

Fossil and extant species of *Cylindromyrmex* (Hymenoptera: Formicidae)

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Fossil and extant species of *Cylindromyrmex* (Hymenoptera: Formicidae). - The genus *Cylindromyrmex* is restricted to the Neotropics and comprises ten Recent species and two fossil ones from Dominican amber. *Cylindromyrmex parallelus* Santschi is a junior synonym of *Cylindromyrmex meinerti* Forel. *Cylindromyrmex whympersi* (Cameron) is re-established as a good species. *Cylindromyrmex escobari* n. sp. is described from Colombia. A cladistic analysis allows grouping of the twelve known species into four clades: the *striatus*, the *boliviae*, the *brevitarsus*, and the *longiceps* clades. No *Cylindromyrmex* has been reported from the Recent fauna of Hispaniola yet. This genus existed on Hispaniola during the Early or Middle Tertiary times and its apparent absence from the extant fauna of the island, if confirmed, should be due to a more recent extinction.

Key-words: Formicidae - neotropical ants - *Cylindromyrmex* - Dominican amber - fossil ants - Tertiary.

INTRODUCTION

The subfamily Cerapachyinae contains 3 tribes: Cerapachyini (three genera), Acanthostichini (one genus) and Cylindromyrmecini (one genus, *Cylindromyrmex*, revised in this work). *Cylindromyrmex* nests in cavities of rotten wood, under bark, in hollow twigs, and in termite galleries. They are said to be termite predators. Among cerapachyines, WILSON (1985) and BARONI URBANI (1995) reported the presence of the genus *Cylindromyrmex* in Dominican amber without further specifications, and DE ANDRADE (in press) describes a new species of *Acanthostichus* from Dominican amber. Only two more species of cerapachyines are known in the fossil record, both assigned to the extinct genus *Procerapachys* from Baltic Amber. Their systematic position is not clear. In fact, BROWN (1975) within *Cerapachys*, considered the two Baltic species to represent a distinctive species group on the basis of their large eyes and complete promesonotal suture. The eyes of these two species, as they have been figured by WHEELER (1915), appear comparable to those described for several Recent representatives, and the promesonotal suture is drawn uninterrupted only for *C. annosus* and not for *C. favosus*. The two Baltic species, as far as I know, have never been re-studied

since WHEELER's descriptions at the beginning of this century. Most contemporary species, however, show a completely fused mesosoma without traces of suture, but a well visible suture is present at least in the S. African *C. wroughtoni*.

MATERIAL AND METHODS

Two fossil specimens of *Cylindromyrmex* have been examined in two samples of amber from the Dominican Republic:

Do-4130-1 (Fig. 1) of the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A light yellow sample containing only one winged gyne of *Cylindromyrmex*. The preservation condition of the specimen is good, though whitish layers surround the right side of the frontal carina, the mesosoma, the wings, the gaster, and part of the legs.

MCZC (Fig. 2) of the collection of the Museum of Comparative Zoology, Harvard, U.S.A. A dark yellow sample containing a dipteran, few impurities, small air bubbles, remaining of insect wings and one winged gyne of *Cylindromyrmex*. The preservation condition of the specimen is good.

The Recent species of *Cylindromyrmex* examined in this study are deposited in the following collections, given here with the relative coden as it will be used in the following text:

- | | |
|------|---|
| BMNH | The Natural History Museum, London, England. Courtesy of Barry Bolton. |
| CPC | Centro de Pesquisa do Cacao, CEPLAC, Itabuna, Bahia, Brasil. Courtesy of Dr. Jacques H. C. Delabie. |
| WEMC | William and Emma MacKay, Texas, United States. Courtesy of Prof. William P. MacKay. |
| DEIC | Deutsches Entomologisches Institut, Eberswalde, Deutschland. Courtesy of Dr. Stephan M. Blank. |
| IAVH | Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Villa de Leiva, Santafé de Bogotá, Colombia. Courtesy Fernando Fernández-C. |
| IEGG | Istituto Di Entomologia "Guido Grandi", Bologna, Italy. Courtesy of Prof. Egidio Mellini. |
| LACM | Natural History Museum of Los Angeles County, USA. Courtesy of Roy R. Snelling. |
| MHNG | Muséum d'Histoire Naturelle, Geneva, Switzerland. Courtesy of Dr. Ivan Löbl. |
| MIZA | Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépes", Maracay, Venezuela. Courtesy of John Latke and José L. García |
| MNH | Muséum National d'Histoire Naturelle, Paris. Courtesy of Dr. Janine Casevitz-Weulersse. |
| MCSN | Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy. Courtesy of Dr. Valter Raineri. |
| MCZC | Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA. Courtesy of Stefan Cover. |
| MPEG | Museu Paraense Emilio Goeldi, Pará, Brazil. Courtesy of Dr. Ana Y. Harada. |
| MZSP | Museu de Zoologia, Universidade de São Paulo, Brazil. Courtesy of Prof. Carlos Roberto Ferreira Brandão. |
| NHMB | Naturhistorisches Museum Basel, Switzerland. Courtesy of Dr. Michel Brancucci. |
| NHMW | Naturhistorisches Museum Wien, Austria. Courtesy of Dr. Stefan Schödl. |
| USNM | United States Department of Agriculture, Agricultural Research Service, Systematic Entomology Laboratory, c/o National Museum of Natural History, Washington, D. C., USA. Courtesy of Dr. Ted R. Schultz. |



FIG. 1

Dominican amber. Specimen Do-4130. Profile (top); dorsal view (bottom).

The measurements and Indices I used are those defined by BROWN (1975); these and other measurements defined here are:

- | | |
|-----|---|
| TL | (Total Length): combined head length in full face view (mandibles included), Weber's length, petiole length (side view), and postpetiole and remaining gastral lengths (both in side view). |
| HL | (Head Length): with head in full frontal view, maximum measurable distance between the middle of the vertexal margin and the middle of the anterior border of the clypeus. |
| HW | (Head Width): maximum measurable head width behind the eyes in frontal view. |
| EL | (Eye Length): maximum eye length. |
| SL | (Scape Length): length of scape shaft, excluding the basal condyle. |
| SW | (Scape Width): maximum width of scape. |
| WL | (Weber's Length): diagonal length of mesosoma from the anterior pronotal slope to distal edge of the posterior border of the propodeum. |
| PeL | (Petiole Length): maximum measurable distance, in dorsal view, between the middle of the anterior petiolar margin to the middle of its posterior margin. |

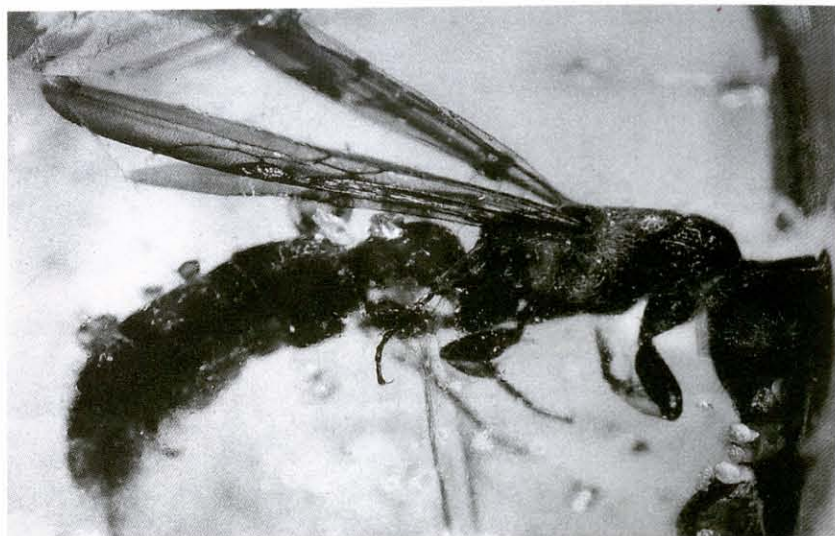


FIG. 2

Dominican amber. Specimen from MCZC. Profile (top); head in dorsal view (bottom).

- PeW (Petiole Width): maximum measurable width of the petiole in dorsal view.
 HFeL (Hind Femur Length): maximum measurable distance on the anterior face of the hind femur.
 HFeW (Hind Femur Width): maximum measurable width of the anterior face of the hind femur.
 HTiL (Hind Tibia Length): maximum measurable distance on the anterior face of the hind tibia.
 HTiW (Hind Tibia Width): maximum measurable distance on the anterior face of the hind tibia.
 HBaL (Hind Basitarsus Length): maximum measurable distance on the anterior face of the hind basitarsus excluding the spines.
 HBaW (Hind Basitarsus Width): maximum measurable distance on the anterior face of hind basitarsus.
 CI (Cephalic Index): $HW/HL \times 100$
 SI (Scape Index): $SW/SL \times 100$
 HFeI (Hind Femur Index): $HFeW/HFeL \times 100$
 HTiI (Hind Tibia Index): $HTiW/HTiL \times 100$
 HBaI (Hind Basitarsal Index): $HBaW/HBaL \times 100$

A species-level cladistic analysis was performed using as outgroups two representatives of two closely related genera, *Acanthostichus* and *Simopone*. No straightforward autapomorphies have been included in the data matrix. The search for the most parsimonious tree(s) was performed by PAUP 3.1.1 (SWOFFORD 1993). The search was performed by means of the Branch-and-Bound algorithm (HENDY & PENNY 1982).

In order to assess a statistical degree of confidence to the results obtained in this way, 1,000 replicates of a bootstrap analysis as described by FELSENSTEIN (1985) were performed by the algorithm equally implemented in PAUP 3.1.1. The graphic tracing of synapomorphies of Fig. 35 was obtained by MacClade 3.01 (MADDISON & MADDISON 1992).

All characters were assumed to be unordered and with equal weight.

DESCRIPTIONS

Cylindromyrmex Mayr, 1870

Cylindromyrmex Mayr, 1870: 967. Type species *Cylindromyrmex striatus* Mayr, by monotypy.

Holcaponera Cameron, 1891: 92. Type species *Holcaponera whymperi* Cameron, by monotypy.

Junior homonym of *Holcaponera* Mayr, 1887. Synonymy with *Cylindromyrmex* proposed by FOREL (1892).

Cylindromyrmex, Wheeler 1924: 106 (subgenus ad *Cylindromyrmex*). Type species *Cylindromyrmex striatus* Mayr, by original designation. Synonymy with *Cylindromyrmex* proposed by BROWN (1975).

Hypocylindromyrmex Wheeler, 1924: 106 (subgenus ad *Cylindromyrmex*). Type species *Cylindromyrmex longiceps* Roger, by original designation. Synonymy with *Cylindromyrmex* proposed by BROWN (1973).

Metacylindromyrmex Wheeler, 1924: 106 (subgenus ad *Cylindromyrmex*). Type species *Cylindromyrmex godmani* Forel, by original designation. Synonymy with *Cylindromyrmex* proposed by BROWN (1973).

DIAGNOSIS AND DESCRIPTION OF THE GENUS *CYLINDROMYRMEX* MAYR

The workers of *Cylindromyrmex* and *Acanthostichus* according to BOLTON (1994) can be separated from those of the other genera of Cerapachyinae (*Sphinctomyrmex*, *Simopone* and *Cerapachys*) for the head dorsum lacking a carina between the antennal socket and the lateral margin of the head. In the same key *Cylindromyrmex* is separated from *Acanthostichus* by means of the following combination of characters: antennal scrobes present, mid and hind tibiae each with 2 pectinate spurs, presternite of abdominal segment III approximately at midheight of the first gastric segment, side of the head without longitudinal groove, and distinct eyes. To these characters I would add another one, easier to detect: all known *Cylindromyrmex* species have the dorsum of the head, of the mesosoma and of the petiole longitudinally striate while no described *Acanthostichus* shows traces of similar heavy striation on the same body parts (only a very light striation close to the antennal articulation, on the pleurae and on the petiolar sides can be present in a few species). The groove and the size of the eyes are likely to have a weak diagnostic value. All workers and gynes of *Cylindromyrmex* possess a longitudinal groove running posteriorly from the mandibular articulation, but

the groove of *Cylindromyrmex* is placed more dorsally than in *Acanthostichus*. The *Cylindromyrmex* groove is somehow difficult to see because all species have a longitudinally striate head, while no *Acanthostichus* are striated. For what concerns the size of the eyes, I have examined workers of *C. longiceps* with 16 ommatidia and the worker of *A. texanus* should have 10 ommatidia only (MACKAY 1996).

A detailed description of the males, gynes and workers of *Cylindromyrmex* can be found in BROWN (1975). Here, I will complement only BROWN's diagnoses:

Worker. Monomorphic but variable in size. Head longer than broad, with slightly convex, subparallel or parallel sides. Clypeus short. Frontal carinae parallel or subparallel diverging posteriorly. Ocelli present or reduced to an impressed pit. Compound eyes placed on the middle or slightly behind the mid line of the head and with a variable number of ommatidia (16-500). Antennae 12-jointed. Funicular joints 8-10 with spine-like seta on the proximal border; last joint with similar spine-like seta but almost on its all surface (Fig. 3). Scapes reaching or slightly surpassing the anterior border of the eyes. Funiculi thickening from the base to the apex. Mandibles subtriangular, dorsally flat or convex. Masticatory margin of the mandibles with 4-14 irregular denticles or edentate. Apex of the mandibles with pointed apical tooth. Palpal formula 2.2 or 2.3. Mesosoma elongate, cylindric, with parallel sides and weakly convex dorsally. Promesonotal and propodeal sutures absent, simply marked by a pit or superficially impressed. Promesopleural suture superficially or deeply impressed. Meso-metapleural suture superficially impressed. Humeral angles round. Propodeum with basal and declivous faces distinct separated or not by a margin. Propodeal spiracle round or oval and placed at mid height in lateral view. Petiole subcylindric, as long as broad, longer than broad, or shorter than broad. Petiolar sides subparallel and often diverging posteriorly. Ventral petiolar process small or large, subtriangular, subtruncate, or subround. Postpetiole (abdominal segment III or gastral segment I) broader than petiole, broader than long, and as broad as the first gastric segment (abdominal segment IV or gastral segment II). Postpetiolar sternite antero-medially without or with a variably marked triangular "lip". Pygidium obliquely or perpendicularly truncate; apex of pygidium with or without a notch. Sides of pygidium surrounded by a set of many irregularly distributed denticles with in 2-4 larger denticles above the sting, or with a row of denticles enlarging apically. Sting developed, curved upwards and with flat sides. Legs incrassate or slender. Femora with a concavity of variable deepness to receive the tibiae. All tibiae with a large, pectinate spur. Mid and hind tibiae with an additional, smaller, pectinate spur close to the large one. Basitarsi of the three pairs of legs of variable length and with 3-7 spine-like setae on the outer apical edge. First, second and third tarsomeres with similar spines. Fourth (apical) tarsomeres of variable length. Pretarsal claws thicker proximally than distally and with a small denticle or an angle on the proximal part. Head, mesosoma and petiole covered by longitudinal striae of variable thickness. Postpetiole smooth or striate. First, second and third gastric tergites smooth and variably reticulate-punctate or longitudinally striated. Remaining gastric tergites, sternites and pygidium smooth and/ or reticulate-punctate. Legs smooth to superficially punctate; some species with hind or hind and mid coxae longitudinally striated. Body with pointed hairs of different size and variably distributed, generally

denser on the gaster. Colour dark ferrugineous to black. Legs concolour with or lighter than the body. Some species with yellowish tibiae.

Gyne. Very similar to the worker but differing from it in the following characters. Size slightly or much larger than the worker. Ocelli and compound eyes larger. Wings as in Fig. 4. Fore wing with well marked veins and pterostigma. Rsf5 connected with R1. Mf2 and r-m medially interrupted. Mf4 and CuA1 variably pigmented. Hind wings with R+Sc, M+CuA and A pigmented. Distal veins faintly pigmented, CuA and 1A more pigmented than Rs and M. In some species the wings have violaceous reflexes. Dorsum of the mesonotum with or without striae on the sides. Mesopleurae striate or not on the anterior part. Scutellum smooth or with variably impressed longitudinal striae.

Male. Size variable, generally smaller, but in some species as large as, or larger than the gyne. Head shorter than broad, as long as broad, or longer than broad. Vertex convex. Frontal carinae developed but never completely hiding the antennal socket. Sides of the frontal carinae subparallel, or broad anteriorly and converging posteriorly, or strongly broad anteriorly and touching each other posteriorly. Antennae 13-segmented, varying from 1/3 to 1/2 of the maximum body length. Ocelli large. Compound eyes very large, slightly longer than 1/2 of the head length and largely on the anterior half of the head sides. Scapes very short. First funicular joint less than or about 1/2 of the length of the second one; second and last two apical joints thinner than joints 3-10. Mandibles slender, edentate except for a visible apical pointed tooth. Mesosoma robust. Pronotum with subparallel or diverging sides. Mesonotum and scutellum gently convex. Pair Mayrian furrows impressed or not. Parapsidal furrows variably impressed. Propodeum with the sides converging posteriorly. Basal face of the propodeum separate from the declivous one by a well marked carina. Petiole cylindric, as long as or longer than broad. Anterior face of the petiole truncate and separate from the dorsal one by a marked carina. Subpetiolar process variable in size, subtriangular or subtruncate. Postpetiole broader than the petiole. Postpetiolar sides diverging posteriorly or gently convex. First gastric segment broader than the postpetiole. Second gastric segment as broad as or slightly narrower the first segment, rarely broader than the first segment. Remaining gastric segments narrowing posteriorly. Legs long and slender. Head with deep punctures or piligerous foveae sometimes separated by irregular or regular striae. Mesosoma pro- and mesopleurae smooth and with punctures or piligerous foveae of variable size. Propodeum and metapleurae with thick, longitudinal rugosities, sometimes irregular. Petiole and postpetiole smooth or with irregular, longitudinal rugosities, very superficial on the postpetiole. Gaster and legs smooth and variably punctate. Body with pointed hairs denser than in the female castes. Sometimes the posterior part of the head, pronotum, gaster and legs with dense pilosity of variable size. Wings as in Fig. 5, similar to the one of the gyne. Colour brown to black. Legs concolour with or lighter than the body. Some species with yellowish tibiae.

LIST OF THE CHARACTERS

The characters listed below are considered as of possible phylogenetic significance:

1. Worker. Eyes small to medium (10-200 ommatidia) (0), or large (more than 400 ommatidia) (1).
2. Worker. Petiolar dorsum with at most 14 striae (0), or with at least 16 striae (1). Species with smooth or foveolate petiole (character 7 state 0) were coded as "?".
3. Worker and gyne. Frons at most slightly broader than 1/3 of the head width (0), or ca. 1/2 or more of the head width (1).
4. Worker and gyne. Base of the mandibles not angulate laterally (0), or angulate laterally (1).
5. Worker and gyne. Occiput high (Fig. 17) (0), or low (Figs. 8, 31) (1).
6. Hypostomal bridge narrow (Fig. 9) (0), or broad (Fig. 32) (1).
7. Worker and gyne. Head, mesosoma and petiole smooth or foveolate but never striate (only traces of fine striation can be present close to the antennal insertions, on the pleurae and on the petiolar sides) (0), or head, mesosoma and petiole clearly striate (1).
8. Worker and gyne. Dorsum of head, mesosoma and petiole with thick striae (Figs. 6, 8, 12) (0), or with thin striae separated by large interspaces (Figs. 29, 31) (1), or with thin striae very close each other (Figs. 17, 20) (2). Species with smooth or foveolate body coded as "?".
9. Worker and gyne. Ventral process of the petiole different shape but never triangular (0), or broad, triangular (1).
10. Worker and gyne. Dorsum of the petiole with more than 7 long pointed hairs (0), or with at most 3 long, pointed hairs (1).
11. Worker and gyne. All gastric tergites smooth or foveolate but never striate (0), or only first gastric tergite striate (1), or first and second gastric tergites striate (2).
12. Worker and gyne. Dorsal face of hind coxae without a concavity close to the articulation with trochanter (0), or with a concavity close to the articulation with the trochanter (1).
13. Worker and gyne. Mid tibiae with no or with one pectinate spur (0), or with two pectinate spurs (1).
14. Worker and gyne. Fore basitarsi longer than mid basitarsi (0), or fore basitarsi at most as long as the mid basitarsi (1).
15. Worker and gyne. Fore basitarsi shorter than hind basitarsi (0), or fore basitarsi as long as or longer than hind basitarsi (1).
16. Worker and gyne. Mid basitarsi longer than 1/2 of the hind basitarsi (0), or mid basitarsi shorter than 1/2 of the hind basitarsi (1).
17. Worker and gyne. Outer apical edge of the hind basitarsi with 0, or 3, or 5 spine-like setae (0), or hind basitarsi with 6-7 spine-like setae (1), or hind basitarsi with 4 spine-like setae (2).
18. Worker and gyne. Apical tarsomeres of hind legs shorter than the sum of second and third tarsomeres (0), or apical tarsomeres of hind legs as long as or longer than the sum of second and third tarsomeres (1).
19. Gyne. Compound eyes largely behind the mid line of the head (0), or on the mid line of the head (1).
20. Gyne. Scutellum smooth, foveolate, or with very thin striae (0), or scutellum with very thick striae (1).
21. Gyne. Hind femora Index < 48 (0), or > 50 (1).
22. Male. Frontal carinae subparallel (0), broad anteriorly and narrower posteriorly (1), or strongly broad anteriorly and touching each other posteriorly (2).
23. Male. Antero-median border of the clypeus convex (0), or straight (1).
24. Male. Anterior face of femora densely covered by hairs (0), or with only few hairs (1).
25. Male. Hypopygium smooth or finely denticulate between the distal apodemes (Figs. 7, 11, 13) (0), or with a simple, unpaired, median projection between the apodemes (Figs. 27, 34) (1), or with a bidentate median projection between the apodemes (Figs. 16, 23, 24) (2).
26. Male. Hypopygium not strongly constricted distally (Figs. 23, 27, 34) (0), or strongly constricted distally (Figs. 7, 11, 13) (1).
27. Male. Ventral and dorsal borders of the aedeagus straight or partially concave (Figs. 7, 16, 27, 34) (0), or convex on their entire length (Figs. 11, 13) (1).

Data matrix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|------------------------|---|---|---|---|---|---|---|-----|-----|----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| <i>C. boliviae</i> | ? | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 |
| <i>C. brasiliensis</i> | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| <i>C. brevitarsus</i> | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 0&1 | 0 | 1&2 | 1 | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 |
| <i>C. darlingtoni</i> | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | ? | ? | ? | ? | ? | ? |
| <i>C. escobari</i> | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | ? | ? | ? | ? | ? | ? |
| <i>C. godmani</i> | ? | 1 | 1 | 0 | 1 | 0 | 1 | 0&1 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 |
| <i>C. longiceps</i> | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | ? | ? | ? | ? | ? | ? |
| <i>C. meinerti</i> | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 |
| <i>C. striatus</i> | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| <i>C. whymperi</i> | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| † <i>C. antillanus</i> | ? | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | ? | ? | ? | ? | ? | ? |
| † <i>C. electrinus</i> | ? | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | ? | ? | ? | ? | ? | ? |
| <i>A. texanus</i> | 0 | ? | 0 | 0 | 0 | 0 | ? | ? | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>S. annettae</i> | ? | ? | ? | 0 | 0 | 0 | 0 | ? | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | ? | ? | ? | ? | ? | ? |

TAB. 1

Matrix with the presence (1) or absence (0) of the 27 characters described in text among the known species of *Cylindromyrmex* and two outgroups.

