿, 2 ♂♂; Manaus, INPA V8, pupunheira, 23. VIII.1991, leg. B. Telles, 2 ☿☿ (INPA); Manaus, Reserva Florestal Adolpho Ducke, 28.VIII.1991, leg. J. Adis, 2 ♀♀ (CPDC); Manaus, Reserva Florestal Adolpho Ducke, Terra Firme, 26.VIII.1992, leg. J. Adis, 2 ♀♀, 2 ♂♂; Manaus, Rio Solimões, Ilha de Marchantaria, Várzea, Lago Camaleão, 1. - 2.IX.1992, leg. J. Adis, 2 ☿☿, 2 ♂♂; Manaus, BR 174, Km 44, 24.VI.1994, leg. A.Y. Harada, 2 ☿☿; Manaus, Reserva Florestal Adolpho Ducke, Terra Firme, 26.VII.1994, leg. J. Adis & al., 1 ☿, 1 ♀; Manaus, INPA Cantina, 27.IX.2009, leg. I.O. Fernandes, 1 ♀; Presidente Figueiredo, Ilha Ressaca, Lago Balbina, 28.V.1994, leg. Queiroz, 1 ♀, 2 ♂♂ (INPA); Purus, Boca do Rio Purus, margem esquerda, Experimento Permanente Amazonas, 2. - 5.IV.1976, leg. anonymous, 2 ☿☿, 2 ♀♀ (MZSP). – Maranhão, Buriticupu, 30.IX.1978, leg. F.F. Ramos, 1 ☿ (MPEG); Imperatriz, Expedição do departamento de Zoologia, 15.VIII.1974, leg. anonymous, 2 ☿☿ (DZUP). – Ceará, Barbalha, Chapada do Araripe, 28.XII.1997, leg. A.C.C. Almeida, 2 ☿☿, 2 ♀♀ (CPDC); Chapada do Araripe 850 m a.s.l., 6.IV.1962, leg. D. Zajeiw, 2 ☿☿ (MZSP); Crato, Cerrado, Crato, 30.VII.1997, leg. J. Jardim, 1 ☿, 2 ♀♀ (CPDC). – Paraíba, João Pessoa, Reserva do Buraquinho IBDF, 25. - 29.I.1989, leg. I.S. Gorayeb, 2 ☿☿, 1 ♀; João Pessoa, Reserva do Buraquinho IBDF, 29.I. 1989, leg. F.F. Ramos, 1 ☿ (MPEG); João Pessoa, UFPB, 2. - 5.IV.1995, leg. M.F.S. Santos, 1 ☿, 2 ♀♀ (CPDC). – Acre, Rio Branco, Mata Terra Firme, 25.XI.1991, leg. I.



Figs. 84 - 90: *Pachycondyla villosa* (worker): (84) lateral view; (85) head in frontal view; (86) clypeus and mandibles in frontal view; (87) mesosoma in lateral view; (88) mesosoma in dorsal view; (89) petiole in lateral view; (90) petiole in dorsal view.

Gorayeb & N. Bittencourt, 1 ♀ (MPEG); Porto Walter #12852, 5. - 7.IV.1997, leg. J. Caldwell, 2 ♀♀ (CPDC). – Rondônia, Guajará-Mirim, Forte Príncipe da Beira, 19.XI - 3.XII.1962, leg. anonymous, 1 ☿ (MZSP); Guajará-Mirim, #5223 Manual, 12.II.1998, leg. J.M.R. Santos, 1 ☿ (CPDC); Ouro Preto do Oeste, 18. - 21.VIII.1984, leg. W.L. Overal, 1 ☿; Ouro Preto do Oeste, L.212 G.21. 0326, 3.IV.1985, leg. J. Dias, 2 ☿☿; Ouro Preto do Oeste, L.212 G.21. 0513, 7.IV.1985, leg. W. França, 1 ☿, 1 ♀ (MPEG). – Bahia, Aurelino Leal, Fazenda Safira, 10.VIII.1998, leg. J.R. do Carmo, 2 ☿☿, 1 ♀; Aurelino Leal, Fazenda Pedras Pretas, 10.VIII.1988, leg. J.M. Maria, 1 ☿; Camacan, 15.III.1991, leg. Niella, 2 ☿☿; Canavieiras, 7.IV.1993, leg. A.M. Argolo, 2 ☿☿, 1 ♀; Cruz das Almas, 17.IV.1991, leg. O. Marques, 2 ♀♀; Firmina Alves, Fazenda Itiuba, 21.XI.1988, leg. J. Crispim, 1 ☿, 1 ♀; Gongogi, Fazenda São Carlos, 9.VIII.1988, leg. J. Crispim, 2 ☿☿; Ilhéus CEPEC#261, X.1969, leg. D. Fresneau, 1 ☿, 1 ♀; Ilhéus, CEPEC, 23.II.1988, leg. P. Terra, 1 ☿, 1 ♀; Ilhéus, CEPEC, 13.X.1991, leg. anonymous, 1 ☿; Ilhéus, Fazenda Commodoty, 6.XII.1991, leg. A.A.M.V. Encarnação, 1 ☿, 1 ♂; Ilhéus, Praia do Norte, 7.I.1994, leg. J.H.C. Delabie, 1 ♀, 1 ♂; Ilhéus, Praia do Norte, 8.I.1994, leg. J.H.C. Delabie, 2 ♀♀; Ilhéus, CEPEC AH', 9.VI.1994, leg. A.L.E. Souza, 1 ☿, 1 ♂; Ilhéus CEPEC OH, 10.VII.1995, leg. A.L.B. Souza, 2 ☿☿; Ilheus, CEPEC, 15.XII.1995, leg. J. Assis, 1 ☿, 1 ♂; Ilhéus, CEPEC H', 3.VII.1995, leg. A.L.E. Souza, 1 ☿, 1 ♂; Ilhéus, CEPEC #5119, X.1996, leg. J.C.S. do Carmo, 2 ☿☿; Ilhéus, CEPEC# 5261-10C, 26.X.1996, leg. D. Fresneau, 2 ☿☿; Ilhéus, CEPEC Reserva, IX.1997, leg. J.R.M. Santos, 2 ☿☿; Ilhéus, CEPEC, 2.VII.1998, leg. anonymous, 1 ♂; Ilheus, CEPLAC, IX.1998, leg. D. Fresneau, 2 ☿☿; Ilhéus, CEPEC 61, 15-22.X.1999, leg. D. Fresneau, 2 ☿☿; Ilhéus, CEPEC, I.1999, leg. J.R. Maia, 2 ☿☿; Ilheus, CEPEC #5261, 17. - 23.X.1999, leg. anonymous, 2 ☿☿; Ilhéus, CEPEC#5261-16, 29.X.1999, leg. D. Fresneau, 2 ☿☿; Ilhéus CEPEC, VIII.2000, leg. B. Jahyny, 2 ♀♀, 1 ♂; Ilhéus, CEPEC, 26.II.2002, leg. J.R.M. dos Santos, 2 ♀♀; Ilhéus, #5385, 9.XII.2003, leg. W. Duhamel, 1 ☿, 1 ♀, 1 ♂; Ilhéus, CEPEC, II.2005, leg. K. Watkins & M. Cobb, 1 ♀; Ilhéus, CEPEC#5509, cupinzeiro 12, 2.V.2007, leg. P.P. Santos, 1 ☿; Ilhéus, CEPEC#5509, cupinzeiro 24, 13.IX.2007, leg. P.P. Santos & J.H.C. Delabie, 2 ☿☿; Ilhéus, Serra Bonita, 7.X.2009, leg. F.D. Santana, 1 ☿; Itabuna, 14.III.1999, leg. anonymous, 1 ☿; Itabuna, 14.III.1999, leg. anonymous, 1 ☿; Itaju da Colônia, Fazenda Serra do Farol, 20.VII.1991, leg. A.J.S. Argolo, 1 ☿; Ipiaú, Fazenda Sempre Viva, 13.VII. 1998, leg. J.S. Crispim, 1 ♀; Itamarajú, Fazenda Pau Brazil, 22.V.1991, leg. A.S. Argolo, 1 ♀, 1 ♂; Itamarajú, 21.I. 1994, leg. I. Cardoso, 1 ☿, 1 ♂; Itamarajú, 29.III.2004, leg. E. Mariano, 1 ♀; Itajuipe, 26.V.1993, leg. T.F. Midles, 1 ☿, 1 ♀; Itubera Fazenda Ondulada, 19.V.2000, leg. K. Nakayama, 1 ☿, 1 ♀; Jequiriça, Fazenda Pontes, 21.VI.1988, leg. J. Crispim, 1 ☿; Lages, Fazenda Arilan, 22.VI.1988, leg. J.S. Crispim, 1 ☿, 1 ♂; Mucuri, Fazenda Guanabara, 29.X. 1979, leg. F.P. Benton, 2 ☿☿; Mutuipe, Fazenda São Roque, 22.VI.1988, leg. J.S. Crispim, 2 ☿☿; Santa Luzia, conjunto Ipiranga, 21.IV.1988, leg. J.S. Crispim, 2 ☿☿, 1 ♂; Teixeira de Freitas, 10.IX.2001, leg. J.R.M. Santos, 1 ☿; Teixeira de Freitas, 10.IX.2004, leg. J.R.M. Santos, 1 ♀, 1 ♂; Teixeira de Freitas, 30.III.2004, leg. C.S.F. Mariano, 2 ☿☿; Una, Rebio IBDF, XI.1987, leg. M.C. Alves, 1 ☿, 1 ♀; Una, ESMAI, 10.VIII.1995, leg. Conceição, 1 ☿; Una, 13.VIII. 1997, leg. J.H.C. Delabie & D. Agosti, 2 ☿☿, 1 ♀; Una, EDJAB, 28.VIII.2007, leg. A. Lago, 1 ♀ (CPDC). – Mato Grosso, Chapada dos Guimarães, Exp. D. Zoo., da UFPR, 1.XII.1983, leg. anonymous, 1 ☿ (DZUP); Cuiabá, Cerrado, 22.XI.1984, leg. J.C. Trager, 1 ☿; Serra do Roncador MT-RS Base Camp., 13.VII.1968, leg. Laroca & Azevedo, 1 ☿ (MZSP); Tangará da Serra, 30.V.2008, leg. P.R. Maria, 1 ☿ (CPDC); Três Lagoas, Fazenda Dr. José Mendes, Exp. D. Zoo., 26.V.1964, leg. anonymous, 2 ☿☿ (MZSP). – Distrito Federal, APA Gama Cabeça de Veado, II.-III.2000, leg. Mireille Pic, 2 ☿☿, 1 ♂♂ (CPDC). – Goiás, Jataí, Fazenda Aceiro, 2.XI.1962, Exp. D. Zoo., leg. anonymous, 2 ☿☿; Niquelandia, 18. - 30.V.1996, leg. Silvestre & Brandão, 1 ♀ (MZSP). – Minas Gerais, Marleria, Parque Estadual do Rio Doce, 6. - 23.IV.1978 / 8. - 15.XII.1979, leg. M.A.V. Andrade & F.S. Pereira, 1 ☿, 4 ♂♂ (UFMG); Paineiras, Fazenda Olhos D'água, estrada do aeroporto, 25.XII.2003 / 1.I.2004, leg. A.A. Tavares, 1 ☿ (MZSP); Santana do Riacho, 19.XI.2001, leg. S.M. Soares, 1 ♀ (CPDC). – Espírito Santo, Linhares, 11.X.1966, leg. Niella, 1 ☿, 1 ♂; Linhares, Fazenda São Sebastião, 14.IV.1991, leg. anonymous, 1 ☿; Linhares, Fazenda Guanabara, 15.VIII.1991, leg. Conceição, 1 ☿; Linhares, Fazenda Guanabara, 13.IX.1991, leg. A.C. Spaggiari, 1 ☿, 1 ♀; Regncia, 25.I.1994, leg. J.H.C. Delabie, 1 ☿; Serra, 17.III.1993, leg. W. Loureiro, 1 ☿ (CPDC); Vitória, Penha n.1078, I.1954, leg. R. Muller, 1 ☿ (MZSP). – Mato Grosso do Sul, Cassilandia, Fazenda Olho D'água, 15. - 16.XII.1987, leg. anonymous, 1 ☿; Corumbá, 22.XI.1960, leg. K. Lenko, 1 ☿, 1 ♀ (MZSP). – Rio de Janeiro, Seropédia, UFRRJ, 3.II.2004, leg. J.H.C. Delabie, 1 ♀, 1 ♂ (CPDC). – São Paulo, Itatinga, 6. - 18. XI.1990; Piracicaba, ESALQ (540M) EBF, V.1972; Piracicaba, 13.XI.1990, leg. J.A. Cerignoni, 2 ☿☿, 1 ♀ (ESALQ); Rio Claro, 25.XII.1993, leg. C. Mintevera, 2 ☿☿ (CPDC); São Paulo, Fazenda Itaquere, Boa Esperança do Sul, 24.XI. 1963, leg. K. Lenko, 1 ☿; São Paulo Luiz Antonio, Reserva Ecológica Jataí, 23. - 25.V.1997, leg. R. Silvestre & R.R. Silva, 1 ♀ (MZSP). – Paraná, Guaíra, VIII.1982, leg. A.M. Cordeiro, 1 ♀; Guaíra, IX.1982, leg. A.M. Cordeiro, 1 ☿ (DZUP); Porto Cabral, 1 - 25.IV.1944, F.O. Trav., leg. Carrera & E. Dente, 1 ☿ (MZSP). **Argentina:** Misiones, IX.1956, leg. L.N. Alem, 5 ☿☿ (MZSP).