RESULTS OF THE CLADISTIC ANALYSIS

The data of Table 1 allows the construction of only one most parsimonious tree of length 41 (Fig. 35). The tree has a Consistency Index of 0.854 (Rescaled CI = 0.782), a Retention Index of 0.915, and a Homoplasy Index of 0.220. The *Cylindromyrmex* species appear grouped in 4 clades with the two fossils, *antillanus* and *electrinus*, in different clades. A bootstrap test (Fig. 36) of significance as described in the methods chapter reveals that only the *striatus* clade (*brasiliensis*, (*striatus*, *whymperi*)), its subclade (*striatus*, *whymperi*), part of the *longiceps* clade (*antillanus*, (*longiceps*, *meinerti*)), and its subclade (*longiceps*, *meinerti*) are represented at frequencies higher than the conventional statistical limits in 1,000 replicates.

THE CLADES OF *CYLINDROMYRMEX* AND THEIR SPECIESTHE *STRIATUS* CLADE

This clade includes three species: *brasiliensis*, *whymperi* and *striatus*. They are characterized by the following synapomorphies: (1) eyes large, (2) base of the mandibles of the worker and of the gyne laterally angulate, (3) dorsum of the postpetiole of the worker and of the gyne with three long, pointed hairs at most, (4) fore basitarsi as long as the mid basitarsi, (5) outer apical edge of the mid and hind basitarsi of the worker and of the gyne with 6 or 7 spine-like setae, (6) scutellum of the gyne with very thick striae, (7) male hypopygium strongly constricted distally.

Cylindromyrmex brasiliensis Emery

Figs 3, 6-7

Cylindromyrmex striatus Mayr, MAYR 1887: 545. Worker and male (Santa Catarina), nec gyne from Lima = *whymperi* (nec MAYR 1870). Misidentification.

Cylindromyrmex brasiliensis Emery, 1901: 53. Worker and male (Santa Catarina). Original description. Type locality: Brazil. Type material: 3 syntype workers labelled: "S. Catharina, Schmalz, typus", in MCSN; 1 syntype worker labelled: "Bresil, Mayr, typus, *Cylindromyrmex brasiliensis* Em (*striatus* Mayr 1887)", in MCSN, examined.

Cylindromyrmex brasiliensis Emery, BORGMEIER 1937: 218. Gyne.

Cylindromyrmex brasiliensis Emery, JAFFÉ 1993: fig. 51. Worker.

Cylindromyrmex brasiliensis Emery, FOWLER & DELABIE 1995: 328.

Diagnosis. The basalmost species of the *striatus* clade and differing from both other species, *striatus* and *whymperi*, by the legs dark orange or light brown instead of black with at least part of the tibiae yellowish.

Worker (Fig. 6). Head about 1/5 longer than broad, with subparallel sides. Occiput low. Vertex angles round. Frontal carinae about half broad as the maximum head width. Anterior third of the frontal carinae diverging backwards and reaching the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed, short, median sulcus anteriorly. Frontal carinae not reaching the anterior border of the clypeus. Compound eyes large, slightly convex and behind the mid line of the head. Ocelli developed. Scapes surpassing the anterior border of the eyes. Proximal fifth of the scapes about 1/2 narrower than the remaining parts. Mandibles weakly convex dorsally. Mandibles laterally angulate at the base. Masticatory margin of the mandibles with a set of 5-6 irregular denticles followed by an apical tooth.

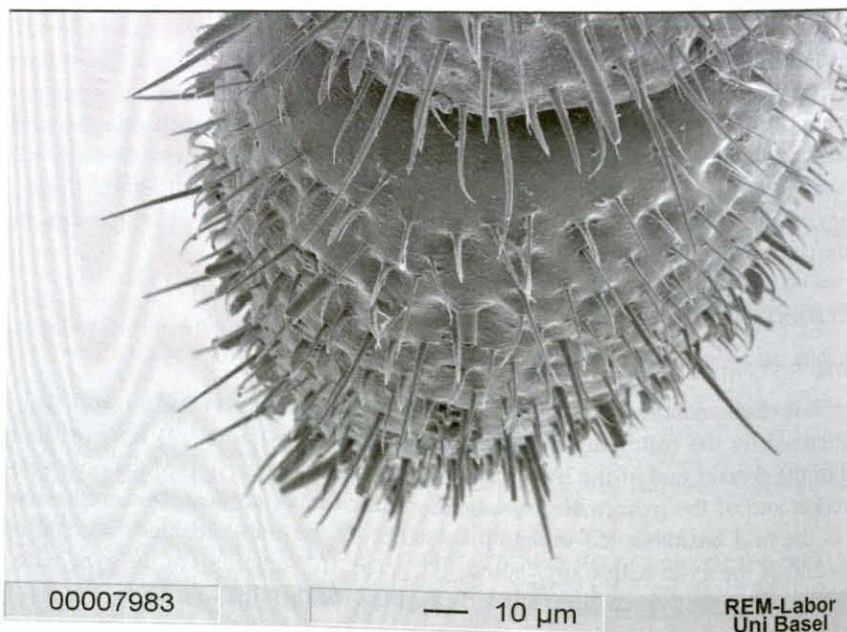


FIG. 3

C. brasiliensis Emery. Worker from Capão Bonito, São Paulo, Brazil. Apical funicular joint with spine-like setae.

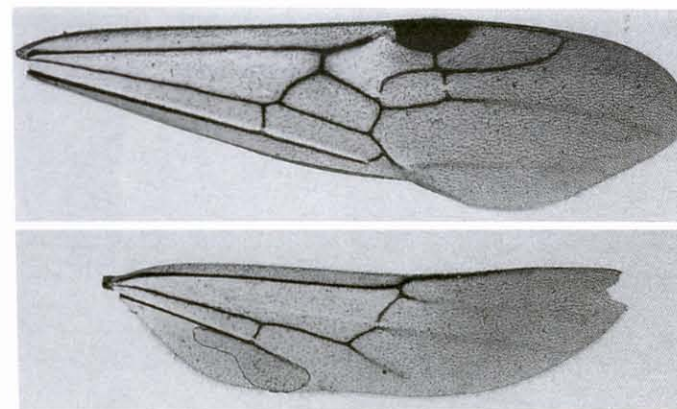


FIG. 4

C. boliviae Wheeler. Gyne from Rancho Grande, Aragua, Venezuela. Fore and hind wings.

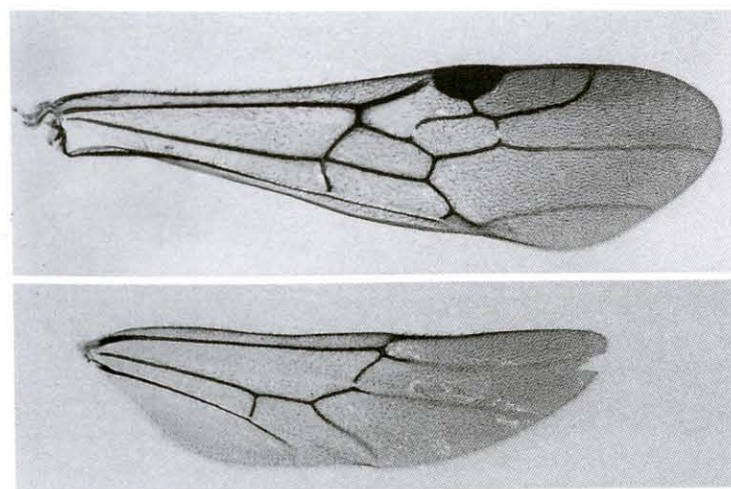


FIG. 5

C. godmani Forel. Male from Turrialba, Costa Rica. Fore and hind wings.

Mesosoma slightly convex dorsally and as long as or slightly longer than the head (mandibles included). Pronotum with parallel sides. Mesonotum narrower than pronotum. Propodeal sides gently convex. Basal face of the propodeum separate from the declivous one by a marked margin superficially interrupted medially.

Petiole sub-cylindrical, slightly longer than broad, anteriorly truncate and dorsally convex. Ventral process of the petiole small and triangular. Postpetiole slightly broader than long. Postpetiolar sides diverging backwards. Postpetiolar sternite antero-medially with a salient triangular "lip" pointed backwards. Postpetiole in dorsal view antero-laterally angulate. Pygidium in side view obliquely truncate. Pygidium in dorsal view with the sides bearing irregularly distributed small denticles followed by a row of larger denticles converging towards a pair of small teeth over the sting.

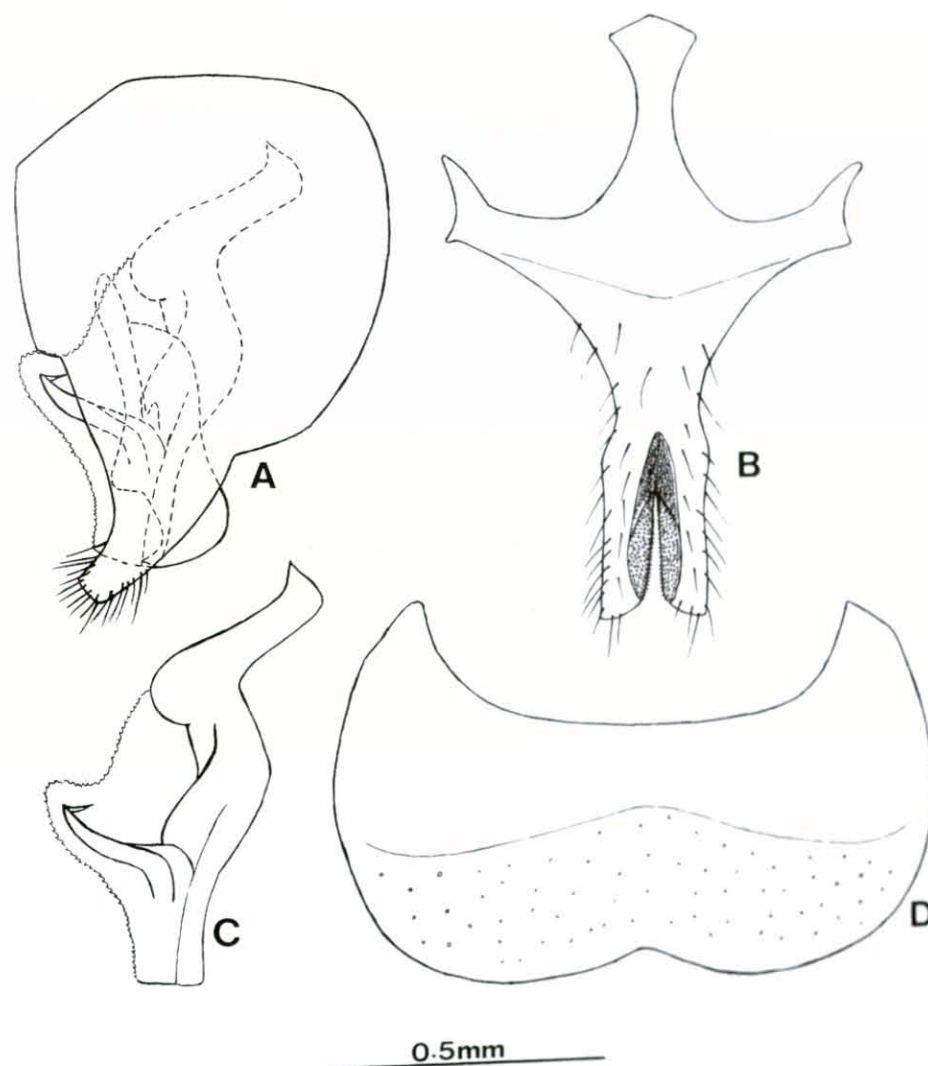
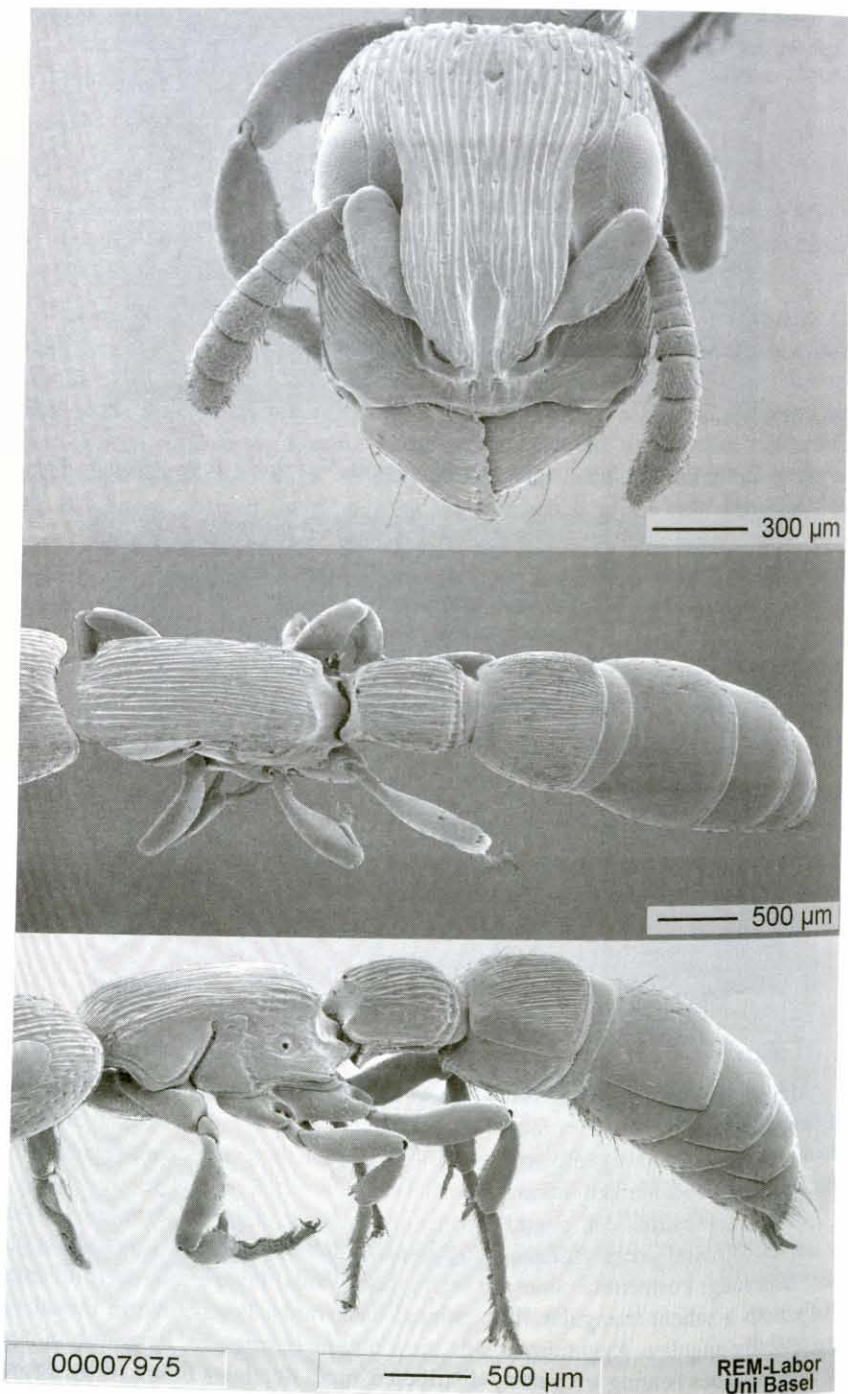


FIG. 7

C. brasiliensis Emery. Male from Santa Catarina, Brazil. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 6. *C. brasiliensis* Emery. Worker from Capão Bonito, São Paulo, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Legs. Femora and tibiae not inflated. Hind basitarsi long and about 1/5 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi with 6 or 7 spine-like setae.

Sculpture. Posterior third of the head dorsum and frontal carinae with longitudinal striae, thinner on the anterior half of the frontal carinae; some striae bifurcated. Posterior third of the head dorsum with additional, small, sparse, piligerous foveae. Anterior half of the head dorsum in front of the eyes with striae converging towards the scrobes, these striae thinner than those on the anterior part of the frontal carinae. Ventral part of the head smooth, with sparse piligerous foveae and longitudinal, slightly irregular striae on the antero-lateral half only. Mesosoma longitudinally striate and with sparse, superficial, piligerous foveae. Dorsum of the pronotum with 17-21 striae similar to those on the posterior part of the head dorsum. Pronotal striae prolonging onto the mesonotum and to the propodeum but thinner. Pleurae with thin, longitudinal striae and rare piligerous foveae, the striae absent on the lower propleurae. Lower mesopleurae smooth in small specimens. Piligerous foveae on the meso- and metapleurae denser in large specimens. Petiolar dorsum with 15-17 striae similar to those on the pronotum and with piligerous foveae. Petiolar sides minutely and superficially reticulate; their dorsal half with piligerous foveae, in some specimens the foveae separated by few, thin, longitudinal striae. Declivous face of the propodeum and anterior face of the petiole minutely and superficially reticulate. Dorsum of the postpetiole with ca. 33-35 striae as those on the mesonotum and propodeum and with few piligerous foveae, more impressed on the anterior third; postpetiolar sternite smooth and with sparse piligerous foveae. First, second, third and fourth gastric tergites and first gastric sternite smooth and with sparse punctuations. Remaining gastric segments superficially reticulate-punctate. Legs with very superficial, minute punctures.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) one long, erect to suberect on the external border of the scape, a pair between the frontal carinae and clypeus, sparse on the external border of the mandibles, one close to each pronotal angle, two or three on the postpetiole, sparse on the gaster, and denser on the pygidium; (2) shorter than type (1), variably distributed on the whole body; (3) shorter than type (2), suberect or subdecumbent on the head dorsum, subdecumbent on the mesosoma, on the petiole and on the postpetiole, decumbent on the ventral part of the head, on the gaster and on the legs. In addition, the hypostomal bridge surrounded by a row of hairs similar to those of type (1) but appressed and apically curved. Outer ventral border of the mandibles with hairs similar to those of the hypostomal bridge but shorter.

Colour black and shining. Mandibles castaneous red. Antennae and tarsi ferruginous-brown. Legs dark orange or light brown.

Measurements (in mm) and indices: TL 5.56-8.48; HL 1.16-1.64; HW 0.93-1.32; EL 0.37-0.49; SL 0.51-0.73; SW 0.17-0.22; WL 1.40-2.20; PeL 0.55-0.96; PeW 0.51-0.84; HFeL 0.67-1.02; HFeW 0.25-0.34; HTiL 0.65-1.04; HTiW 0.19-0.26; HBaL 0.53-0.83; HBaW 0.09-0.12; CI 78.1-80.5; SI 30.7-34.4; HFeI 33.3-37.3; HTiI 25.0-29.2; HBaI 14.4-15.1.

Gyne. Similar to the worker but differing from it in the following details: head with parallel sides; ocelli larger; mesosoma broader; parapsidal furrows impressed;

anterior corners of the postpetiole more angulate; striae on the head dorsum less regular; piligerous foveae on the vertexal angles and on the ventral part of the head denser and deeper; pronotum with longitudinal striae as in the worker; one specimen has the pronotal striae irregular and separated by piligerous foveae; mesonotum medially with irregular, short striae and few piligerous foveae; sides of mesonotum smooth; scutellum with sculpture similar to the one on the mesonotum; pro- and mesopleurae almost completely smooth; petiolar dorsum with 10 longitudinal, irregular striae.

Measurements (in mm) and indices: TL 8.56; HL 1.44; HW 1.14; EL 0.45; SL 0.60; SW 0.19; WL 2.40; PeL 0.81; PeW 0.77; HFeL 0.77; HFeW 0.30; HTiL 0.75; HTiW 0.22; HBaL 0.61; HBaW 0.10; CI 79.2; SI 31.7; HFeI 39.0; HTiI 29.3; HBaI 16.4.

Male. Head as broad as long. Vertexal margin subtruncate. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior half of the head. Borders of the frontal carinae raised and diverging backwards. Frons anteriorly superficially concave, medially convex and posteriorly sloping towards the impair ocellus. Clypeus declivous; its anterior border gently convex medially. Mandibles long, with edentate masticatory margins and a pointed apical tooth. Scapes about half longer than broad. Second and last two funicular joints thinner than joints 3-10.

Mesosoma robust. Pronotum in dorsal view with subparallel sides. Mesonotum slightly convex. Parapsidal furrows impressed. Scutellum slightly higher than the mesonotum. Basal face of the propodeum separated from the declivous one by a marked carina.

Petiole cylindric, its anterior face truncate and separated from the dorsal one by a marked carina. Ventral process of the petiole subtriangular. Postpetiole antero-laterally angulate, broadening backwards and much narrower than the first gastric tergite.

Genitalia as in Fig. 7.

Legs. Femora not inflated. Mid and hind metatarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum minutely punctate, with transversal striae around the ocelli and on the antennal scrobes, and with large foveae on the vertexal angles and on the ventral part of the head. Dorsum of the pronotum punctate and densely covered by foveae slightly larger than those on the head. Mesonotum smooth and with very sparse, small foveae. Scutellum with foveae larger than those on the pronotum. Basal face of the propodeum and petiole covered by slightly irregular foveae of different sizes, separated by longitudinal striae. Declivous face of the propodeum with longitudinal striae. Pro- and mesopleurae smooth and with short striae close to the posterior borders. Metapleurae with irregular, longitudinal striae. Postpetiole, first gastric segment and legs smooth and with sparse, superficial punctures. Remaining gastric segments punctate.

Pilosity. Body covered by pointed hairs of three types: (1) long and suberect, dense on the head, mesosoma, sparse on the gaster and on the legs; (2) shorter than type (1) variably distributed on the body, dense on the gaster; (3) shorter than type (2), decumbent, sparse on the vertexal angles, dense on the legs.

Colour. Black. Mandibles brown. Antennae and legs yellowish-orange.

Measurements (in mm) and indices: TL 8.78; HL 1.16; HW 1.16; EL 0.59; SL 0.32; SW 0.17; WL 2.76; PeL 0.81; PeW 0.72; HFeL 1.00; HFeW 0.23; HTiL 0.88; HTiW 0.18; HBaL 0.77; HBaW 0.07; CI 100.0; SI 53.1; HFeI 23.0; HTiI 20.4; HBaI 10.4.