Diagnosis of worker (Figs. 84 - 90): Anterior border of clypeus concave medially; anterior face of petiole vertical and broadly convex on dorsum.

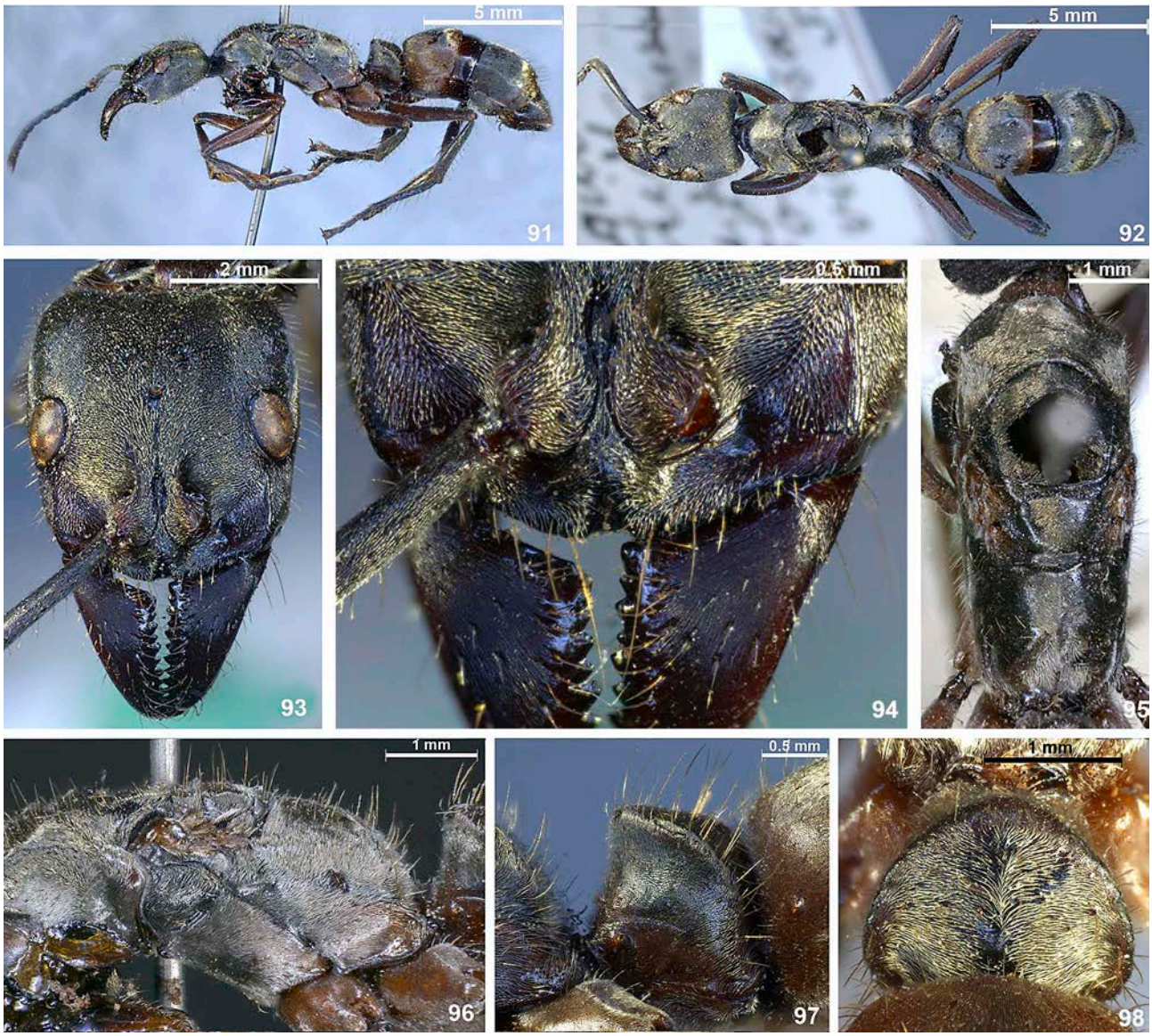
Measurements of worker (n = 261): SL: 2.60 - 2.80; HW: 2.67 - 2.77; HL: 2.89 - 2.98; PW: 1.79 - 1.84; WL: 4.50 - 4.59; NLd: 0.96 - 1.02; NWd: 1. 29 - 1.36; NHl: 1.01 - 1.10; NLl: 1.30 - 1.40; NIl: 127.27 - 128.71; SI: 97.37 - 101.08.

Diagnosis of queen: As worker.

Measurements of queen (n = 94): SL: 2.90 - 3.10; HW: 3.01 - 3.09; HL: 3.20 - 3.34; PW: 2.28 - 3.38; WL: 5.27 - 5.70; NLd: 1.22 - 1.34; NWd: 1.58 - 1.84; NHl: 1.06. - 1.19; NLl: 1.20 - 1.45; NIl: 113.20 - 121.84; SI: 96.34 - 100.32.

Redescription of queen type: Measurements: SL: 3.03; HW: 3.08; HL: 3.29; PW: 2.35; WL: 5.73; NLd: 1.31; NWd: 1.81; NHl: 1.18; NLl: 1.43; NIl: 121.18; SI: 98.37.

Head (Figs. 91 - 94): mandibles with 15 teeth on masticatory border; ocelli well developed; malar carina reaching eye; clypeus concave medially.



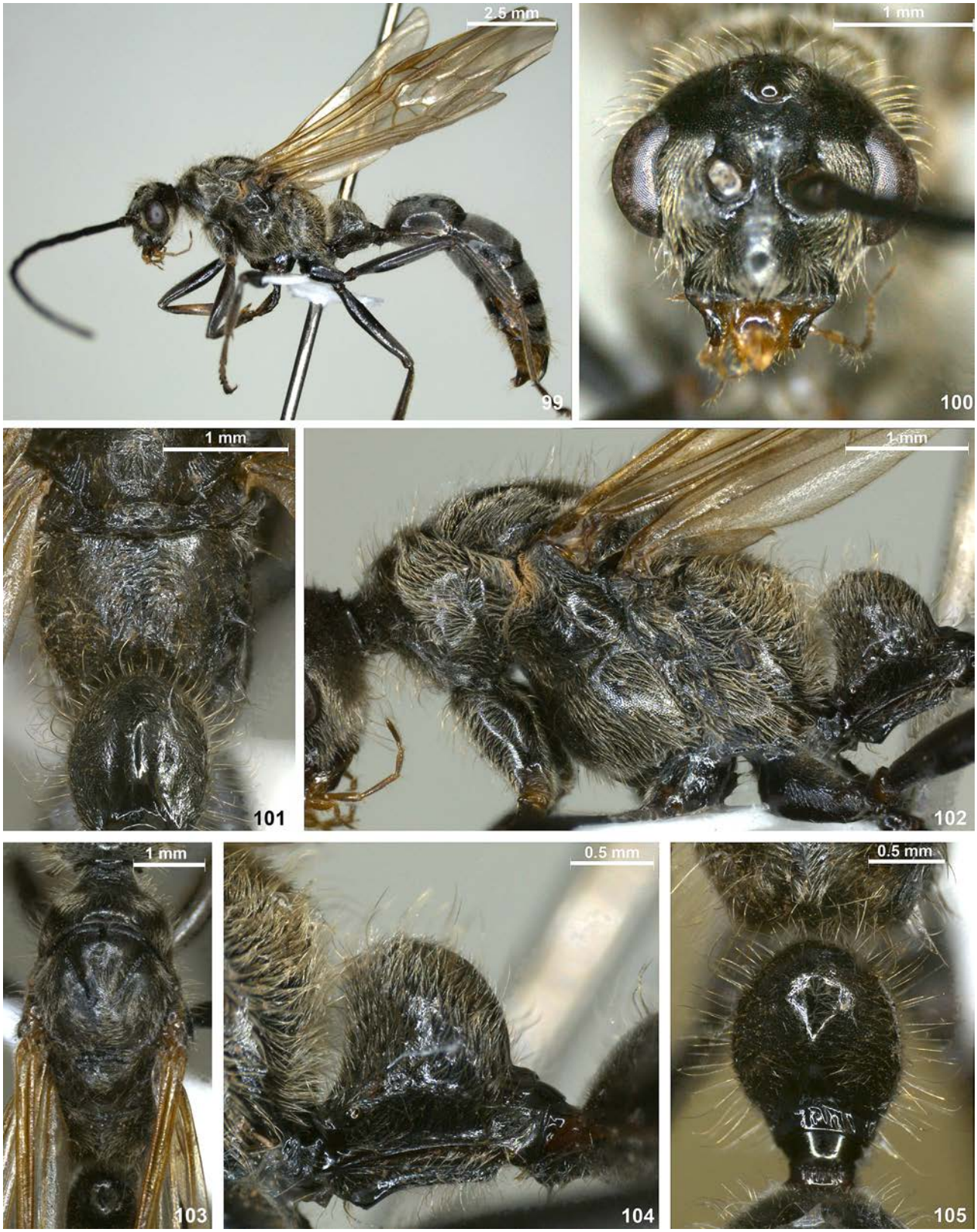
Figs. 91 - 98: *Pachycondyla villosa* (lectotype queen): (91) lateral view; (92) dorsal view; (93) head in frontal view; (94) clypeus and mandibles in frontal view; (95) mesosoma in dorsal view; (96) mesosoma in lateral view; (97) petiole in lateral view; (98) petiole in dorsal view.