Material examined. **BRAZIL:** no further locality, 1 worker (syntype), Mayr [MCSN]; 18 workers, G. Mayr [MCZC, MHNG, MNHN, NHMB, NHMW, USNM]. **PERNAMBUCO:** Caruaru, IV.1972, 1 worker, M. Alvarenga [MZSP]. **BAHIA:** Encruzilhada, 980 m, XI.1974, 2 workers, Seabra & Alvarenga [MZSP]; Buerarema, 22.IX.1996, 1 worker, R. Blatrix [CPCC]. **RIO DE JANEIRO:** Floresta da Tijuca, II.1957, 14 workers, C. A. Campos Seabra [MZSP]; Represa do Rio Grande, 08.II.1961, 6 workers [MZSP]. **SÃO PAULO:** Piracicaba, Escola Superior de Agricultura "Luiz de Queiróz", 25.X.1974, 10 workers, 1 gyne, E. Berti Filho [MZSP, MPEG]; Agudos, VIII.1958, 5 workers, R. Mueller [MZSP]; Barueri, 03.VI.1967, 88 workers, K. Lenko [MZSP]; Botucatu, 13.X.1987, 1 worker, L. C. Forti & I. M. P. Rinaldi [MZSP]; São Paulo, Butantan 23-31.VII.1969, 13.VIII.1969, 31.VII.1973, 5 workers, L. Travassos Filho [MZSP]; Ilha de São Sebastião, VII.1987, 500 m, 13 workers, C. R. F. Brandão [MZSP]; Salesópolis, Estação Biológica de Boracéia, 3-5.V.1996, 1 worker, C. R. F. Brandão et al. [MZSP]; Capão Bonito, 14.XI.1990, 1 worker, M. L. de Andrade [LACM]. **PARANA:** Londrina, VII.1987, 1 worker, M. E. M. Tomotake [MZSP]. **SANTA CATARINA:** no further locality, 3 workers (syntypes), Schmalz [MCSN]; no further locality, 8 workers, 1 male, G. Mayr [NHMW]; no further locality, 1 worker [IEGG]; Gaspar, 123 workers, 1 gyne, M. Silva Fontes [MZSP]; Blumenau, 2 workers, Hetschko [NHMW]; same locality, 1 worker [NHMW]. **RIO GRANDE DO SUL:** Pareci Novo, 10.V.1927, 3 workers, Hansen [MCZC, MZSP]; same locality, 18.III.1926, 4 workers, P. Rambo SJ [IEGG, MZSP]. **PARAGUAY:** LA CORDILLERA: San Bernardino, 1 gyne, Fiebrig [MHNG].

Discussion. The workers and the gynes of *brasiliensis* possess on the mesosoma, on the petiole and on the postpetiole, striae thinner and less regular than *striatus* and *whymperi*. These three species are very similar each other but the characters already given in the diagnosis should be sufficient to clearly allow separation of *brasiliensis* from the other two.

MAYR (1887) reported specimens of "*striatus*" collected by Hetschko in Brazil in termite galleries. BORGMEIER (1937) cited specimens of *brasiliensis* collected by P. Rambo from Pareci Novo (Brazil) in a branch of *Erythroxyllum obovatum* (Erythroxyllaceae).

Distribution. Brazil and Paraguay.

Cylindromyrmex whymperi (Cameron) sp. rev.

Figs 8-11

Cylindromyrmex striatus Mayr, MAYR 1887: 546 (gyne, Lima), nec worker and male (= *brasiliensis*). Nec MAYR 1870. Misidentification.

Holcopena whymperi Cameron, 1891: 92, fig. Worker. Original description. Type locality: Ecuador. Type material: holotype worker labelled: "Whymp. Supp. App. p. 92, *Holcopena whymperi* Cam. type", in BMNH, examined. First combination in *Cylindromyrmex* by FOREL 1892: 256.

Cylindromyrmex striatus Mayr, EMERY 1901: 53. Misidentification.

Cylindromyrmex whymperi (Cameron), WHEELER 1910: 228, fig. 127 (worker).

Cylindromyrmex striatus Mayr, WHEELER 1919: 266. Misidentification.

Cylindromyrmex williamsi Wheeler, 1924a: 101, fig. 19. Worker and gyne. Original description. Type locality: Seymour Island. Type material: 1 worker labelled: "S. Seymour I., Galapagos, W. M. Wheeler", in MCZC, examined. **Syn. nov.**

Cylindromyrmex striatus var. *tibialis* Stitz, 1932: 367. Worker. Original description. Type locality: Galapagos Islands. Type material: not available for the present study. Not synonym of *striatus* as proposed by BROWN 1975: 82. **Syn. nov.**

Cylindromyrmex schmidt Menozzi, 1931: 191, fig. 3. Partim. Worker. Nec gyne (= *meinerti*). Original description. Type locality: La Caja, Costa Rica. Type material: 2 workers (syntypes) labelled: "La Caja: 8 kil. w. San José C. R., Heinr. Schmidt, TYPUS, *Cylindromyrmex schmidt* Typus, Menoz.", in IEGG, examined. Synonymia nova.

Cylindromyrmex striatus Mayr, BROWN 1975: different pages, Fig. 94. Partim (only material from Peru, Ecuador, Galapagos = *whymperi*). Misidentification.

Cylindromyrmex striatus Mayr, SNELLING & HUNT 1975. Partim (only material from Peru, Ecuador, Galapagos, Chile = *whymperi*). Figs 19-22 (= gyne, male and worker of *whymperi*). Misidentification.

Cylindromyrmex striatus Mayr, FOWLER & DELABIE 1995. Partim (only material from Peru, Ecuador, Galapagos, Chile = *whymperi*). Misidentification.

Cylindromyrmex whymperi (Cameron), HOLDOBLER & WILSON 1990: 85, n. n. Fig. (worker).

Cylindromyrmex, BOLTON 1994: Figs 9 & 10, worker.

Diagnosis. A *Cylindromyrmex* species belonging to the *striatus* clade, resulting as sister species of *striatus*, but differing from it in the worker and gyne by the thicker body striation, and by the posterior third of the head dorsum with 25 longitudinal striae at most instead of more than 34.

Worker (Fig. 8). Head about 1/6 longer than broad, with slightly convex sides. Occiput low. Vertex angles round. Frontal carinae about half broad as the maximum head width. Sides of the frontal carinae diverging posteriorly or gently convex medially. Dorsum of the frontal carinae with an impressed, short, median sulcus anteriorly. Frontal carinae not reaching the anterior border of the clypeus. Compound eyes large, convex and slightly behind the mid line of the head. Ocelli developed. Scapes surpassing the anterior border of the eyes. Proximal fifth of the scape 1/2 narrower than the remaining parts. Mandibles flat dorsally and shorter than in *brasiliensis*. Mandibles laterally angulate at the base. Masticatory margin of the mandibles with a set of 4-5 irregular denticles followed by an apical tooth. Hypostomal bridge narrow, with the antero-lateral margin concave (Fig. 9).

Mesosoma gently convex dorsally and as long as or slightly longer than the head (mandibles included). Pronotum with parallel sides. Mesonotum narrower than pronotum. Propodeal sides converging posteriorly. Basal face of the propodeum separated from the declivous one by a marked margin converging medially.

Petiole sub-quadrate, with the sides gently diverging backwards. Anterior face of the petiole truncate and the dorsal one convex. Ventral process of the petiole triangular and slightly smaller than in *brasiliensis*. Postpetiole broader than long and with convex sides. Postpetiolar sternite antero-medially with a variably marked triangular "lip". Postpetiole in dorsal view antero-laterally angulate. Pygidium in side view obliquely truncate. Pygidium in dorsal view with the sides bearing a row of denticles strongly converging to a pair of small teeth over the sting.

Legs. Femora and tibiae not inflated. Hind metatarsi long and about 1/5 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi with 6 or 7 spine-like setae.

Sculpture. Posterior third of the head dorsum and frontal carinae with thick, longitudinal striae, thinner on the anterior half of the frontal carinae. Rare, small, piligerous foveae can be present behind the ocelli. Anterior half of the head dorsum

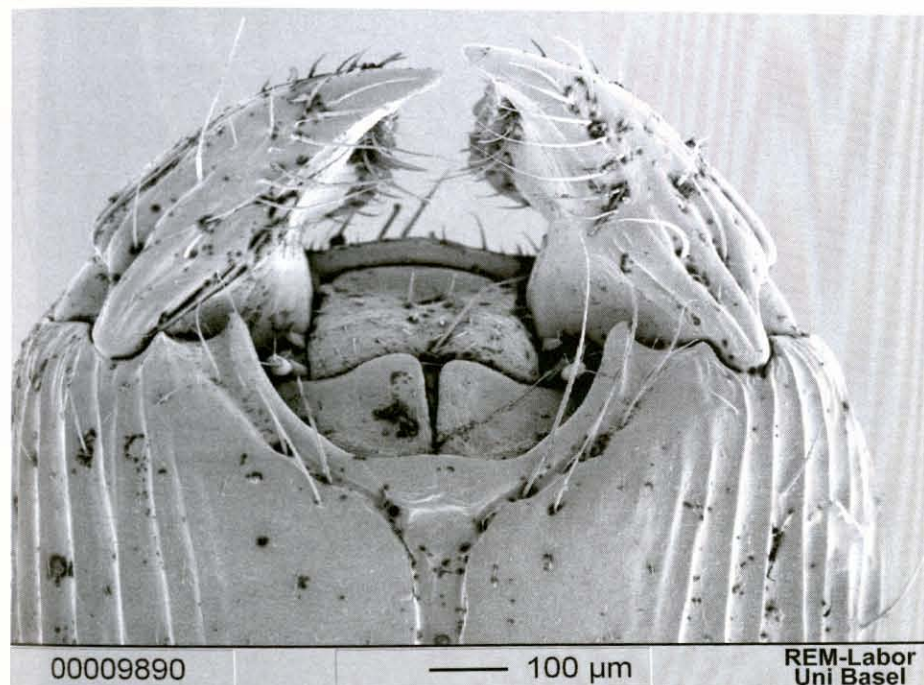
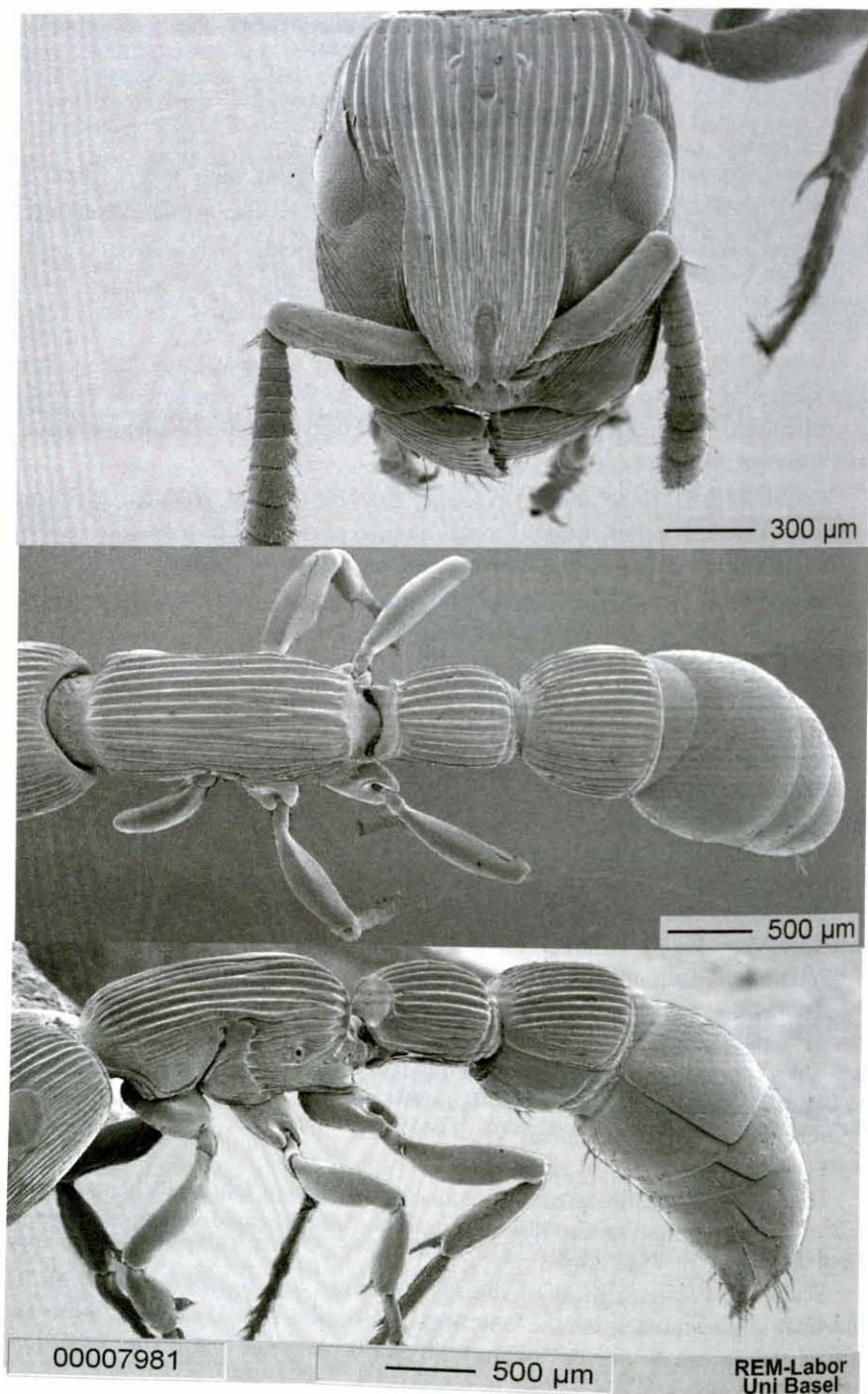


FIG. 9

C. whymperi (Cameron). Worker from Antofagasta, Chile. Anterior portion of the cephalic capsule and mandibles in ventral view to show the narrow hypostomal bridge (character 6 state 0). Notice the concavity of the anterior margin of the hypostomal bridge, a character not verified in all species of the genus.

with striae converging towards the scrobes, these striae thinner than those on the anterior half of the frontal carinae. Ventral part of the head with longitudinal striae laterally, smooth and superficially punctate medially. Mesosoma with 11-15 longitudinal striae similar or slightly thicker than those on the posterior third of the head dorsum. Lower pro- and metapleurae, and mesopleurae with thin longitudinal striae similar to those on the anterolateral part of the head dorsum. Upper pro- and metapleurae with striae as on the anterior part of the frontal carinae. Petiolar dorsum with 9-14 striae similar to those on the mesosoma. Petiolar sides minutely reticulate and with less regular and thinner striae than those on its dorsum. Declivous face of the propodeum and anterior face of the petiole minutely and superficially reticulate. Dorsum of the postpetiole with ca. 19-25 striae as thick as or slightly thinner than those on the mesosoma. Postpetiolar sternite smooth or reticulate and with sparse piligerous foveae.

FIG. 8. *C. whymperi* (Cameron). Worker from Ecuador. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

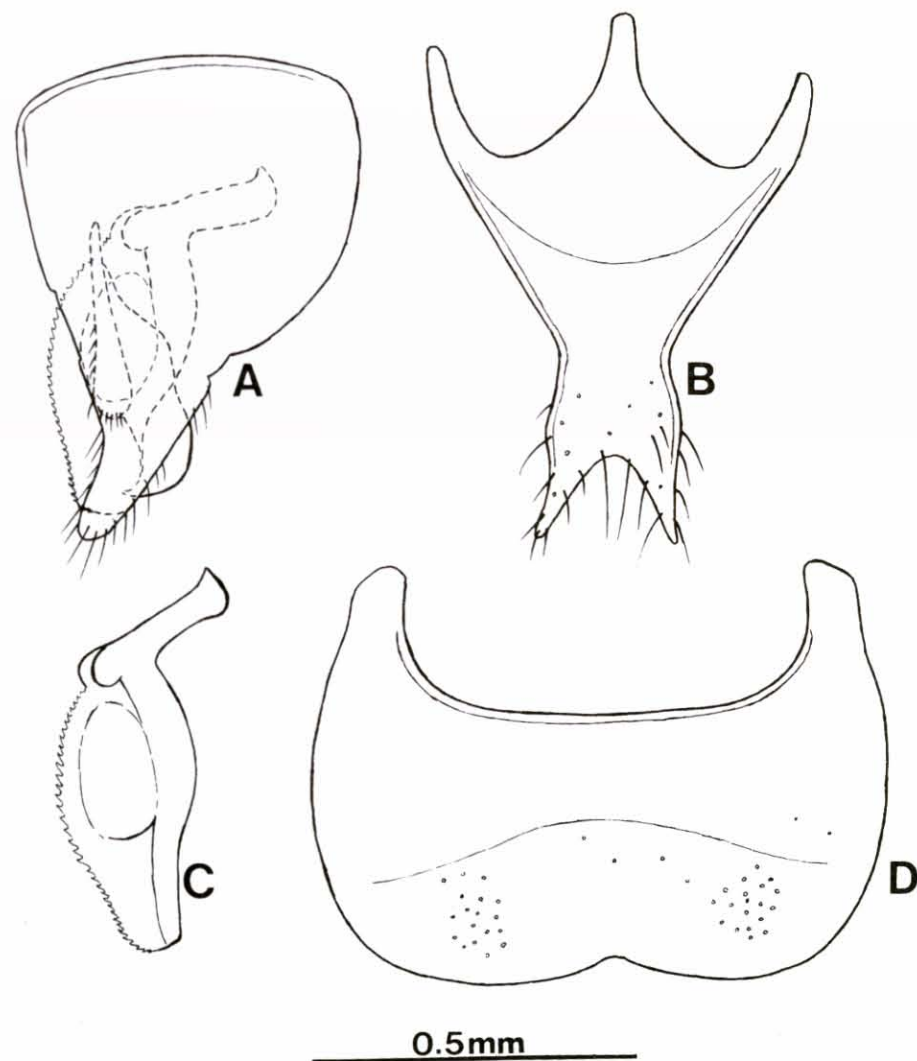
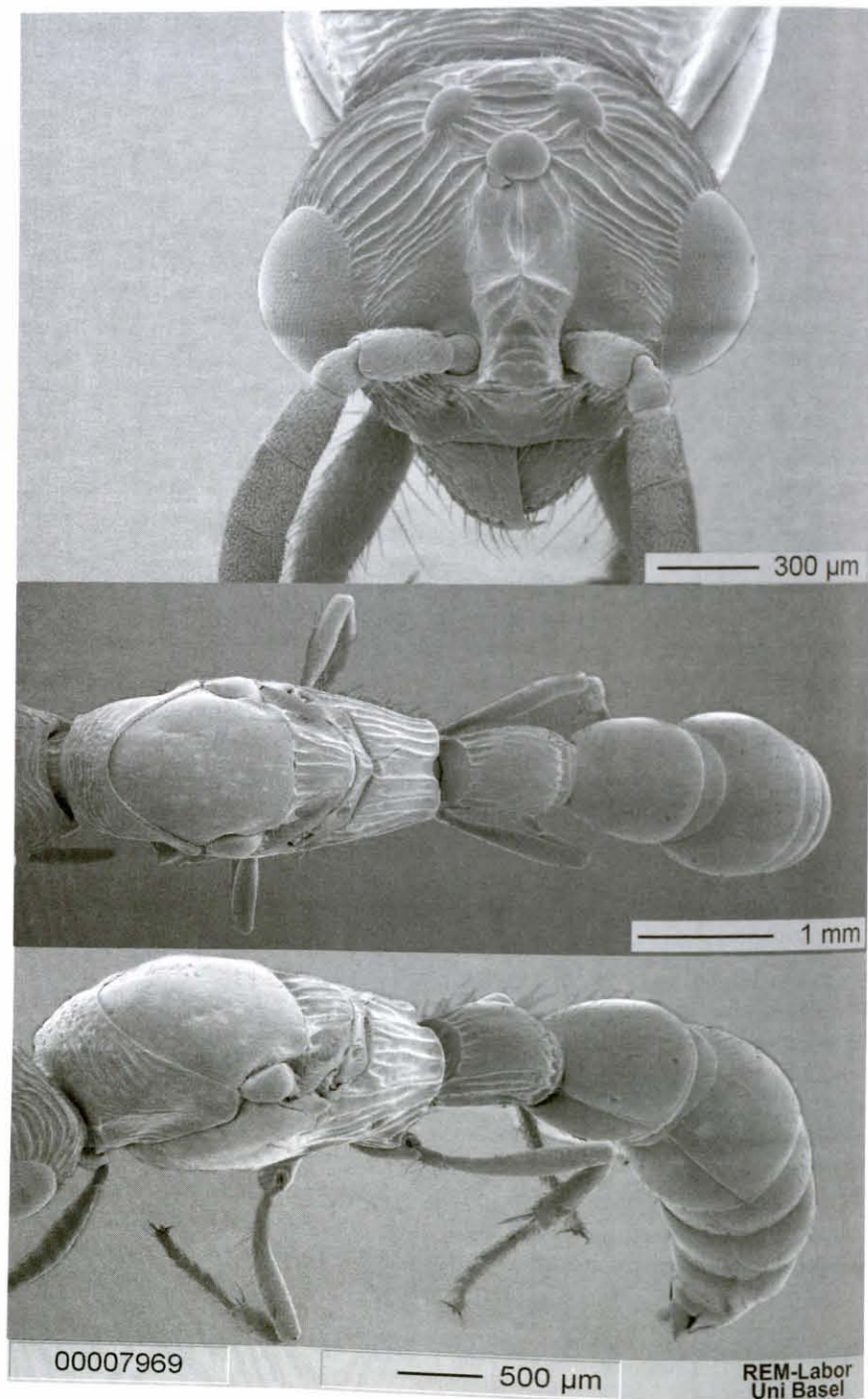


FIG. 11

C. whymperei (Cameron). Male from Lima, Peru. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 10. *C. whymperei* (Cameron). Male from Lima, Peru. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

BOLIVIA: BENI: Trinidad, 1 worker, Lizer & Deletang [NHMB]. **CHILE:** TARAPACA: Arica, 18°29' S 70°20' W, 40 m, 24.IX.1966, 1 worker, 1 gyne, M. E. Irwin [LACM]. ANTOFAGASTA: Antofagasta, 1988, 13 workers, J. Vidal [MZSP]. **BRAZIL:** SANTA CATARINA: Blumenau, 1 male, G. Mayr [NHMW].

Discussion. FOREL (1892) considered *H. whymperi* a species distinct from all the other *Cylindromyrmex*. Few years later EMERY (1901) proposed the synonymy of *Cylindromyrmex whymperi* (Cameron) with *Cylindromyrmex striatus* because the description of *whymperi* fits well Peruvian gynes of what he thought to be "*striatus*". WHEELER (1910), without justifying his point of view, published a figure of a *Cylindromyrmex* worker under the name *whymperi*. A few years later, WHEELER (1924) described *williamsi* as a new species from the Galapagos, supposed to be different from his "*striatus*" from Guayaquil (Ecuador) and from the worker of *whymperi*. The examination of the type material of *striatus*, *williamsi* and *whymperi* reveals that *whymperi* and *striatus* are distinct species and *williamsi* is a junior synonymy of *whymperi*.

Examination of the material labelled as "typus" of *schmidtii* by MENOZZI shows several contradictory points. The type locality of *schmidtii* is La Caja (Costa Rica) and the "type" (worker?) should have been deposited in the Deutsches Entomologisches Museum and a "cotype" in his own collection. Two workers labelled "S. José, Costa Rica, Holotypus, Paratypus, *Cylindromyrmex schmidtii*, Typus! Menoz., Menozzi deter." are preserved in the Deutsches Entomologisches Institut of Eberswalde. These workers are identical to *whymperi*. They are unlikely to be the holotype and paratype of *schmidtii* because the locality name does not correspond to the one given by MENOZZI (1931). Two workers and a gyne of *schmidtii* labelled "La Caja: 8 kil. w. San José C. R., Heinr. Schmidt, TYPUS, are preserved in the Menozzi collection (IEGG). These workers are similar to *whymperi* and are likely to be the true syntypes of *schmidtii*. The gyne does not fit the description and drawing of the gyne of *schmidtii* by MENOZZI (1931). Additional material in the IEGG contains two other gynes with labels similar to those of the "syntype" workers of *schmidtii* and fit exactly the description of MENOZZI (1931). These two gynes correspond to *meinerti* Forel.