Mesosoma (Figs. 91 - 92, 95, 96): pronotal carina sharp and well developed; scutum large and thickened; scutellum reduced; scutello-metanotal groove well developed; deep metanotal-propodeal grooves; propodeal carina poorly developed in dorsal view, with posteropropodeum nearly concave between carina in dorsal view.

Petiole (Figs. 91, 92, 97, 98): anterior face vertical, lateral face with posterolateral carina evident in lateral view; dorsal face broadly convex and rounded; sternopetiolar process forming anterior projection separated by carina.

Gaster (Figs. 91, 92): sternopostpetiolar process without carina.

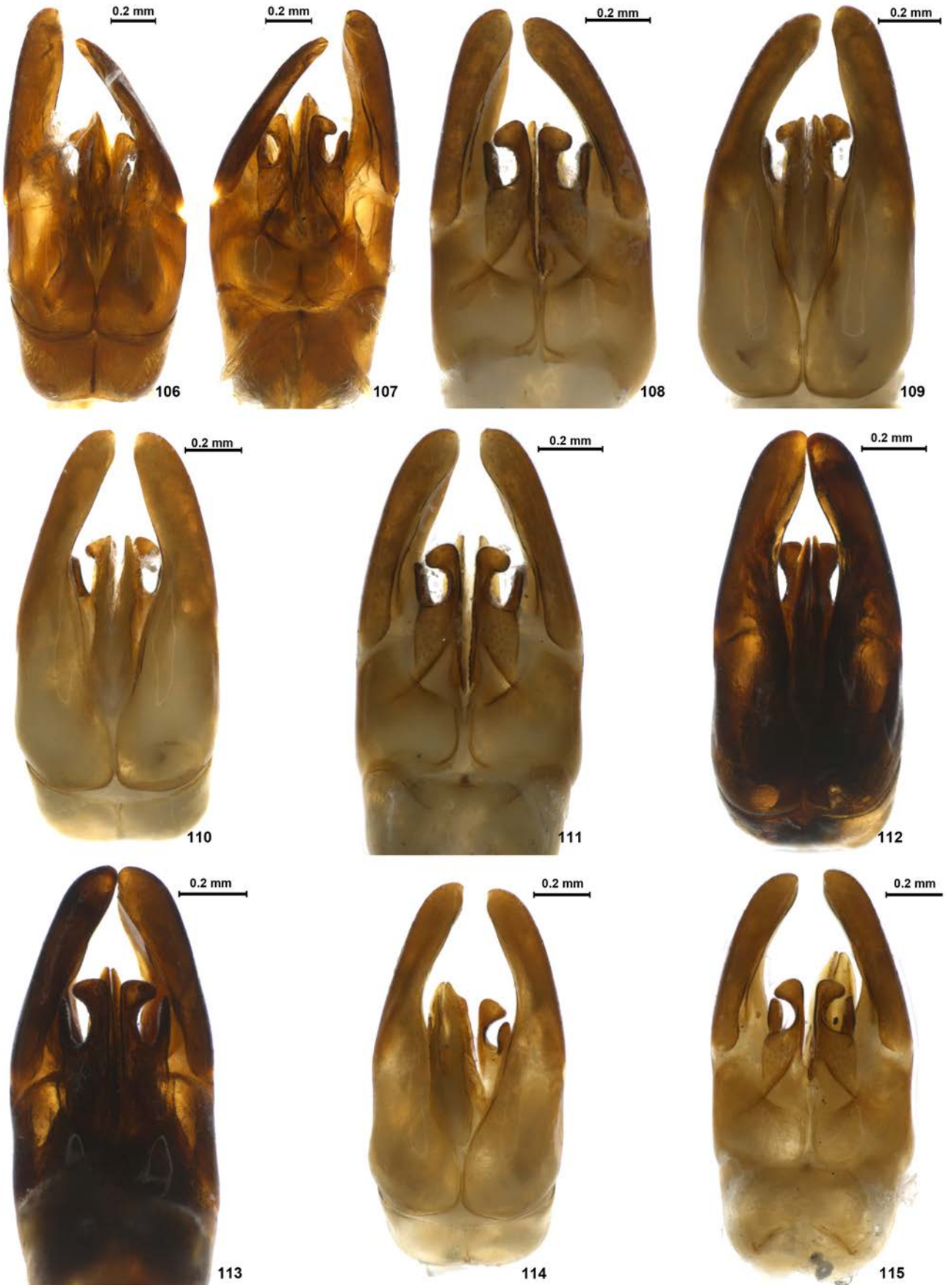
Sculpture, pilosity and color (Figs. 91 - 98): integument of head black and brown, finely punctate; scape covered by golden pubescence; clypeus with long and short erect golden hairs; mandibles opaque, with few punctures; masticatory border with short golden hairs and fine striation on dorsal surface; integument of mesosoma black and brown, abundant erect golden and silver hairs and pubescence distributed on all surfaces, more evident on dorsum; legs brown, covered with sparse silver and golden pubescence; anterior, medial and posterior basitarsi and tarsi brown, dense golden pubescence on ventral surface; medial and posterior tarsi with row of golden setae on ventral surface; tarsal claws not armed with tooth; arolium brown; integument of petiole brown below, black above, with erect golden hairs abundant on all surface, most evident on dorsum; integument of gaster brown weakly