C. whymperi has a much broader distribution than *striatus*. A male in the NHMW labelled "Blumenau (Brazil), *striatus*" (handwriting of Mayr) is definitively not *striatus*. It is identical to all the other males of *whymperi* I examined in this study. I have some doubts about the autenticity of this locality record which is the only one from Brazil for this species.

The species *whymperi* and *striatus* are very similar each other in both worker and gyne. Examination of the sculpture shows that the striae of *whymperi* are much thicker than those of *striatus*, especially on the head dorsum and postpetiole. The head of *whymperi* is shorter and with more convex sides than the one of *striatus*. There seems to be little variation in the thickness of the striae on the mesosoma and on the postpetiole of workers of *whymperi*. The specimens from Hac de Tenguel are those with thickest mesosomal and postpetiolar striation. Two workers, one from Bolivia (NHMB) and the other from Costa Rica (IAVH) have thinner striation on the postpetiole but still definitively thicker than that of *striatus*. Normally gynes of *whymperi* have thicker and less striae on the postpetiole than the gynes of *striatus*. Ten out of

eleven gynes of *whymperi* have 22-24 striae on the postpetiole. Only a gyne from Costa Rica (LACM) has 30 striae on the postpetiole, approaching in this way the gynes of *striatus* with 30-34. *Whymperi* exhibits also some colour variation. Rare workers and gynes have the distal half of the tibiae dark brown. The subspecies *striatus tibialis* Stitz is based on specimens with a similar type of coloration.

There are no elements to assert whether *whymperi* is introduced or indigenous in the Galapagos Islands. The most remarkable fact about its distribution is that, judging from the collection records, it seems to be common on the islands. Its success there, however, can be explained in both ways, i. e. by being native of the islands and by the lack of competitors after its introduction (see discussion chapter).

WHEELER (1919) mentioned "*striatus*" from a house of Indefatigable Island (Galapagos Is.). WHEELER (1924, 1936) reports "*williamsi*" nesting in dead branches of the Celastraceae shrub *Maytenus obovata* whose dead parts contained flourishing colonies of *Calotermes pacificus*. The specimens collected on the Ferdinand Is. by R. Silberglied were under the bark of *Bursera graveolens* (Burseraceae).

Distribution. Guatemala, Costa Rica, Galapagos Island, Ecuador, Peru, Bolivia, Chile, and Brazil.

Cylindromyrmex striatus Mayr

Figs 12-13

Cylindromyrmex striatus Mayr, 1870: 967. Gyne. Nec MAYR 1887 (worker and male = *brasilensis*). Original description. Type locality: Surinam. Type material: two gynes labelled: "Surinam, Coll. G. Mayr, *striatus*, G. Mayr, Type"; one gyne labeled: "Surinam, M. Haab, Collect. G. Mayr, *striatus*, G. Mayr, Type"; all in NHMW, examined.

Cylindromyrmex striatus Mayr, BROWN 1975. Partim (only material from Guyanas = *striatus*). Nec *Cylindromyrmex williamsi* Wheeler, BROWN 1975: 82. Incorrect synonymy of *striatus*. Misidentification.

Cylindromyrmex striatus Mayr, SNELLING & HUNT 1975. Partim (only material from Surinam and French Guiana = *striatus*). Nec figs. 19-22 (= *whymperi*).

Cylindromyrmex striatus Mayr, OVERAL & BANDEIRA 1985.

Cylindromyrmex striatus Mayr, FOWLER & DELABIE 1995. Partim (only material from Manaus = *striatus*).

Diagnosis. A *Cylindromyrmex* species belonging to the *striatus* clade, resulting as sister species of *whymperi* in my analysis, but differing from it by the thinner body striation, by the posterior third of the head dorsum with more than 34 striae instead of 25 at most.

Worker (previously undescribed) (Fig. 12). Head 1/5 longer than broad. Sides of the head subparallel. Occiput low. Vertex angles round. Frontal carinae about half broad as the maximum head width. Sides of the frontal carinae anteriorly diverging and posteriorly gently convex. Dorsum of the frontal carinae with an impressed, short, median sulcus anteriorly. Frontal carinae not reaching the anterior border of the clypeus. Compound eyes large, convex and slightly behind the mid line of the head. Ocelli well defined. Scapes reaching the anterior border of the eyes. Proximal fifth of the scapes 1/2 narrower than the remaining parts. Mandibles flat and short. Mandibles laterally angulate at the base. Masticatory margin of the mandibles with a set of 4 irregular denticles followed by an apical tooth.

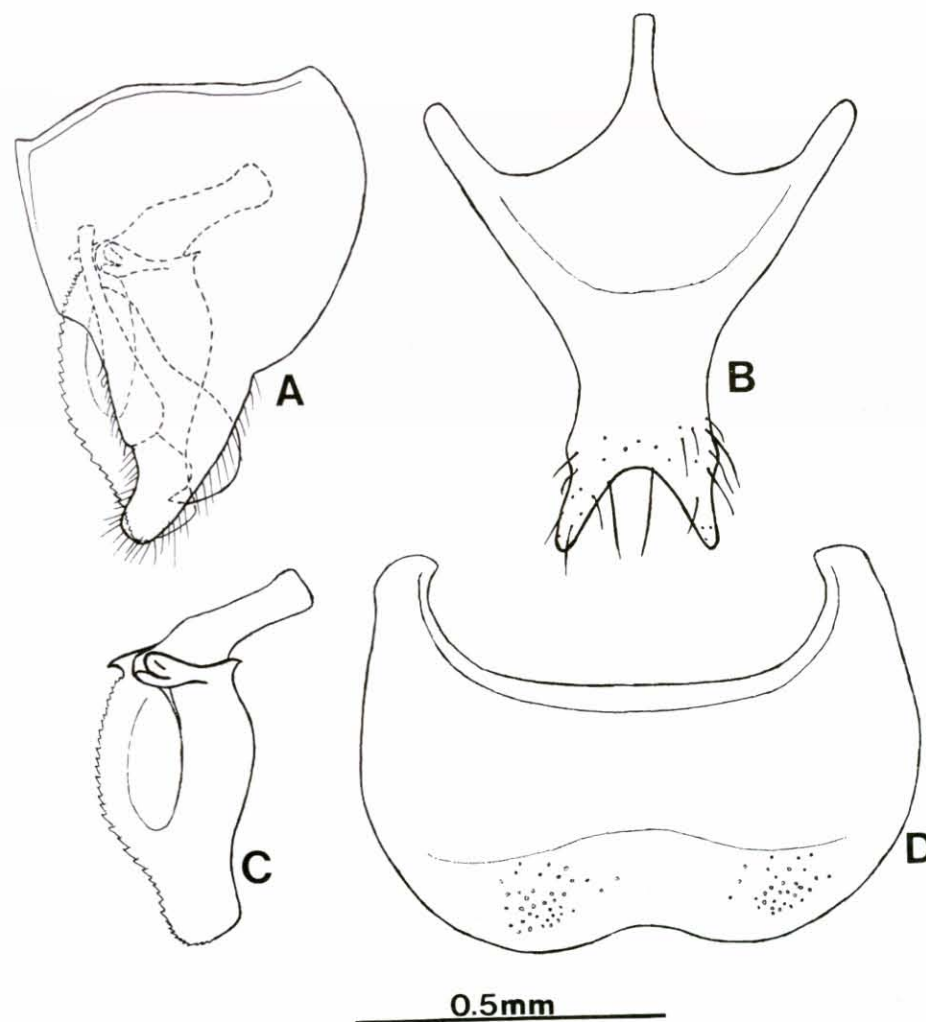
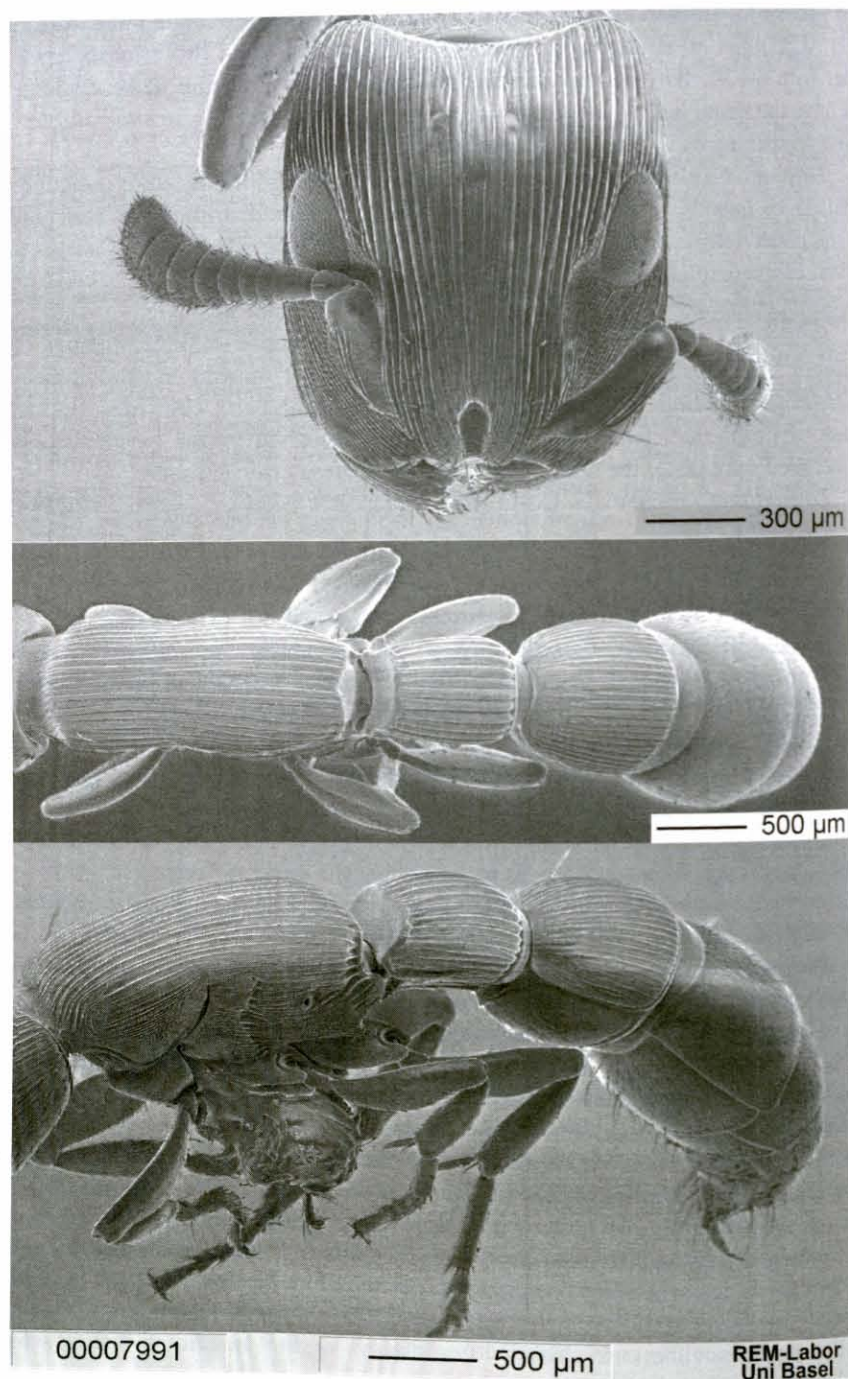


FIG. 13

C. striatus Mayr. Male from French Guyana. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 12. *C. striatus* Mayr. Worker from Pará, Rio Curuá-Una, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Mesosoma gently convex dorsally and as long as or slightly longer than the head (mandibles included). Pronotum with subparallel sides. Mesonotum narrower than pronotum. Propodeal sides slightly convex. Basal face of the propodeum separated from the declivous one by a marked margin converging medially.

Petiole slightly longer than broad, anteriorly truncate and dorsally convex. Petiolar sides gently diverging backwards. Ventral process of the petiole small and triangular. Postpetiole slightly more than 1/4 broader than long. Postpetiolar sides gently convex. Postpetiolar sternite antero-medially with a marked triangular "lip" pointing backwards. Postpetiole in dorsal view antero-laterally angulate. Pygidium as in *whymperi*.

Legs. Femora and tibiae not inflated. Hind basitarsi long, ca. 1.4 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi with 6 or 7 spine-like setae.

Sculpture. Head mesosoma and postpetiole with thinner striation than those in *whymperi*. Posterior third of the head dorsum and frontal carinae with longitudinal striae, thinner on the anterior part of the frontal carinae. Sides of the head dorsum in front of the compound eyes with thinner striae than on the anterior part of the frontal carinae. Ventral part of the head antero-laterally with longitudinal striae; remaining parts of the ventral part of the head smooth and with minute, superficial piligerous punctures. Mesosoma with longitudinal striae thicker than those on the posterior half of the head dorsum. Pronotum with 20-22 striae. Propodeum with ca. 17 striae. Pleurae with thin longitudinal striae as those in front of the compound eyes, the striae thicker on the upper pro- and metapleurae. Petiolar dorsum with 12-14 striae thicker than those on the mesosoma. Petiolar sides minutely reticulate and with less regular and thinner striae than those on its dorsum. Declivous face of the propodeum and anterior face of the petiole minutely and superficially reticulate. Dorsum of the postpetiole with ca. 29-30 striae similar to those on the mesosoma. Postpetiolar sternite smooth and with small, sparse piligerous foveae. First, second and third gastric tergites and first gastric sternite smooth and with sparse punctuations. Remaining gastric segments reticulate-punctate. Hind coxae with few, thin, longitudinal striae. Legs with very superficial, minute punctures.

Pilosity as in *whymperi* and *brasiliensis*.

Colour black and shining with lighter legs. Tibiae of three pairs of legs yellowish with the distal borders brown.

Measurements (in mm) and indices: TL 6.18-6.56; HL 1.24-1.28; HW 0.99-1.04; EL 0.35-0.36; SL 0.52-0.56; SW 0.15-0.16; WL 1.52-1.72; PW 0.72-0.75; PeL 0.65-0.75; PeW 0.59-0.65; HFeL 0.72-0.78; HFeW 0.25-0.28; HTiL 0.71-0.80; HTiW 0.19-0.21; HBaL 0.52; HBaW 0.09; CI 79.8-81.2; SI 28.6-28.8; HFeI 34.7-35.9; HTiI 26.2-26.8; HBaI 17.3.

Gyne. Similar to the worker but differing from it in the following peculiarities: mesosoma broad medially; parapsidal furrows impressed; posterior part of the head dorsum with slightly thicker striae than on those the anterior part; pronotum with 22-24 longitudinal striae slightly thicker than those on the posterior part of the head dorsum; mesonotum smooth to weakly striated medially, the striae very thin and incomplete; scutellum with 8-10 striae similar to those on the pronotum; dorsum of the propodeum

with 18-20 striae similar to those on the pronotum; petiolar dorsum with 13-15 longitudinal striae thicker than those on the pronotum; postpetiolar dorsum with 30-34 longitudinal striae slightly thinner than those on the pronotum

Wings as in fig. 4.

Measurements (in mm) and indices: TL 7.50-7.72; HL 1.30-1.32; HW 1.00; EL 0.40-0.42; SL 0.50-0.51; SW 0.16; WL 2.08-2.12; PW 0.76-0.80; PeL 0.67-0.70; PeW 0.63; HFeL 0.68; HFeW 0.27; HTiL 0.67-0.68; HTiW 0.21-0.22; HBaL 0.53; HBaW 0.09; CI 75.7-76.9; SI 31.4-32.0; HFeI 39.7; HTiI 30.9-32.8; HBaI 17.0.

Male (previously undescribed). Very similar to the one of *whymperi* but differing from it in the following details: head (eyes excluded) slightly longer than broad; vertex angles less convex. Scutellum with the sides less converging and with the posterior border less truncate.

Genitalia as in Fig. 13.

Wings as in Fig. 5.

Sculpture. Ventral part of the head smooth and with few, small piligerous foveae. Scutellum, propleurae, petiole, postpetiole, gaster and legs smooth and with minute, superficial punctures, more impressed on the last gastric segments. Ventral border of the propleurae with two-three longitudinal striae.

Colour. Head and mesosoma dark brown-black and shining. Gaster brown. Mandibles, antennae and legs yellow to light brown. The specimen in question is immature.

Measurements (in mm) and indices: TL 7.74; HL 1.05; HW 1.00; SL 0.26; SW 0.15; WL 2.54; PeL 0.73; PeW 0.68; HFeL 0.95; HFeW 0.20; HTiL 0.81; HTiW 0.17; HBaL 0.62; HBaW 0.08; CI 95.2; SI 57.7; HFeI 21.0; HTiI 21.0; HBaI 12.9.

Material examined. **SURINAM**: no further locality, 3 gynes (syntypes), G. MAYR [NHMW]. **FRENCH GUYANA**: no further locality, 1 gyne, 1 male [MNHN]. **BRAZIL**: AMAZONAS: Manaus, 15.II.1989, 1 worker, H. G. FOWLER [CPCC]. PARA: Rio Curuá-Una, 13.XII.1984, 1 worker, W. L. OVERAL [MZSP].

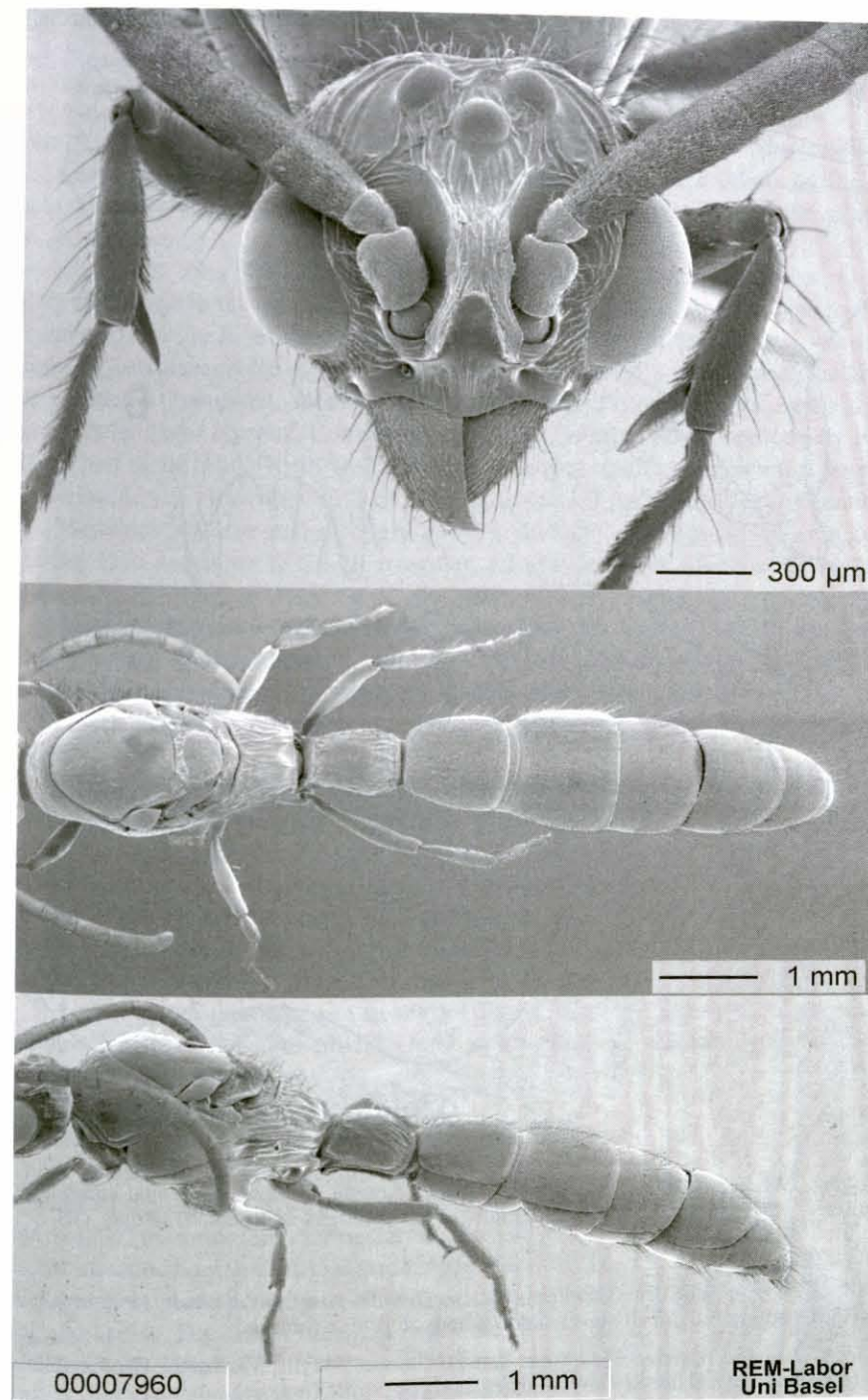
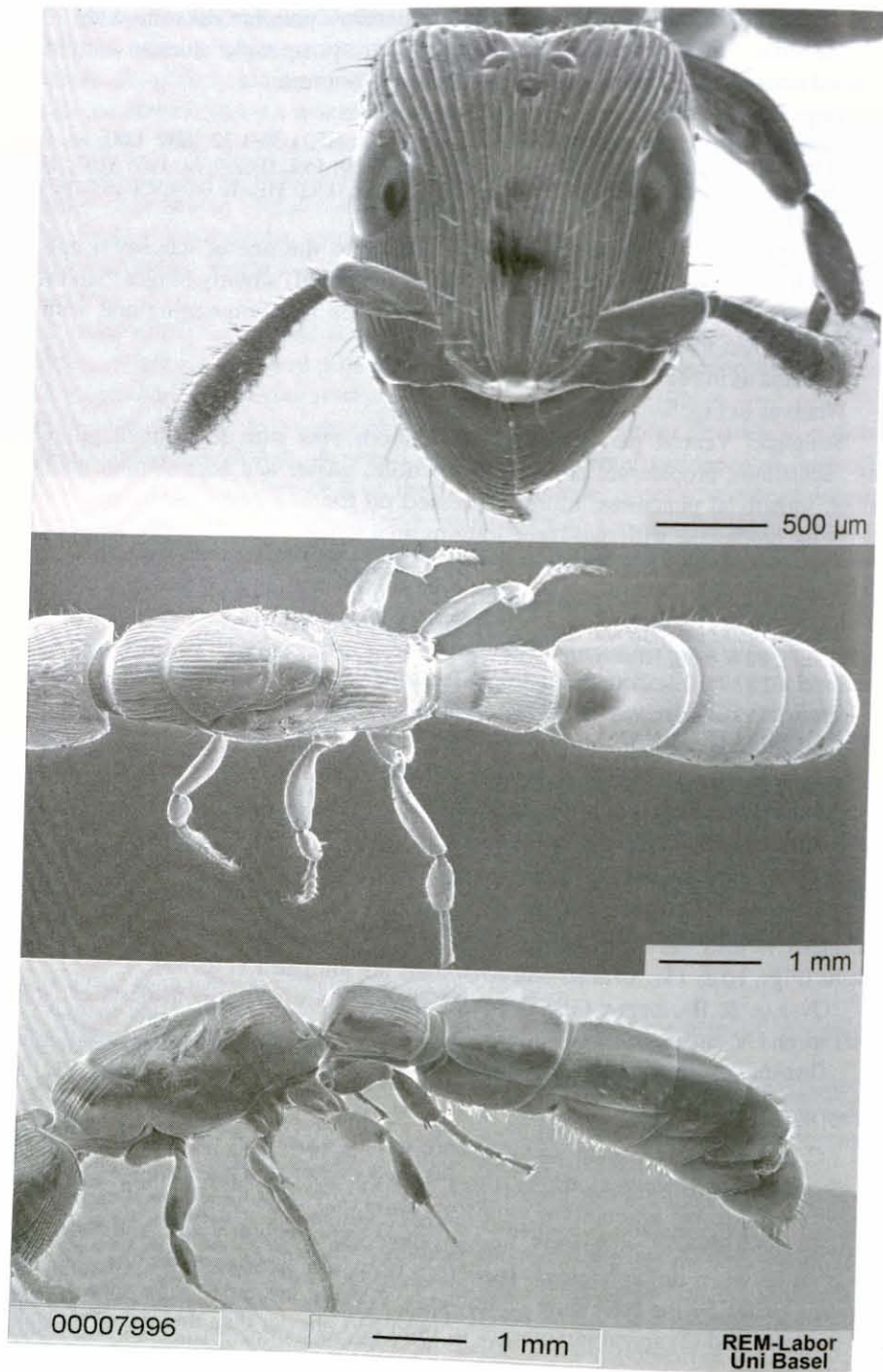
Discussion. *C. striatus* is a rarely collected species occurring only in the northern part of South America. The similarities between *striatus* and *whymperi* and the small number of *striatus* specimens available for study is one of the reasons for which *whymperi* has been considered a junior synonymy of *striatus*. The sole male of *striatus* I examined is also very similar to *whymperi*. Few differences are visible in their genitalia (Figs. 10 & 13). *Striatus* and *whymperi* are allopatric (Fig. 37).