punctate, erect golden hairs present on dorsum and appressed gold and silver pubescence present on all surfaces; tergites covered by golden pubescence and long golden hairs; hypopygidium and pygidium punctate. Appressed golden and silver pubescence distributed on most surfaces, especially on mesosoma, petiole and gaster. Erect golden hairs abundant on most surfaces, including the dorsal and ventral surfaces of the head, the antennal scapes, the posterior border of the



Figs. 99 - 105: *Pachycondyla villosa* (male): (99) lateral view; (100) head in frontal view; (101) proprodeum in posterior view (102) mesosoma in lateral view; (103) mesosoma in dorsal view; (104) petiole in lateral view; (105) petiole in dorsal view.

head, the dorsum of the mesosoma, dorsum of the petiole, all surfaces of the gaster. The hairs on the legs either erect or suberect.

Diagnosis of male (Figs. 99 - 105, 114, 115): Posteropropodeum strongly striate; anterior face of petiole vertical, petiole robust with posterolateral carina.



Figs. 106 - 115: Genitalia: *Pachycondyla bactronica* sp.n., (106) dorsal and (107) ventral view. *P. curvinodis*, (108) ventral and (109) dorsal view (male with black gaster), and (110) dorsal and (111) ventral view (male with yellow gaster). *P. inversa*, (112) dorsal and (113) ventral view. *P. villosa*, (114) dorsal and (115) ventral view.

Measurements of male (n = 65): HW: 1.92 - 2.01; HL: 1.50 - 1.55; PW: 1.40 - 1.48; WL: 4.00 - 4.12; NLd: 0.65 - 0.70; NWd: 0. 70 - 0.75; NLl: 0.50 - 0.54; NHl: 0.85 - 0.93; NIl: 58.06 - 58.82.