OVERAL & BANDEIRA (1985) found specimens of *striatus* in nests of *Nasutitermes* sp. and *N. surinamensis*.

Distribution. Surinam, French Guyana and Brazil.

THE BOLIVIAE CLADE

C. boliviae is an isolate species representing a clade of its own. It differs from the species of the *striatus* clade by the following characters: (1) hind coxae with a concavity close to the articulation with trochanter, (2) male with frontal carinae broad anteriorly and narrower posteriorly, and (3) male hypopygium with a bidentate median projection between the apodemes. It differs from the species of the *brevitarsus* and *longiceps* clades by the following characters: (1) mid basitarsi longer than 1/2 of the hind basitarsi, and (2) apical tarsomeres of hind legs shorter than the sum of second and third tarsomeres.



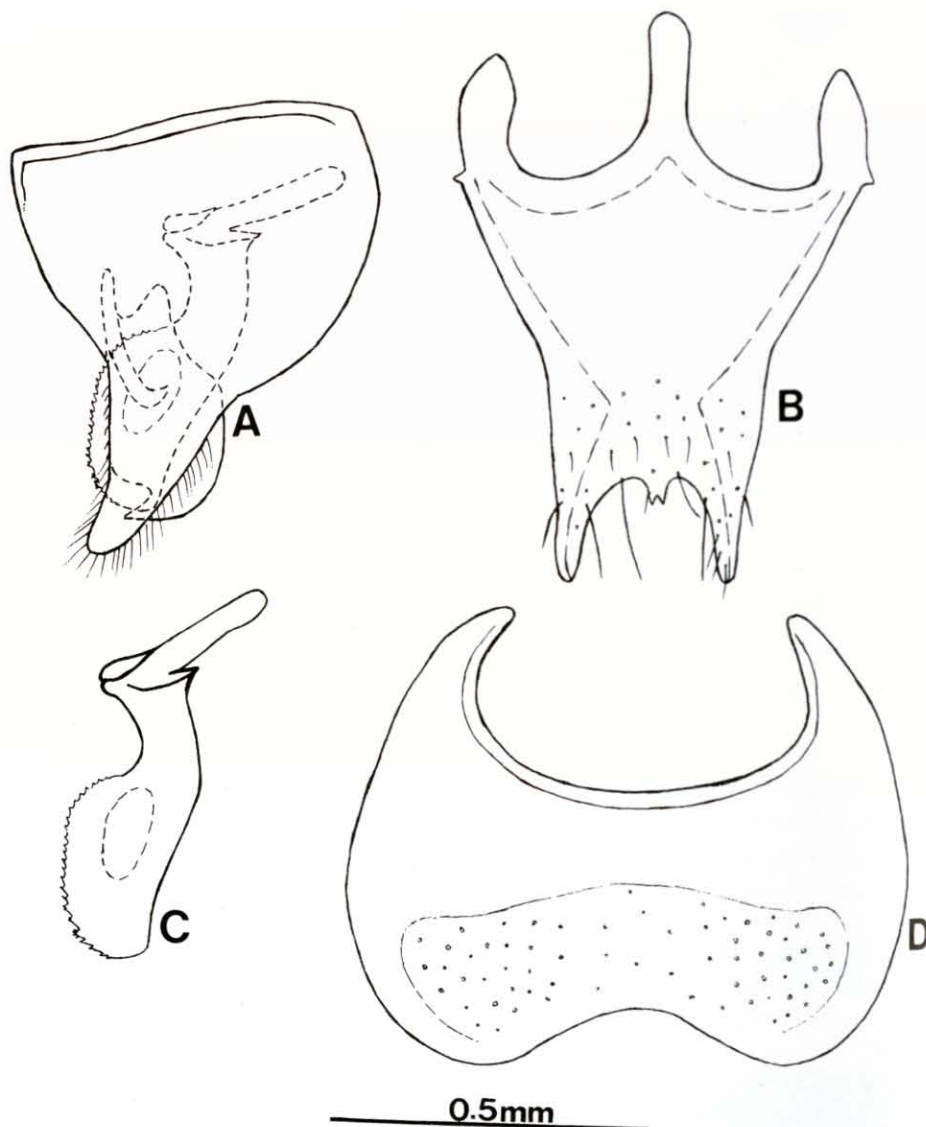


FIG. 16

C. boliviae Wheeler. Male from Rancho Grande, Aragua, Venezuela. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 14. *C. boliviae* Wheeler. Gyne from Rancho Grande, Aragua, Venezuela. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

FIG. 15. *C. boliviae* Wheeler. Male from Rancho Grande, Aragua, Venezuela. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Cylindromyrmex boliviae Wheeler

Figs 4, 14-16

Cylindromyrmex boliviae Wheeler, 1924: 104, fig. 20. Gyne. Original description. Type locality: Mapiro, Bolivia. Type material: 1 alate gyne (head missing) labelled: "Mapiro, Bolivia; Cotype; Gift of W. M. Wheeler; M.C.Z. Cotype, 20336", in MCZC, examined.

Cylindromyrmex striatus Mayr, EMERY 1901: 54 (male, Peru). Nec MAYR 1870. Misidentification.

Diagnosis. A *Cylindromyrmex* species differing from all the others by the postpetiole smooth or at most with traces of superficial, short striae on the the posterior half.

Gyne (Fig. 14). Head ca. 1/4 longer than broad, with parallel sides. Occiput slightly higher than in the species of the *striatus* clade. Frontal carinae ca. 1/3 narrower than the maximum head width. Sides of the frontal carinae diverging backwards and reaching at least the middle of the compound eyes posteriorly. Dorsum of the frontal carinae with an impressed, median sulcus anteriorly. Frontal carinae reaching the anterior border of the clypeus. Compound eyes large, gently convex and largely on the posterior half of the head. Ocelli well developed. Scapes reaching the anterior border of the compound eyes. Proximal third of the scapes ca. 1/2 narrower than the remaining parts. Mandibles massive and strongly convex dorsally. Masticatory margin of the mandibles each with a set of 10-12 irregular, minute denticles followed by an apical tooth.

Mesosoma dorsally flat and slightly more than 1/3 longer than the head (mandibles included). Pronotal dorsum with the sides superficially marginate. Propleurae concave. Mesopleurae gently convex. Propodeal sides converging posteriorly. Basal and declivous faces of the propodeum subequal in size and delimited by a superficial margin.

Petiole ca. 1/5 longer than broad, anteriorly truncate and the dorsally gently convex. Petiolar sides diverging backwards. Ventral process of the petiole large, sub-round or obliquely truncate. Postpetiole subquadrate and slightly broader posteriorly. Postpetiole in dorsal view antero-laterally angulate. Postpetiolar sternite antero-medially only with superficial traces of a triangular "lip". Pygidium in side view subtruncate. Pygidium in dorsal view with the sides bearing many irregularly distributed small denticles converging to 4-6 small teeth over the sting.

Legs. Femora and tibiae not strongly inflated. Hind basitarsi 1/4 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi with 5 spine-like setae.

Wings as in Fig. 4.

Sculpture. Head covered by longitudinal striae, thicker on the posterior half of the head dorsum. Striae close to the antennal scrobes thinner than those on the remaining parts of the anterior half of the head. Dorsum of the pronotum with about 18-21 striae similar to those on the posterior part of the head dorsum. Center of the mesonotum with about 9-12 striae, thinner than those on the pronotum; remaining parts of the mesonotum and scutellum smooth, or sides of the mesonotum with thin, superficial, short striae. Dorsum of the propodeum with about 21-24 striae similar to those on the mesonotum. Propleurae, lower mesopleurae, metapleurae and sides of the petiole minutely and superficially reticulate-punctated and with longitudinal striae similar to

those close to the antennal scrobes. Upper mesopleurae smooth. Petiolar dorsum with about 15-17 striae similar to those on the propodeum. Declivous face of the propodeum and anterior face of the petiole minutely reticulate-punctate. Postpetiolar dorsum smooth and sometimes with very thin, short, superficial striae on the center of the posterior half. Postpetiolar sternite and gaster smooth and with variably impressed punctations, denser and larger on the the postpetiolar sternite. Last three gastric sternites and sides of their corresponding tergites minutely and superficially reticulate-punctated. Coxae not striated. Legs with very superficial, minute punctures.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, rare on the head, on the mandibles, on the anterior border of the clypeus, on the mesosoma, on the pedicel, on the ventral process of the petiole and on the gaster, dense on the pygidium; (2) shorter than the type (1) rare and suberect on the whole body except on the sternites these hairs are sub- or decumbent; (3) shorter than the type (2), erect to suberect on the whole body except on the posterior half of the ventral part of the head, on the gaster and on the legs these hairs are sub- or decumbent. In addition, the hypostomal bridge surrounded by a row of hairs similar to those of type (1) but appressed and apically curved.

Colour black and shining. Legs dark orange-brown with darker tarsi and black coxae. Immature specimens with mandibles, antennae, coxae and pygidium reddish-brown, last funicular joints orange.

Measurements (in mm) and indices: TL 9.64-10.28; HL 1.60-1.64; HW 1.24-1.28; EL 0.50-0.54; SL 0.65-0.67; SW 0.23-0.24; WL 2.72-2.76; PeL 0.90-1.00; PeW 0.80-0.81; HFeL 0.88-1.02; HFeW 0.37-0.45; HTiL 0.80-0.92; HTiW 0.24-0.29; HBaL 0.60-0.65; HBaW 0.10-0.11; CI 77.5-78.0; SI 35.4-35.8; HFeI 42.0-43.1; HTiI 30.0-32.5; HBaI 16.4-16.9.

Male (Fig. 15). Head as broad as long. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior half of the head. Frontal carinae high. Borders of the frontal carinae broad, convex on the anterior third and subparallel posteriorly. Frons anteriorly concave, medially gently convex and posteriorly sloping to the impair ocellus. Anterior border of the clypeus convex medially. Mandibles long; their masticatory margin edentated and with a pointed apical tooth. Scapes short and thick. Funicular joints stout; first joint about 1/2 shorter than the second one. Second and last two funicular joints thinner than joints 3-10.

Mesosoma robust. Pronotum in dorsal view with diverging sides. Mesonotum convex. Parapsidal furrows superficially impressed. Scutellum subround and as high as the mesonotum. Basal face of the propodeum narrowing backwards and separated from the declivous one by a marked carina. Posterior border of the basal face of the propodeum with a short sulcus in the middle.

Petiole slightly longer than broad, broader on the posterior half. Anterior face of the petiole truncate and separated from the dorsal one by a marked carina. Ventral process of the petiole subtriangular. Postpetiole with the sides gently convex and narrower than the first gastric tergite.

Genitalia as in Fig. 16.

Legs not inflated. Hind basitarsi about 1/4 shorter than the hind tibiae. Mid basitarsi slightly more than 1/2 of the length of the hind basitarsi.

Wings as in Fig. 5.

Sculpture. Head dorsum minutely punctate and striated, the punctures more impressed on the anterior half, the striae thicker on the posterior half, slightly longitudinal and short on the frons, concentric and irregular close to the internal border of the eyes, and converging from the posterior border of the compound eyes to the pair ocelli. Vertexal angles and sides of the ventral part of the head with small, deep, piligerous foveae, larger on the vertexal angles. Middle of the ventral part of the head with thick transversal striae. Pronotum smooth and with sparse piligerous foveae on the center; some specimens with additional irregular, transversal rugosities between the foveae. Mesonotum and scutellum smooth, with rare, small foveae. Basal face of the propodeum and petiole covered by thick, irregular, longitudinal striae, sometimes missing on the center of the petiole. Declivous face of the propodeum punctate and with rare, very thin, transversal rugosities close to the borders. Pro- and mesopleurae smooth. Metapleurae striated as on the basal face of the propodeum. Postpetiole, first gastric segment and legs smooth and with superficial punctures, denser and deeper on the three last gastric segments.

Pilosity. Body covered by pointed hairs of four types: (1) long, sparse and suberect; (2) shorter than the type (1), sparse and suberect, dense, decumbent on the gaster and on the femora; (3) shorter than the type (2) dense, decumbent on the vertexal angles, on the posterior half of the ventral part of the head, appressed on the mandibles on the scapes, on the first funicular joints, on the coxae, on the tarsi and tarsomeres; (4) very short, thick and dense on the 2-12 funicular joints.

Colour. Black and shining. Mandibles, antennae and legs lighter.

Measurements (in mm) and indices: TL 8.22-9.54; HL 1.16; HW 1.16; EL 0.60-0.62; SL 0.25-0.27; SW 0.18-0.19; WL 2.64-2.74; PeL 0.76; PeW 0.70-0.74; HFeL 1.02-1.09; HFeW 0.23-0.25; HTiL 0.89-0.92; HTiW 0.18-0.19; HBaL 0.71-0.74; HBaW 0.08; CI 100.0; SI 66.7-73.1; HFeI 21.1-24.5; HTiI 19.8-20.6; HBaI 10.8-11.3.

Material examined. **COLOMBIA:** CUNDINAMARCA: Medina, Quebrada Ardita, 1475 m, 28.II.1997, 1 gyne, F. Escobar [IAVH]. **VENEZUELA:** ARAGUA: Rancho Grande, 17.VII.1972, 1 gyne, N. A. Weber [MCZC]; same locality, 1100 m, IV.1987, 1 gyne, C. Bordon [MIZA]; same locality, 1200 m, 15.V & 22.VI.1987, 3 males, C. Bordon [MIZA]. **PERU:** LIMA: Calanga, 1 male, Staudinger [MCSN]. **BOLIVIA:** Songo, 1 male [MCSN]. LA PAZ: Mapiri, 1 gyne (holotype), Staudinger [MCZC].

Discussion. *Boliviae* is known only on the sexuals. The gyne of *boliviae* is easily distinguished from all other species by the characters already listed before and by the very broad frontal carinae reaching the internal border of the eyes. In body shape the gyne of *boliviae* resembles the one of *godmani* of the *longiceps* clade and the worker of *escobari* of the *brevitarsus* clade. *Boliviae*, *godmani* and *escobari* have broad frontal carinae and large, convex mandibles. *Boliviae* and *godmani* share also a broad and large ventral process of the petiole, and *boliviae* and *escobari* have mandibles with more than 11 denticles, and no gastric striae.

The male of *boliviae* can be distinguished from the other *Cylindromyrmex* males by the legs dark brown or black. *Boliviae* males, in addition, have the frontal carinae more similar to males of the *brevitarsus* clade than to males of the *striatus* or *longiceps* clades.

EMERY (1901) attributed with doubts two Peruvian males to "*striatus*". I found in the Emery collection only one of these males and it belongs to *boliviae*.

The size of the eyes of workers was considered an important diagnostic character in *Cylindromyrmex*. The workers of the *longiceps* clade have small and flat eyes. The workers of the *brevitarsus* clade have the eyes as in the species of the *longiceps* clade or slightly larger. The workers of the *striatus* clade have relatively large eyes. There is no difference in the size of the eyes of gynes of species with workers with large or small eyes.

Material available for the present study proves that the range of *boliviae*, previously known only from Bolivia and Venezuela, is much broader than what was previously supposed (Fig. 38). A Bolivian locality (Songo) has not been plotted on the map of Fig. 38 because I was unable to locate it.

Distribution. Colombia, Venezuela, Peru and Bolivia.

THE *BREVITARSUS* CLADE

This clade includes four species: *escobari*, *electrinus*, *brevitarsus* and *darlingtoni*. They are characterized by the following synapomorphies: (1) occiput high, (2) ventral process of the petiole triangular, and (3) hind basitarsi with 4 spine-like setae.

Cylindromyrmex escobari n. sp.

Fig. 17

Cylindromyrmex brasiliensis Emery, FERNANDEZ-C. & ESCOBAR, 1997: 347. Worker. Nec EMERY 1901. Misidentification.

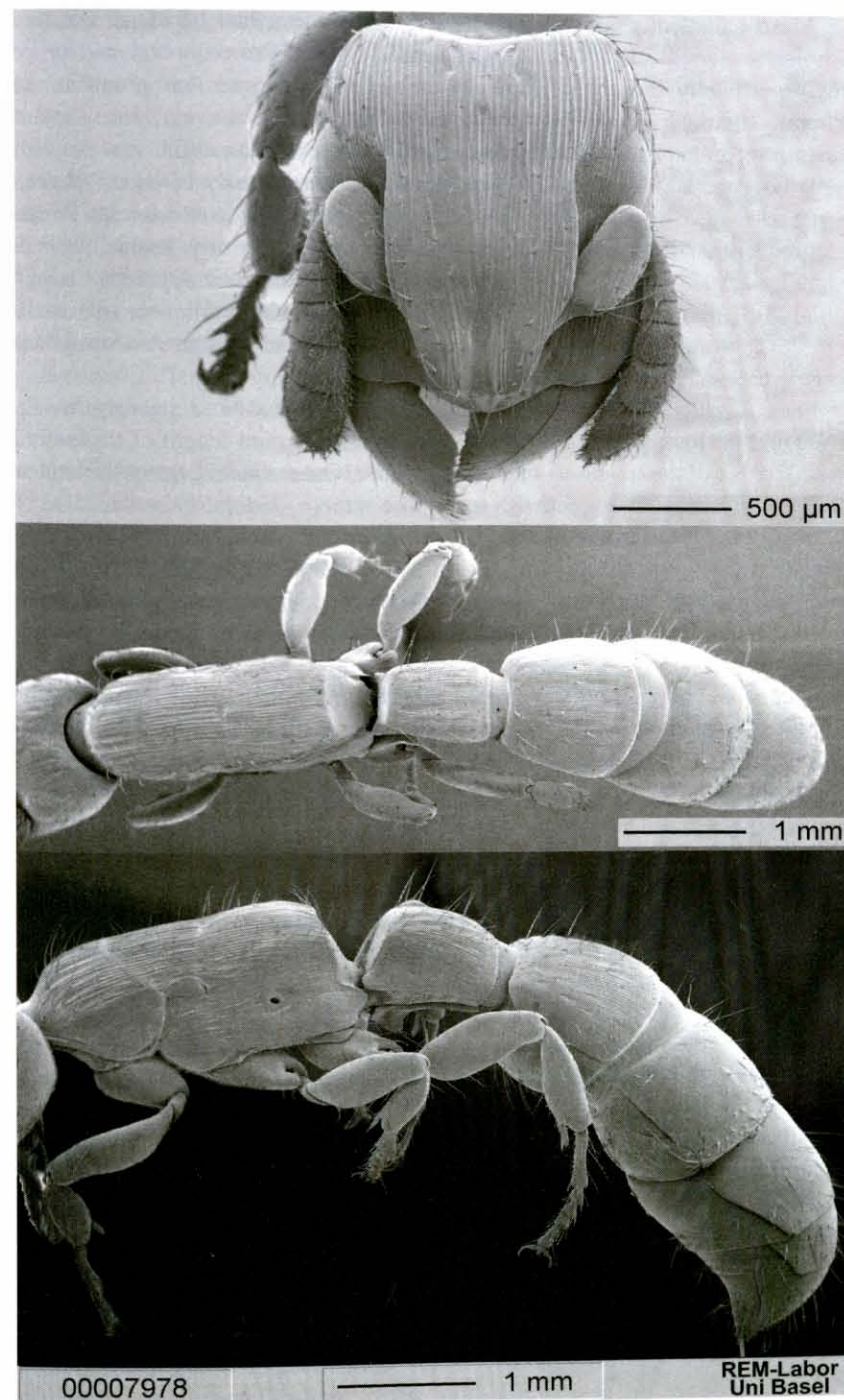
Holotype: Worker labelled: "Colombia, Nariño, Ricaurte La Planada, 1°17' N 78°15' W, 1800 m, interior bosque, bmh-PM, Col: F. Escobar", in IAVH.

Derivatio nominis. *C. escobari* is named after Federico Escobar, the collector of this species.

Diagnosis. The basalmost species of the *brevitarsus* clade, differing from all the other species by the antero-median margin of the clypeus convex and by the absence of striae on the gaster.

Worker (Fig. 17). Head ca. 1.5 times longer than broad, with subparallel sides. Occiput high. Vertexal angles convex. Frontal carinae more than half broad as the maximum head width. Anterior third of the frontal carinae diverging backwards and reaching at least the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed, broad, median sulcus anteriorly. Frontal carinae not reaching the anterior border of the clypeus. Antero-median clypeal margin strongly convex. Compound eyes intermediate in size between the species of the *longiceps* and *striatus* clades, slightly flat and on the posterior half of the head. Ocelli represented by superficial impression only. Scapes stout and surpassing the anterior border of the eyes posteriorly. Proximal third of the scapes 1/2 narrower than the remaining parts. Mandibles strongly convex dorsally. Masticatory margin of the mandibles each with a set of 13-14 irregular denticles followed by an apical tooth.

FIG. 17. *C. escobari* de Andrade. Worker from Ricaurte, La Planada, Nariño, Colombia. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).



Mesosoma gently convex dorsally and slightly less than 1/5 longer than the head (mandibles included). Pronotum with parallel sides. Promesonotal and propodeal sutures superficially impressed. Mesonotum slightly narrower than pronotum. Tegula superficially marked. Propodeum with the sides weakly convex. Basal face of the propodeum separated from the declivous one by a superficial margin.

Petiole rectangular, anteriorly truncate and the dorsally convex. Petiolar sides diverging backwards. Ventral process of the petiole large and subtriangular. Postpetiole ca. 1.5 broader than long. Postpetiolar sides diverging posteriorly. Postpetiole in dorsal view antero-laterally angulate. Postpetiolar sternite antero-medially with a superficial triangular "lip" pointing backwards. Pygidium in side view obliquely truncate. Pygidium in dorsal view with the sides bearing many irregularly distributed small denticles converging to 4 small teeth over the sting.

Legs. Coxae and tibiae slightly inflated. Mid basitarsi strongly broadening distally. Hind basitarsi about 1/3 shorter than the maximum length of the hind tibiae. Mid basitarsi 1/2 of the length of the hind basitarsi. Outer apical edge of the hind and of the mid basitarsi respectively with 4,5 spine-like setae.

Sculpture. Head covered by thin, longitudinal striae, slightly thicker on the posterior third of the head dorsum and on the center of the ventral part of the head, absent on the posterior corners of the ventral part of the head. Mesosoma longitudinally striated. Pronotum and mesonotum with striae thicker than those on the propodeum. Pronotum with about 28-30 longitudinal striae similar to those on the posterior part of the head dorsum. Propodeum with about 30-35 longitudinal striae. Pleurae with very thin, superficial, longitudinal striae, less impressed on the propleurae. Petiolar dorsum with about 30-35 striae slightly thinner than those on the propodeum. Petiolar sides with very thin, superficial striae. Declivous face of the propodeum and anterior face of the petiole with superficial reticulation. Dorsum of the postpetiole with striae thinner than those on the petiolar dorsum. Remaining gastric tergites, sternites and legs smooth, with minute, superficial reticulation more impressed on the distal segments of the gaster. Ventral face of the hind coxae with thin, longitudinal striae.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, sparse on the head, on the mesosoma, on the pedicel and on the gaster, dense on the pygidium; (2) shorter than the type (1), suberect and variably distributed on the whole body; (3) shorter than the type (2), sparse, suberect or subdecumbent on the whole body. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved. Outer ventral border of the mandibles with hairs similar to those of the hypostomal bridge but shorter.

Colour black. Mandibles, antennae and coxae dark ferruginous-brown. Legs yellow-orange to light brown with darker tarsi.

Measurements (in mm) and indices: TL 8.16; HL 1.56; HW 1.28; SL 0.732 SW 0.25; WL 2.16; PeL 0.68; PeW 0.56; HFeL 1.00; HFeW 0.37; HTiL 0.85; HTiW 0.26; HBaL 0.50; HBaW 0.09; CI 82.0; SI 34.7; HFeI 37.0; HTiI 30.5; HBaI 18.0.

Material examined. COLOMBIA: NARIÑO: Ricaurte, Reserva La Plananda, 1°17' N 78°15' W, 1800 m, 1 worker (holotype), F. Escobar [IAVH].

Discussion. *Escobari* differs from the other species of the *brevitarsus* clade mainly by the absence of striae on the first gastric tergite. In particular, it differs from

electrinus by the larger and more massive mandibles with 13-14 denticles instead of smaller and less massive and with 6-7 denticles. From *darlingtoni* and *brevitarsus*, *escobari* differs by the more elongate body. *Escobari* in general body shape resembles more *darlingtoni* than *brevitarsus*. A comparison of *escobari* and *darlingtoni* proves that they are very different each other. *Escobari* can be separated from *darlingtoni* by the strongly convex anterior border of the clypeus, by the frontal carinae not reaching the anterior clypeal border and by the more enlongate femora.

Comparisons were made also between the worker of *escobari* and the gynes of *boliviae* and *godmani*, two species the workers of which are still unknown and occurring close to the area where *escobari* was collected. *Escobari* has concolour femora and tibiae (yellowish-orange to light brown) and *godmani* has black femora and yellow tibiae. *Escobari* differs from *boliviae* by the postpetiole striate instead of smooth or with very superficial, short striation restricted to the center of the posterior half, and by thinner striation.

FERNANDEZ- C. & ESCOBAR (1997) reported this species from decayed wood.

Distribution. Colombia.

Cylindromyrmex electrinus sp. n.

Figs 2 & 18

Holotype: Winged gyne in an amber sample without reference number from the MCZC.

Derivatio nominis. From the Latin *electrinus* (= made of amber).

Diagnosis. A species appearing in an unresolved position together with *brevitarsus* and *darlingtoni* within the *brevitarsus* clade, but differing from both other species by the following combination of characters: basal face of the propodeum separated from the declivous one by a marked margin, by the coxae and femora black instead of dark brown, and by the mid basitarsi long and not broad distally.

Gyne (Figs 2 & 18). Head ca. 1/4 longer than broad, with parallel sides. Occiput high. Vertex angles convex. Frontal carinae about half broad as the maximum head width. Anterior third of the frontal carinae diverging backwards. Dorsum of the frontal carinae with an impressed, median sulcus anteriorly. Frontal carinae reaching the anterior border of the clypeus. Compound eyes large, slightly flat and mostly on the posterior half of the head. Ocelli well developed. Scapes reaching the anterior border of the eyes. Proximal third of the scapes about 1/2 narrower than the remaining parts. Mandibles convex dorsally. Masticatory margin of the mandibles with a set of 6-7 irregular denticles followed by a pointed apical one.

Mesosoma dorsally flat and ca. 1.3 longer than the length (mandibles included). Pronotum dorsally with the sides superficially marginate. Propleurae gently concave. Mesopleurae gently convex. Propodeum with the sides converging posteriorly. Basal and declivous faces of the propodeum subequal in size and delimited by a margin.

Petiole ca. 1/4 longer than broad, anteriorly truncate and the dorsally convex. Ventral process of the petiole triangular. Postpetiole diverging backwards and broader posteriorly. Anterior corners of the postpetiole angulate. Postpetiole in dorsal view antero-laterally angulate. Postpetiolar sternite antero-medially with a salient, triangular "lip" pointing backwards. Pygidium obliquely truncate; its sides bearing many irregularly distributed small denticles converging to 4 small teeth over the sting.

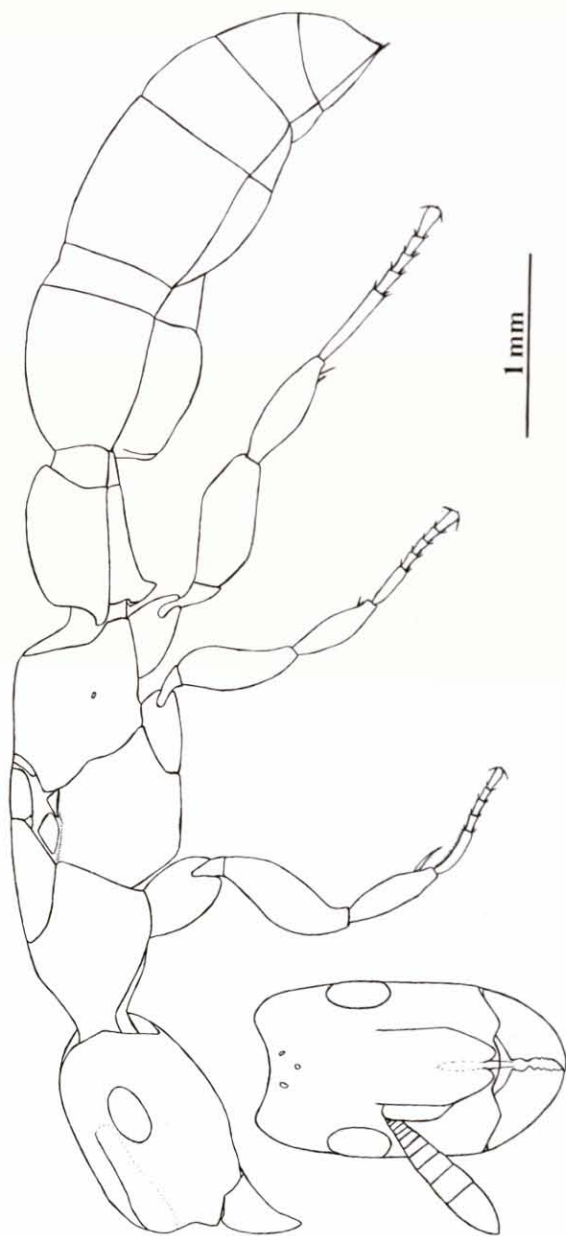


FIG. 18
C. electrinus de Andrade. Gyne from Dominican amber. Body in profile (top), head in full dorsal view (bottom).

Legs. Femora slightly inflated. Mid basitarsi with parallel sides. Hind basitarsi slightly less than 1/3 shorter than the length of the hind tibiae. Mid basitarsi ca. 1/2 of the length of the hind basitarsi. Outer apical edge of the hind and of the mid basitarsi respectively with 4,5 spine-like setae.

Wings as in Fig. 4.

Sculpture. Head covered by thin, longitudinal striae, thicker on the posterior part of the dorsum, thinner close to the antennal scrobes, absent on the posterior third of the ventral part of the head. Posterior third of the ventral part of the head minutely punctate and smooth. Dorsum of the pronotum with at least 40 striae similar to those on the posterior part of the head dorsum. Mesonotum with at least 25 striae thinner than those on the pronotum. Scutellum covered by striae slightly thinner than those on the mesonotum. Dorsum of the propodeum covered by striae similar to those on the mesonotum. Pleurae and petiole with longitudinal striae similar to those on the scutellum, the striae more superficial on the upper mesopleurae and on the sides of the petiole. Petiolar dorsum with at least 25 striae. Postpetiole covered by at least 50 striae similar to those on the mesonotum. First gastric tergite with very thin, short striae on the center of the anterior half only. Remaining gastric tergites and sternites smooth and with variably impressed punctuations more impressed on the last segments. Legs with very superficial, minute punctures. Hind coxae with thin, longitudinal striae.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, one on the external border of the scape, a pair between the frontal carinae and the clypeus, rare on the external border of the mandibles, rare on the gaster, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), erect to suberect, sparse on the whole body. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1).

Colour black. Tibiae of three pairs of legs partially yellowish and transparent or dark brown. Tarsi dark brown, tarsomeres lighter.

Measurements (in mm) and indices: TL 7.36; HL 1.24; HW 0.94; EL 0.36; SL 0.46; SW 0.16; WL 2.20; PeL 0.68; PeW 0.56; HFeL 0.75; HFeW 0.30; HTiL 0.64; HTiW 0.21; HBaL 0.47; HBaW 0.08; CI 75.8; SI 36.9; HFeI 40.0; HTiI 32.8; HBaI 17.0.

Material examined. **Dominican amber:** 1 gyne (holotype) without reference number [MCZC].

Discussion. *C. electrinus*, in the phylogeny proposed in this paper, appears close to the Recent *brevitarsus* and *darlingtoni*. These three species differs from the basal-most species of the clade, *escobari*, by the presence of striae on the first gastric tergite. *Electrinus* shares with *brevitarsus* the frontal carinae reaching the anterior border of the clypeus and the mandibles with 6-7 denticles, and with *darlingtoni* the striae on the first gastric tergite thin, short and restricted on the anterior part only. *Electrinus* is very similar to both *brevitarsus* and *darlingtoni*, but the characters listed in the diagnosis allow an easy separation of the fossil from both Recent species.

Distribution. Dominican amber.

***Cylindromyrmex darlingtoni* Wheeler**

Fig. 19

Cylindromyrmex darlingtoni Wheeler, 1937: 441. Worker and gyne. Original description. Type locality: Cuba. Type material: 2 workers and 2 gynes labelled: "Gran Piedra Rge. Ote, Cuba, 2-3000 ft., 30.VI.1936, P. J. Darlington, MCZ cotype", in MCZC, examined.

Diagnosis. A species belonging to the *brevitarsus* clade and resulting in a unresolved position together with *brevitarsus* and *electrinus*, but differing from both by the frontal carinae surpassing the anterior border of the clypeus instead of as long as the clypeus, and by the mandibles with 9-10 denticles instead of 6-8. *Darlingtoni* differs from *electrinus* by the mid and fore basitarsi shorter and broader distally instead of long and with parallel sides, and from *brevitarsus*, by the ventral face of the hind femora with only traces of longitudinal striae instead of markedly striate.

Worker (Fig. 19). Head ca. 1.5 times longer than broad, with parallel sides. Occiput high. Vertex angles convex. Frontal carinae about half broad as the maximum head width. Frontal carinae anteriorly diverging backwards and reaching at the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed, broad, median sulcus anteriorly. Frontal carinae slightly longer than the anterior border of the clypeus. Compound eyes small, flat and behind the mid line of the head. Impar ocellus minute, pair ocelli reduced to a superficial pit. Scapes almost reaching the anterior border of the eyes. Proximal third of the scapes 1/2 narrower than the distal parts. Mandibles convex dorsally. Masticatory margin of the mandibles each with a series of 9-10 irregular denticles followed by an apical one.

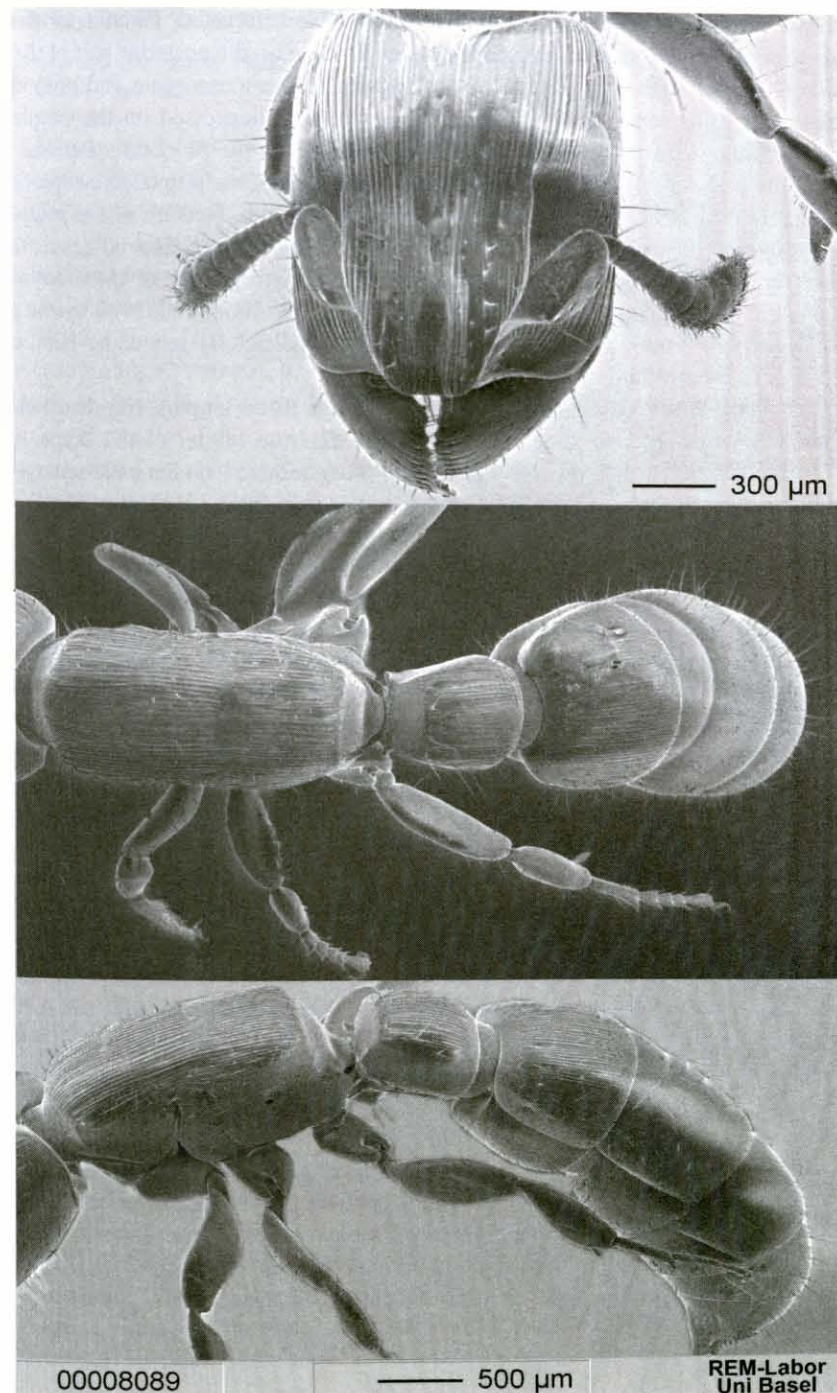
Mesosoma convex dorsally and as long as the head (mandibles included). Pronotum with parallel sides. Promesonotal and propodeal sutures superficially impressed. Mesonotum narrower than pronotum. Propodeal sides gently convex and converging posteriorly. Basal face of the propodeum separated from the declivous one by a faint margin.

Petiole subquadrate, slightly broader than long, anteriorly truncate and dorsally convex. Petiolar sides diverging backwards. Ventral process of the petiole large and subtriangular. Postpetiole ca. 1.3 broader than long. Postpetiolar sides gently diverging posteriorly. Postpetiole in dorsal view gently angulate antero-laterally. Postpetiolar sternite antero-medially with a superficial, triangular lip pointing backwards. Pygidium truncate; its sides bearing many irregularly distributed, small denticles converging to 4 small teeth over the sting.

Legs. Femora and tibiae slightly inflate. Fore and mid basitarsi strongly broadening distally. Hind basitarsi short, ca. 1/2 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi respectively with 4,5 spine-like setae.

Sculpture. Head covered by thin, longitudinal striae, thicker on the posterior third of the head dorsum, absent on the angles of the ventral part of the head. Meso-

FIG. 19. *C. darlingtoni* Wheeler. Worker from Gran Piedra, Range Oriente, Cuba. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).



soma longitudinally striated, some mesosomal striae bifurcated. Dorsum of the pronotum with about 40 longitudinal striae similar to those on the posterior part of the head dorsum. Pronotal striae prolonging to the dorsum of the mesonotum and propodeum. Pleurae with thin, superficial, longitudinal striae, less impressed on the propleurae. Petiolar dorsum with about 30 striae similar to those on the pronotum. Petiolar sides with minute and superficial reticulation. Declivous face of the propodeum superficially and sparsely reticulate. Anterior face of the petiole smooth. Dorsum of the postpetiole densely covered by striae similar to those on the petiolar dorsum. Second gastric tergite with extremely thin, superficial, longitudinal striae on the center of the anterior half only. Postpetiolar sternite and remaining gastric segments smooth and with sparse punctures. Pygidium, border of the sternites, and legs superficially reticulate. Hind coxae with traces of longitudinal striae.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, one on the external border of the scape, a pair between the frontal carinae and clypeus, rare on the mandibles, on the mesosoma, on the pedicel, on the gaster and on the legs, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), suberect on the head dorsum and mesosoma, subdecumbent on the pedicel, decumbent on the ventral part of the head, on the gaster and on the legs. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour black. Mandibles and antennae brownish red. Coxae and femora dark brown. Last funicular joints, tibiae and tarsomeres yellowish-orange, tarsi darker.

Measurements (in mm) and indices: TL 6.52; HL 1.28; HW 1.08; EL 0.25; SL 0.54; SW 0.20; WL 1.64; PeL 0.58; PeW 0.60; HFeL 0.73; HFeW 0.33; HTiL 0.63; HTiW 0.23; HBaL 0.34; HBaW 0.08; CI 84.4; SI 37.0; HFeI 45.2; HTiI 36.5; HBaI 23.5.

Gyne. Very similar to the worker but differing from it in the following details: compound eyes very large, flat and mostly on the posterior part of the head; ocelli well defined; mesosoma broad medially; parapsidal furrows superficially impressed; petiole slightly longer than broad; anterior half of the mesonotum and of the scutellum with very thin, superficial striae; posterior half of the mesonotum and of the scutellum with few traces of short striae or simply smooth.

Measurements (in mm) and indices: TL 8.16-8.44; HL 1.34-1.36; HW 1.08-1.10; EL 0.46-0.47; SL 0.57; SW 0.21; WL 2.28-2.36; PeL 0.70-0.72; PeW 0.66; HFeL 0.76-0.77; HFeW 0.35-0.36; HTiL 0.66; HTiW 0.24; HBaL 0.40; HBaW 0.08; CI 80.6-80.9; SI 36.8; HFeI 45.4-46.0; HTiI 36.4; HBaI 20.0.

Material examined. CUBA: Gran Piedra Range, Oriente, 2-3000 ft 30.VI.1936, 2 workers, 2 gynes (all syntypes), P. J. Darlington, [MCZC].

Discussion. *C. darlingtoni* is the northernmost species of the genus. It is known only from the type series from Cuba and it is likely to be endemic on the island. Differences between *darlingtoni* and its closest relatives, *brevitarsus* and *electrinus*, are listed in the diagnosis and in the discussion of these species.

The type series of *darlingtoni* was collected in decayed wood.

Distribution. Cuba.

Cylindromyrmex brevitarsus Santschi

Figs 20-24

Cylindromyrmex brevitarsus Santschi, 1925: 5. Worker. Original description. Type locality: Brazil. Type material: 1 worker labelled: "Brésil, Rio Negro, Reichensperger", in NHMB, examined.

Diagnosis. A species belonging to the homonymous clade and resulting in an unresolved position with *darlingtoni* and *electrinus*, but differing from *darlingtoni* by the frontal carinae reaching the anterior border of the clypeus instead of longer than the clypeus, and by the mandibles with 6-8 denticles instead of 9-10; and from *electrinus*, by the mid and fore basitarsi shorter and broader distally instead of long, with parallel sides, and by the yellow-light brown femora instead of black.