Biology: *Pachycondyla villosa* is the most well studied species within the *P. foetida* complex (LACHAUD & al. 1984, HÖLLDOBLER 1985, DEJEAN 1990, DEJEAN & CORBARA 1990a, b, DEJEAN & al. 1990, CAMARGO-MATHIAS & CAETANO 1991, 1992a, b, 1995a, b, 1996, CAMARGO-MATHIAS & al. 1991, VALENZUELA-GONZALEZ & al. 1994, DEJEAN & CORBARA 1998, TRUNZER & al. 1998, MARIANO & al. 2000). Like other members of this group, *P. villosa* has arboreal habits, nesting in trees. It forages on the ground or in trees, looking for extrafloral nectaries and exudates of mealybugs and can carry drops of liquid between the jaws (HÖLLDOBLER 1985, PAUL & ROCES 2003). The colonies are established in hollow logs and in epiphytes (DEJEAN & al. 1990, DEJEAN & OLMSTED 1997), *Tillandsia bulbosa* HOOK and *Tillandsia streptophylla* SCHWEID (DEJEAN & al. 1995), and in pseudobulbs of orchids like *Schomburgkia tibicinis* BATEMAM (WHEELER 1942), and are occasionally found in *Cecropia* sp., especially in *Cecropia hispidissima* Cuatrec and also in cavities of *Bursera simaruba* (L.) SARG. (DEJEAN & al. 1992). VALENZUELA-GONZALEZ & al. (1994) observed that *P. villosa* mainly forages during the night, a period when the humidity is high and the temperature is lower. *Pachycondyla villosa* demonstrates strong allegiance to a particular area, and does not practice recruitment (FRESNEAU & al. 1982, LACHAUD & al. 1984, FRESNEAU 1985). We collected a small nest of *P. villosa*, with 41 workers, 25 males and one queen, totaling 67 ants. *Pachycondyla villosa* is considered the most aggressive species of the *P. foetida* complex with regard to predation and nest defense (MAES 1989, DEJEAN & al. 1990, WILD 2005). Species such as *P. curvinodis* and *P. inversa* showed less aggression, compared to *P. villosa* (I.O. Fernandes, M.L. De Oliveira & J.H.C. Delabie, unpubl.).

Discussion: The taxonomic status of *Pachycondyla villosa* has been unclear for many years due to its confusion with several similar species such as *P. curvinodis*. Part of this confusion is due to its wide distribution, from the southern United States to Argentina and also to the short description by FABRICIUS (1804). The type series consists of two syntypes of *P. villosa*. After examining them we concluded that only one of them (the queen) with a label "Essequibo, Smidt, Mus. Sehestedt, *Formica villosa*", with the signature of Fabricius is really the type of *P. villosa*, and the other one (the worker), which has a label written "*villosa*", is *P. inversa*. The latter was compared to the type of *P. inversa* for confirmation. MOURE (1960) reports a similar problem in bees in the Fabricius collection, in which the locality "South America, Essequibo" corresponds to the Essequibo River in Guyana.

Pachycondyla villosa can be differentiated from other species of the *P. foetida* species complex by the anterior margin of its clypeus, which is concave medially without striae, and by the anterior face of the petiole, which is vertical and convex with a broadly rounded posterior face, characters absent in the other species. *Pachycondyla curvinodis* can be differentiated by the shape of the petiole, which has a concave anterior face, while that in *P. villosa* is vertical. *Pachycondyla theresiae* can be differentiated by striae on the side and dorsum of the petiole, characters not observed in *P. villosa*.

Pachycondyla villosa has a wide distribution in the New World, occurring from the southern United States to Argentina. The species shows little variation in color, although specimens collected nearer to the equator circle have the petiole, mesosoma, gaster, and legs darker brown. Body size is another variable character, but is not correlated with any changes in morphological characters. Diet and age of nest are known to influence body size in many ant species.

Distribution: United States; Mexico; Belize; Guatemala; El Salvador; Honduras; Nicaragua; Costa Rica; Panama; Puerto Rico; Trinidad; Venezuela; Colombia; Guyana; Suriname; French Guiana; Ecuador; Brazil: Amapá, Pará, Amazonas, Maranhão, Ceará, Paraíba, Rondônia, Acre, Bahia, Mato Grosso, Distrito Federal, Goiás, Minas Gerais, Espírito Santo, Mato Grosso Do Sul, Rio De Janeiro, São Paulo and Paraná; Bolivia; Paraguay; Argentina.

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