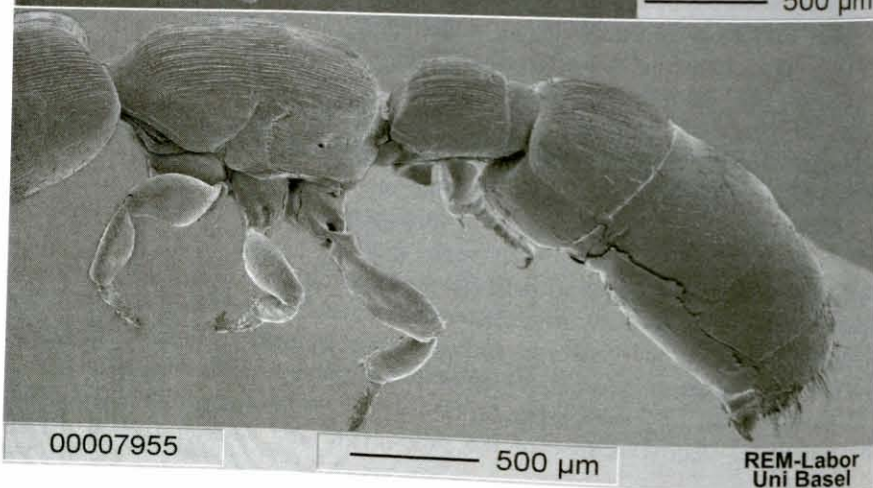
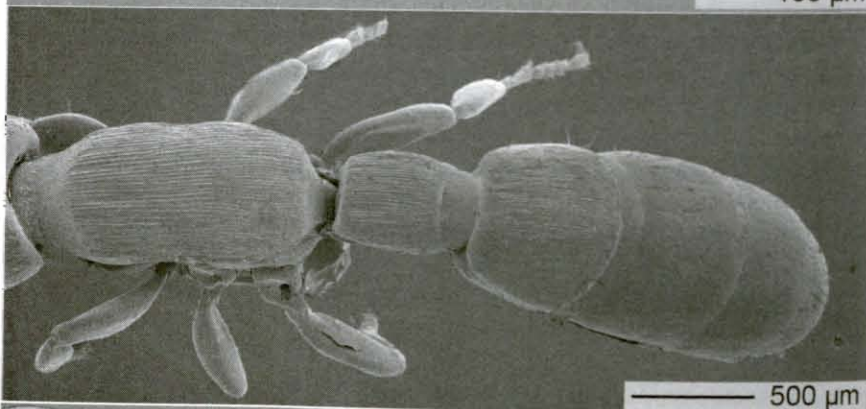
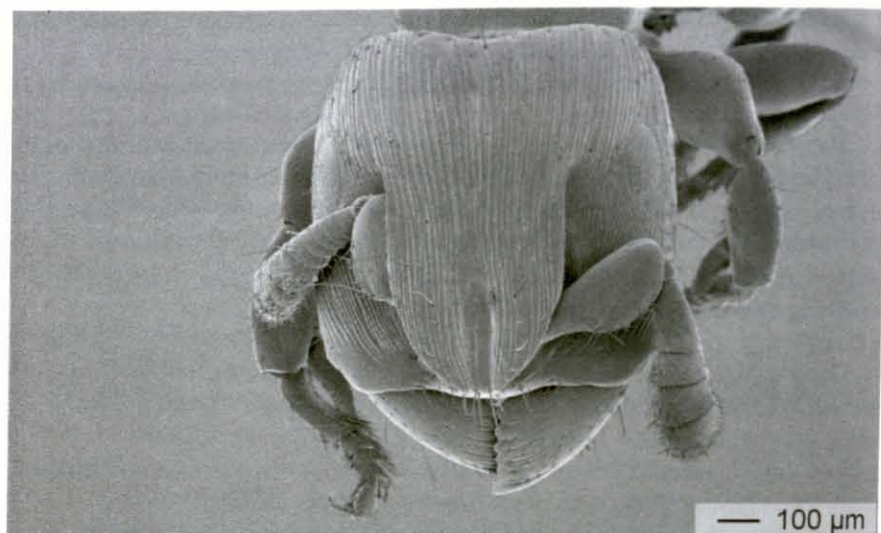
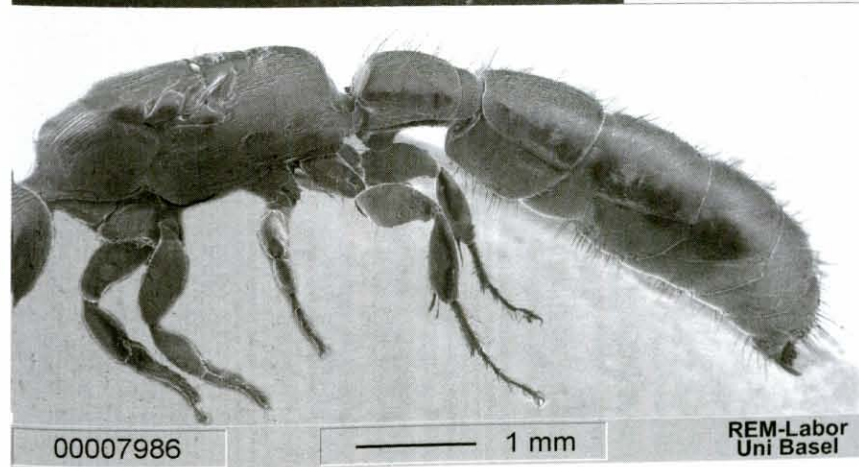
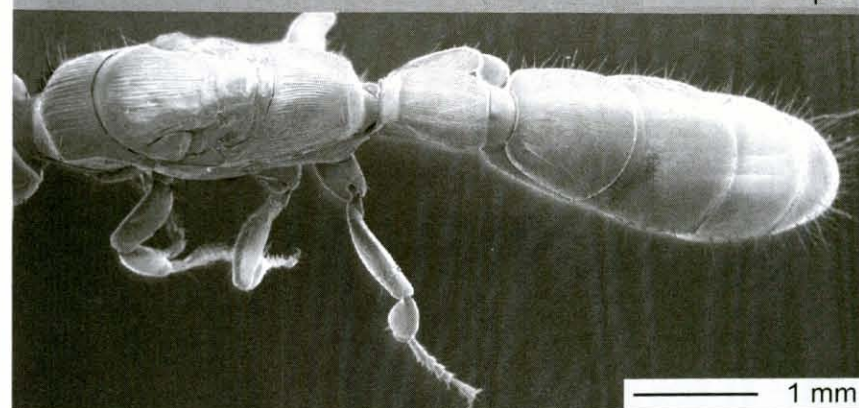
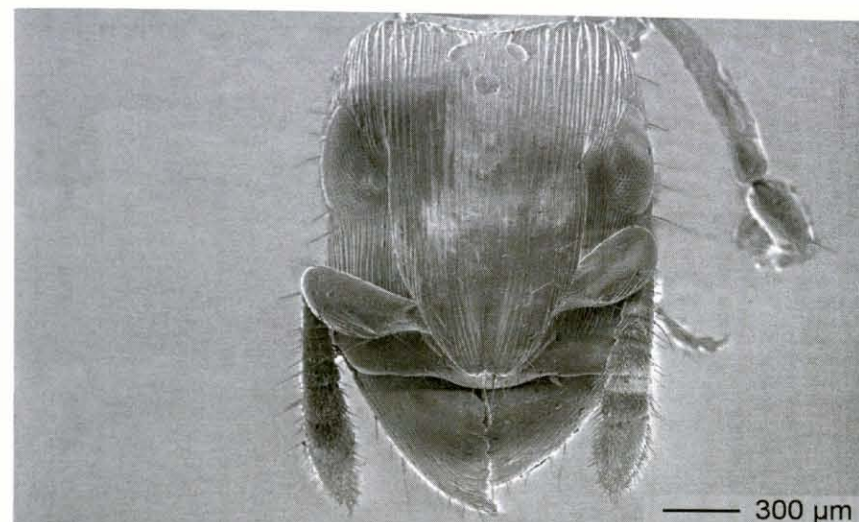
Worker (Fig. 20). Head ca. 1.6-1.7 times longer than broad, with subparallel sides. Occiput high. Vertex angles convex. Frontal carinae about half broad as the maximum head width. Anterior half of the frontal carinae diverging backwards and reaching the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed, broad, median sulcus anteriorly. Frontal carinae as long as the anterior border of the clypeus. Compound eyes small (minimum 30 and less than 150 ommatidia), flat and on the posterior half of the head. Ocelli reduced to very superficial pits. Scapes reaching the anterior border of the eyes. Proximal third of the scapes 1/2 narrower than the distal parts. Mandibles convex dorsally. Masticatory margin of the mandibles each with a series of 6-8 irregular denticles followed by an apical one.

Mesosoma convex dorsally and slightly longer or shorter than the head (mandibles included). Pronotum with parallel sides. Promesonotal and propodeal sutures less impressed than in *darlingtoni*. Mesonotum slightly narrower than pronotum. Propodeum with the sides gently convex and converging posteriorly. Basal face of the propodeum separated from the declivous one by a faint margin.

Petiole quadrate, slightly broader than long, anteriorly truncate and the dorsally convex. Ventral process of the petiole large and triangular. Postpetiole ca. 1.4 broader than long. Postpetiolar sides gently diverging posteriorly. Postpetiole in dorsal view slightly angulate antero-laterally. Postpetiolar sternite antero-medially with traces of a triangular "lip". Pygidium truncate; its sides bearing many irregularly distributed denticles converging to 4-6 small teeth over the sting.

Legs. Femora and tibiae inflated. Fore and Mid basitarsi strongly broadening distally. Hind basitarsi short, ca. 1/2 shorter than the maximum length of the hind tibiae. Mid basitarsi about 1/2 shorter than the hind basitarsi. Outer apical edge of the hind and of the mid basitarsi respectively with 4,5 spine-like setae.

Sculpture. Head covered by thin, longitudinal striae, thicker on the posterior third of the head dorsum and absent on the corners of the ventral part of the head. Mesosoma longitudinally striated. Dorsum of the pronotum with about 34-38 longitudinal striae similar to those on the posterior part of the head dorsum. Pronotal striae prolonging to the dorsum of the mesonotum and propodeum. Pleurae with thin, superficial, longitudinal striae, less impressed on the propleurae. Petiolar dorsum with about 31-35 striae similar to those on the propodeum. Petiolar sides minutely and superficially reticulate. Declivous face of the propodeum and anterior face of the petiole

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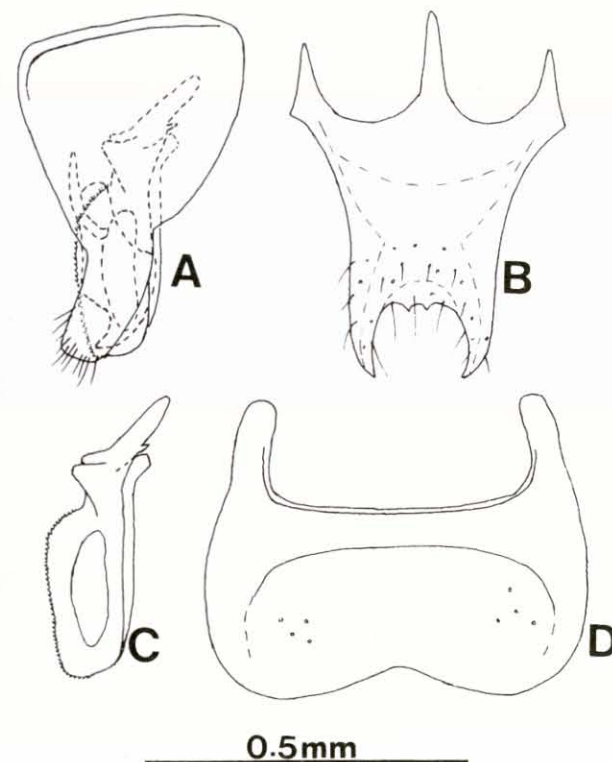
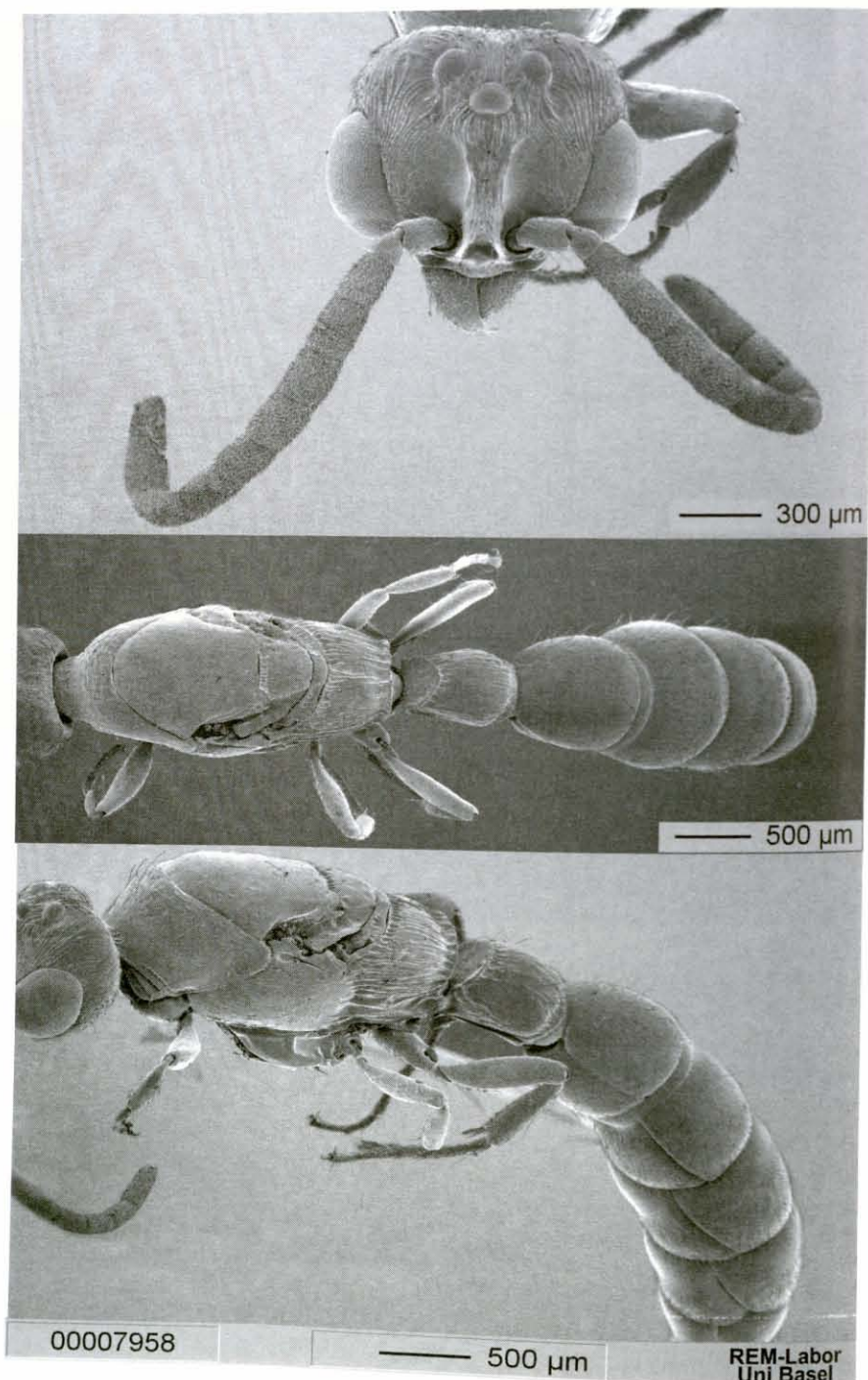


FIG. 23

C. brevitarsus Santschi. Male from Corcovado, Rio de Janeiro, Brazil. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 20. *C. brevitarsus* Santschi. Worker from Corcovado, Rio de Janeiro, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

FIG. 21. *C. brevitarsus* Santschi. Gyne from Serra do Mar, Nova Friburgo, Rio de Janeiro, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

FIG. 22. *C. brevitarsus* Santschi. Male from Corcovado, Rio de Janeiro, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

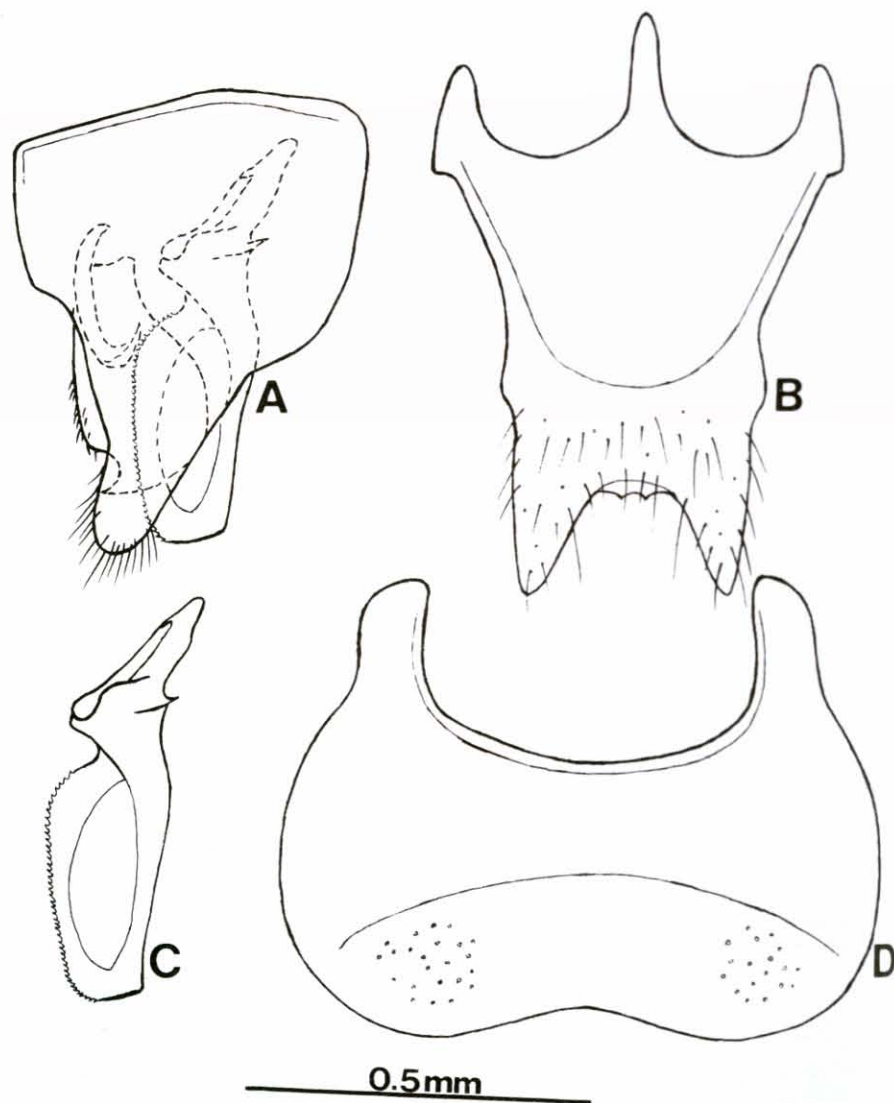


FIG. 24

C. brevitarsus Santschi. Male from Butantan, São Paulo, Brazil. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

smooth or with similar sculpture as on the petiolar sides. Dorsum of the postpetiole densely covered by striae similar to those on the petiolar dorsum. Center of the first gastric tergite with thin, short, longitudinal striae, thinner than those on the postpetiole; mature specimens have the whole first gastric tergite covered by striae and the second

gastric tergite with striae on the center only. Postpetiolar sternite and remaining gastric segments smooth and with sparse punctures. Pygidium, border of the sternites, and legs superficially reticulate. Hind coxae with thin, longitudinal striate. Mid coxae with few, fainter striate than those on the hind coxae.

Pilosity as in *darlingtoni*.

Colour light or dark brown. Legs yellowish-orange to light brown with darker coxae and basitarsi.

Measurements (in mm) and indices: TL 4.20-6.44; HL 0.86-1.20; HW 0.75-0.98; SL 0.36-0.43; SW 0.16-0.19; WL 1.04-1.50; PeL 0.36-0.56; PeW 0.41-0.58; HFeL 0.49-0.64; HFeW 0.26-0.30; HTiL 0.40-0.54; HTiW 0.16-0.19; HBaL 0.20-0.29; HBaW 0.06-0.08; CI 81.7-89.2; SI 42.5-45.0; HFeI 45.3-46.9; HTiI 35.2-40.5; HBaI 26.9-31.8.

Gyne (previously undescribed) (Fig. 21). Very similar to the worker but differing from it in the following details: compound eyes very large, flat or gently convex and largely on the posterior part of the head; mandibles with 6-8 denticles; ocelli well defined; mesosoma broad medially; parapsidal furrows weakly impressed; petiole slightly longer than broad; scutellum with very thin, superficial striae, sometimes on the anterior half only; propodeal dorsum with striae thinner than those on the pronotum and on the mesonotum. Some gynes have short striae on the second gastric tergite.

Colour dark brown or black. Antennae, mandibles and coxae dark ferruginous or brown. Some specimens have the anterior half of the head dorsum dark ferruginous. Legs dark yellowish-orange or light brown with darker coxae and tarsi. The gyne from Ecuador (LACM) and Serra Norte (MPEG) have the femora light brown with yellowish tibiae.

Measurements (in mm) and indices: TL 5.88-9.40; HL 0.95-1.52; HW 0.80-1.28; EL 0.35-0.46; SL 0.37-0.64; SW 0.16-0.24; WL 1.52-2.04; PeL 0.47-0.78; PeW 0.45-0.72; HFeL 0.53-0.93; HFeW 0.25-0.40; HTiL 0.46-0.81; HTiW 0.18-0.27; HBaL 0.28-0.50; HBaW 0.06-0.09; CI 78.5-84.5; SI 37.5-43.2; HFeI 42.5-47.9; HTiI 32.4-39.1; HBaI 17.4-22.6.

Male (previously undescribed) (Fig. 22). Head slightly longer than broad. Vertex angles converging to the subtruncate vertexal margin. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior part of the head. Borders of the frontal carinae broad, convex anteriorly, converging and subparallel posteriorly. Frons anteriorly concave, medially convex and posteriorly sloping towards the impair ocellus. Anterior border of the clypeus medially convex. Mandibles long; their masticatory margin edentate and with a pointed apical tooth. Scapes about 1/4 longer than broad. Funicular joints narrowing from the base to the apex.

Mesosoma robust. Pronotum in dorsal with the sides diverging posteriorly. Mesonotum slightly convex. Mayrian carinae absent. Parapsidal furrows superficially impressed. Basal face of the propodeum narrowing backwards and separated from the declivous one by a marked carina.

Petiole slightly longer than broad; anteriorly truncate and dorsally convex. Petiolar sides broadening backwards. Ventral process of the petiole subtriangular. Postpetiole broadening backwards and narrower than the first gastric tergite. Postpetiole antero-laterally subround.

First gastric segment broader than the postpetiole. Second gastric segment narrower or as broad as the first segment. Remaining gastric segments narrowing backwards.

Genitalia as in Fig. 23 (normal size males) and Fig. 24 (large size male).

Legs. Femora not inflate. Mid and hind basitarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum minutely punctate and with thin striae, the punctures more impressed on the anterior half, the striae slightly longitudinal between the ocelli and on the frons, diverging from the eyes to the frontal carinae. Vertex and sides of the ventral part of the head smooth and with variably distributed small piligerous foveae. Middle of the ventral part of the head with short, transversal striae. Pronotum smooth and with sparse piligerous foveae on the center; some specimens with additional irregular, transversal striae between the foveae. Mesonotum and scutellum smooth and with rare, small foveae. Basal face of the propodeum and petiole covered by thick, irregular, longitudinal striae, sometimes missing on the center of the petiole. Declivous face of the propodeum punctate and with rare, very thin, transversal rugosities close to the border. Pro- and mesopleurae smooth. Metapleurae striated as on the basal face of the propodeum, the striae thicker and less regular ventrally. Postpetiole, first gastric segment and legs smooth and with superficial punctures, denser and deeper on the three last gastric segments.

Pilosity. Body covered by pointed hairs of three types: (1) long, sparse and suberect, denser on the last three gastric segments; (2) shorter than the type (1) and variably distributed on the body; (3) mixed and shorter than the type (2), dense on the vertexal angles, on the posterior half of the ventral part of the head, on the coxae and on the gaster.

Colour. Black and shining. Some specimens with the anterior third of the head dorsum, mandibles and antennae orange-ferruginous or brown. Legs orange-light brown with darker coxae and basitarsi.

Measurements (in mm) and indices: TL 5.98-8.96; HL 0.85-1.18; HW 0.81-1.24; EL 0.44-0.61; SL 0.19-0.28; SW 0.13-0.19; WL 1.80-2.84; PeL 0.48-0.84; PeW 0.43-0.76; HFeL 0.68-1.06; HFeW 0.17-0.23; HTiL 0.59-0.85; HTiW 0.14-0.19; HBaL 0.44-0.69; HBaW 0.05-0.07; CI 89.6-105.1; SI 57.1-73.1; HFeI 22.3-27.9; HTiI 21.0-25.4; HBaI 10.1-13.6.

Material examined. VENEZUELA: ARAGUA: Rancho Grande, 1100 m, 9.IV.1987, 1 gyne [MIZA]; same locality, 1200 m, 22.VI.1987, 1 gyne, C. Bordon [MIZA]; same locality, 1100 m, 28.X.1987, 1 gyne, C. Bordon & H. Romero [MIZA]. ECUADOR: PICHINCHA: Tinalandia, 16 km SE of Santo Domingo de los Colorados, VI.1975, 1 male, S. Peck & J. Peck [MCZC]; Sucumbios, 0.5° S, 76.5° W, 290 m, Sacha Lodge, 22.II-4.III.1994, 1 gyne, 1 male, P. Hibbs [LACM]. PERU: APURIMAC: no further locality, 14.VIII.1962, 1 worker, M. Dourojeanni [USNM]. BRAZIL: PARA: Serra Norte, Estação, Manganeis, 5-9.IX.1983, 1 gyne, F. F. Ramos [MPEG]. GOIAS: Jataí, XII.1972, 1 gyne, F. M. Oliveira [MZSP]. BAHIA: Ilhéus, Reserva Botânica, CEPEC, 23-24.IV.1987, 1 male [CPCC]. MATO GROSSO: Sinop, 55°37' W, 12°31' S, X.1974, 1 male, M. Alvarenga [MZSP]. RIO DE JANEIRO: Ilha Grande, 16.X.1944, 2 workers, H. L. Araujo [MZSP]; Guanabara, Floresta da Tijuca, I.1974, C. A. C. Seabra & M. Alvarenga [MZSP]; Nova Friburgo, Serra do Mar, Bacco farm, forest, 4769 ft., 1991, 2 gynes, K. P. Bland [BMNH]; Silva Jardim, VIII.1974, 1 gyne, F. M. Oliveira [MZSP]. SÃO PAULO: São Paulo, Butantan, Horto Osvaldo Cruz, 17.I.1971, 1 male, L. Travassos Filho [MZSP]. PARANA: Rio Negro, 1 worker (holotype), Reichensperger [NHMB]; same locality and collector, 1 gyne, [NHMB]; same locality, II.1929, 1 male [NHMB].

Discussion. *Brevitarsus* is very similar to *darlingtoni*. Both species can be separated as stated in the diagnosis and, in addition, also by the hind coxae ventrally

markedly striate in *brevitarsus* instead of superficially striate in *darlingtoni*. WHEELER (1937) gave the following characters to separate *brevitarsus* from *darlingtoni*: mandibular shape and dentition, body colour, and size of the eyes. Material available for the present study proves that the body colour and the size of eyes are too variable to be useful to separate *brevitarsus* from *darlingtoni*. The gynes of *brevitarsus* vary remarkably in size (see measurements). The gynes from Corcovado (MZSP) and Jataí (MZSP) are small (TL: 5.88-5.96). Those from Aragua (MIZA), Rio Negro (NHMB), Silva Jardim (MZSP), and Sucumbios (LACM) are intermediate (TL: 7.44-7.64). Those from Nova Friburgo (BMNH) and from Floresta da Tijuca (MZSP) are the largest (TL: 8.20-9.40). There seems to be no relevant morphological differences between small and intermediate size gynes, only the mandibles are shorter and less convex in the small ones. The large gynes differ from the others by the ventral process of the petiole more round. The large size gynes also have the mandibles convex and massive as in the medium ones. From the material available for the present study I find insufficient evidence to regard them as belonging to two (or three) different species.

A Brazilian male from Butantan which I also consider *brevitarsus* has larger size 8.96 instead of 5.98-8.04 (see measurements), more impressed sculpture and darker legs. A comparison of its genitalia with those of two males of "normal" size (Fig. 23) and (Fig. 24) shows no significant differences.

Some workers and gynes of *brevitarsus* may also have the second gastric tergite striate.

Distribution. Venezuela, Ecuador, Peru and Brazil.

THE *LONGICEPS* CLADE

This clade includes four species: *godmani*, *antillanus*, *longiceps* and *meinerti*. They are characterized by the following synapomorphies: (1) first and second gastric tergites striate, (2) male frontal carinae strongly broad anteriorly and touching each other posteriorly, (3) male hypopygium with a simple, impair, median projection between the apodemes.

Cylindromyrmex godmani Forel

Figs 25-27

Cylindromyrmex godmani Forel, 1899: 4, pl. 1, fig. 2. Gyne. Original description. Type locality: Panama. Type material: 1 gyne labelled: "V. de Chiriqui, 2-3000 ft., Champion, Holotype, B. C. A. Hym. *Cylindromyrmex godmani*, Forel, Type", in BMNH, examined.

Diagnosis. The basalmost species of the *longiceps* clade differing from all the others by the distance between the frontal carinae, about 2/3 of the head width instead of about 1/3, and by the superficial gastric striae.

Gyne (Fig. 25). Head ca. 1/4 longer than broad. Sides of the head behind the eyes gently converging posteriorly and in front of the eyes slightly convex. Occiput low. Vertexal angles convex. Frontal carinae about 2/3 as broad as the maximum head width. Anterior part of the frontal carinae gently diverging posteriorly. Dorsum of the frontal carinae with an impressed median sulcus anteriorly. Frontal carinae in full face view with a deep incision antero-medially and as long as the anterior border of the

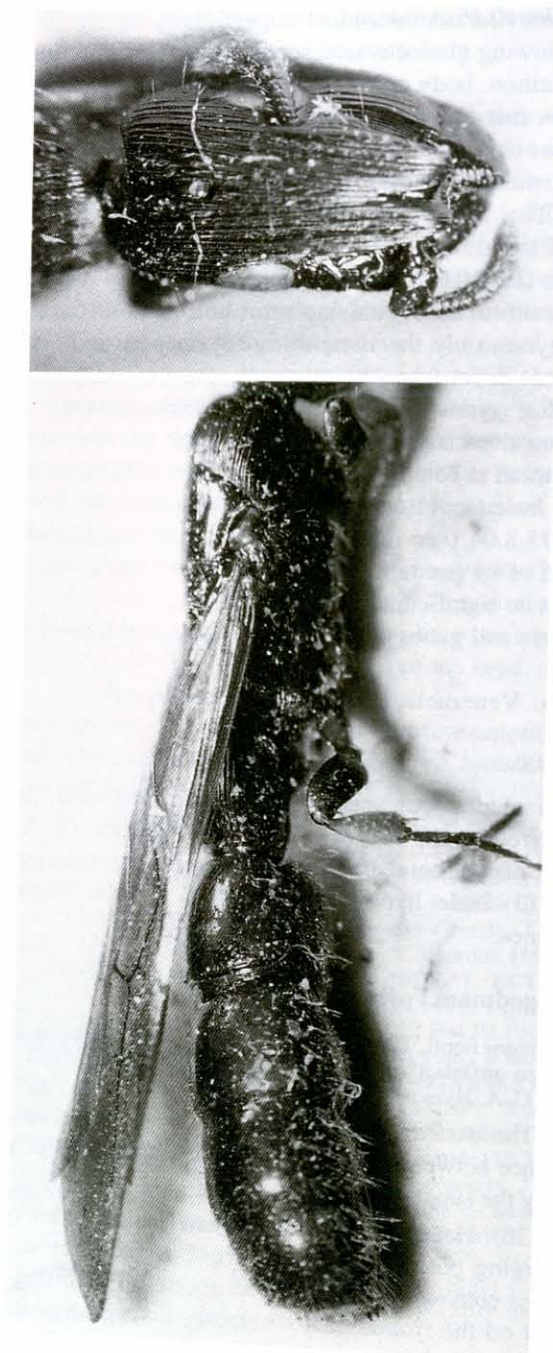


FIG. 25
C. godmani Forel. Gyne from Volcan Chiriqui, Panama. Body in profile (left), head in full dorsal view (right).

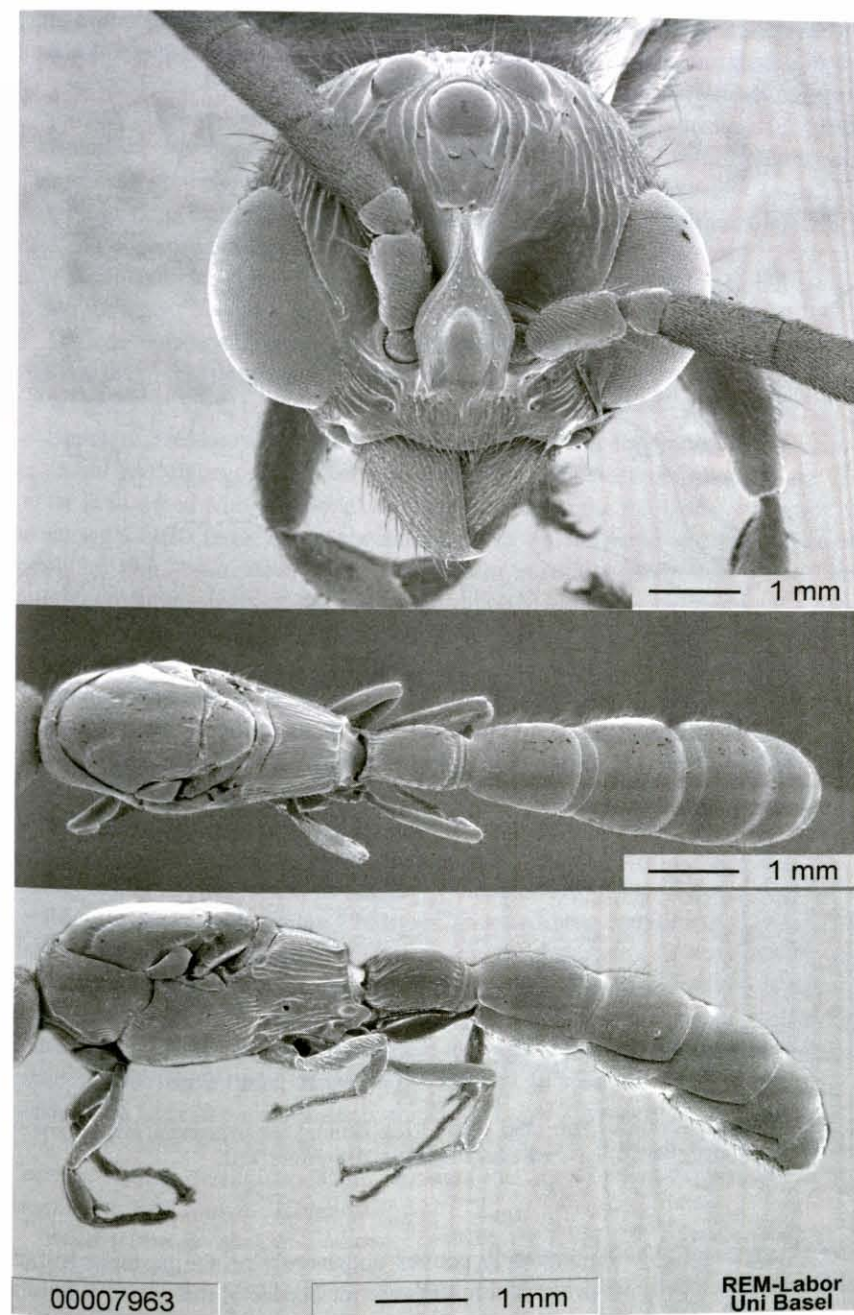


FIG. 26. *C. godmani* Forel. Male from Turrialba, Costa Rica. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

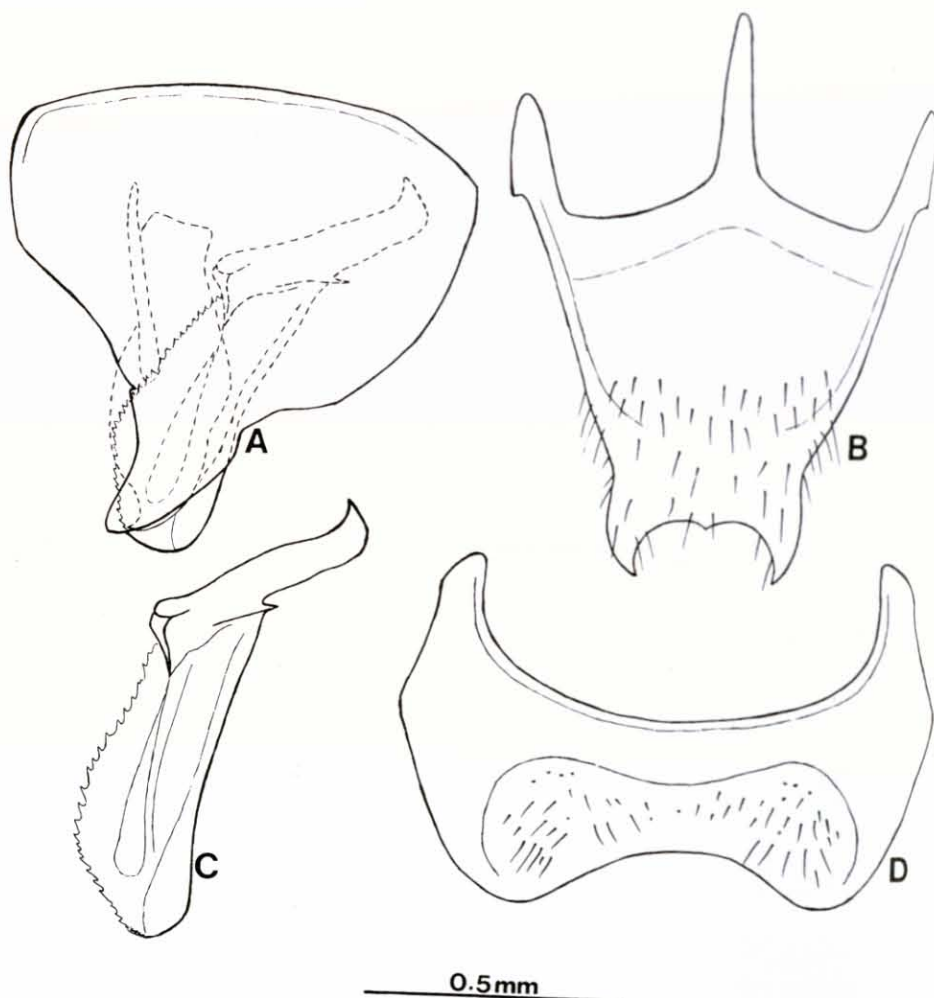


FIG. 27

C. godmani Forel. Male from Turrialba, Costa Rica. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

clypeus. Compound eyes large, gently convex and largely on the posterior half of the head. Ocelli developed. Scapes reaching the anterior border of the eyes. Proximal third of the scapes ca. 1/2 narrower than the distal parts. Mandibles massive and strongly convex dorsally. Masticatory margin of the mandibles with 4-5 irregular denticles followed by an apical tooth.

Mesosoma dorsally flat and 1/4 longer than the head (mandibles included). Pronotum dorsally with the sides superficially marginate. Propodeum concave. Mesopleurae gently convex. Propodeum with the sides gently converging posteriorly. Basal and declivous faces of the propodeum subequal in size and delimited by a superficial margin.

Petiole ca. 1/3 longer than broad, anteriorly truncate and dorsally gently convex. Ventral process of the petiole subround. Postpetiole subquadrate and broader posteriorly. Postpetiole in dorsal view antero-laterally angulate. Pygidium in side view truncate and postero-laterally concave. Pygidium in full face view the sides with a series of small denticles converging to a pair of large, pointed teeth separated by a deep notch over the sting.

Legs. Femora not inflated. Tibiae strongly inflate. Hind basitarsi ca. 1/3 shorter than the maximum length of the hind tibiae.

Wings as in Fig. 4.

Sculpture. Head covered by thick, longitudinal striae, thicker on the anterior half of the ventral part, thinner on the scrobes and on the postero-lateral half of the ventral part of the head. Head with additional thin striae between the thick ones. Dorsum of the pronotum with ca. 20 thick striae similar to those on the head dorsum, some striae separated by thin, bifurcated ones. Mesonotum medially with thin striae, fainter posteriorly; remaining parts of the mesonotum and scutellum simply smooth. Dorsum of the propodeum covered with about 24 striae thinner than those on the pronotum. Pleurae covered by thin, longitudinal striae, more impressed on the metapleurae. Petiolar dorsum with ca. 20 striae similar to those on the propodeum. Declivous face of the propodeum, anterior face of the petiole minutely reticulate-punctate. Postpetiole smooth, irregularly, minutely and superficially punctate and with longitudinal striae, slightly sparsed, very thin and more impressed posteriorly. Center of the first gastric tergite with similar sculpture on the postpetiole, the striae thinner, sparser and fainter. Second gastric tergite with similar sculpture on the first tergite, the striae fainter. Remaining gastric tergites, sternites and legs punctate, denser on the two last sternites.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, sparse on the head, on the mandibles, on the anterior border of the clypeus, on the mesosoma, on the pedicel and on the gaster, dense on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body, dense on the sternites; (3) shorter than the type (2), subdecumbent to decumbent, very sparse on the whole body, dense on the tergites. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour black and shining. Anterior half of the head, antennae, mandibles, femora and pygidium ferruginous, tarsi lighter. Proximal half of the last four funicular joints orange to light brown. Tibiae yellow.

Measurements (in mm) and indices: TL 14.38; HL 2.18; HW 1.54; EL 0.64; SL 0.82; SW 0.31; WL 4.04; PeL 1.16; PeW 1.00; HFeL 1.16; HFeW 0.49; HTiL 1.00; HTiW 0.39; HBaL 0.71; HBaW 0.14; CI 70.6; SI 37.8; HFeI 42.2; HTiI 39.0; HBaI 19.7.

Male (tentative attribution) (Fig. 26). Head slightly longer than broad. Vertex margin convex. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior part of the head. Frontal carinae with raised borders and partially covering the

antennal socket. Borders of the frontal carinae subparallel anteriorly, slightly convex medially, and strongly converging, almost touching each other posteriorly. Frons of the frontal carinae concave anteriorly, raised medially and declivous posteriorly. Anterior border of the clypeus gently convex medially. Mandibles long; their masticatory margin edentated and with a pointed apical tooth. Scapes half longer than broad. Funicular joints thick.

Mesosoma robust. Pronotum in dorsal view with subparallel sides. Mesonotum slightly convex. Pair of Mayrian carinae impressed but not connected each other posteriorly. Parapsidal furrows impressed. Basal face of the propodeum narrowing backwards and separated from the declivous one by a marked carina.

Petiole about 1/4 longer than broad, anteriorly truncate and dorsally convex. Ventral process of the petiole subtriangular. Postpetiole broadening backwards and narrower than the first gastric tergite. Postpetiole in dorsal view antero-laterally angulate. First gastric segment broader than the postpetiole. Second gastric segment broader than the first segment. Remaining gastric segments narrowing backwards.

Genitalia as in Fig. 27.

Legs. Femora not inflated. Mid and hind basitarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum minutely punctate and with longitudinal, slightly irregular striate, the punctures more impressed on the anterior half, the striae more impressed on the posterior half and behind the clypeus. Vertexal angles with additional small, deep, piligerous foveae, continuing to the sides of the ventral part of the head. Middle of the ventral part of the head with thick transversal rugae and piligerous foveae. Pronotum densely covered by deep, small piligerous foveae separated by thin, transversal striae. Mesonotum smooth and with sparse, minute piligerous punctures. Scutellum smooth. Basal face of the propodeum covered by thin, longitudinal striae. Petiolar dorsum smooth, with rare, superficial, small piligerous foveae and with short, longitudinal rugosities on the anterior part. Petiolar sides minutely reticulate and with sculpture similar to those on the anterior part of its dorsum, but sometimes with larger foveae and longer rugosities. Declivous face of the propodeum minutely and superficially punctate and with rugosities converging to the center. Pro- and mesopleurae smooth, with variably impressed punctuations and with traces of longitudinal rugosities, more impressed on the posterior border of the mesopleurae. Metapleurae striated as on the basal face of the propodeum. Postpetiole, first gastric segment and legs smooth and with superficial punctures, denser and deeper on the remaining gastric segments.

Pilosity. Body covered by pointed hairs of four types: (1) long, sparse and suberect, denser on the last three gastric segments; (2) shorter than the type (1) and variably distributed on the body, dense on the mesopleurae; (3) mixed and shorter than the type (2), dense on the vertexal angles, on the posterior half of the ventral part of the head, on the pronotal dorsum, on the coxae, on the ventral face of the femora and tibiae, and on the gaster; (4) short and thick on the funicular joints.

Colour. Black and shining. Anterior third of the head dorsum, mandibles, antennae, tibiae and tarsi ferruginous to dark brown, femora darker. Outer face of the mid and of the hind tibiae, and tarsomeres yellowish to light brown.

Measurements (in mm) and indices: TL 10.1-10.7; HL 1.28-1.36; HW 1.20-1.26; EL 0.66-0.76; SL 0.30-0.33; SW 0.16-0.17; WL 3.04-3.44; PeL 0.80-0.96; PeW 0.60-0.72; HFeL 1.04-1.17; HFeW 0.23-0.27; HTiL 0.90-1.02; HTiW 0.20-0.23; HBaL 0.74-0.79; HBaW 0.07; CI 92.6-93.7; SI 51.5-53.3; HFeI 22.1-23.1; HTiI 22.2-22.5; HBaI 8.8-9.4.

Material examined. COSTA RICA: Turrialba, 15-18.VII.1965, 1 male, P. J. Spangler [USNM]. PANAMA: Volcan de Chiriqui, 1 gyne (holotype), Champion [BMNH]. ECUADOR: PICHINCHA: Tinalandia, 16 km SE of S. Domingo de los Colorados, VI.1975, 1 male, S. Peck & J. Peck [MCZC].

Discussion. *C. godmani* is the largest species of the genus. It is a rare species previously known only on the holotype and on a gyne from Ecuador (WHEELER 1924) not available for the present study. A striking character shared by *godmani*, *antillanus* and *meinerti* is a notch on the apex of the pygidium, more impressed in *godmani* and *antillanus*. The function of the notch is probably to facilitate the movement of the sting.

The isolate males described here as *godmani* are tentatively referred to this species for the following reasons: 1- frontal carinae and genitalia similar to those of *meinerti*; 2- tibiae partially yellowish brown (yellowish in the gyne); 3- they originate from the geographic range of *godmani*; 4- the males of the other species occurring in Central and northernmost countries of South America, i. e. *striatus*, *whymperi*, *boliviae*, *brevitarsus* are already known, except *escobari*. I exclude the possibility that the two males referred here to *godmani* could be attributed to the Colombian *escobari* because this species belongs to another clade the male of which (*brevitarsus*) differs significantly from the those of the *longiceps* clade by the frontal carinae and genitalia. If the attribution of these two males to *godmani* is not correct, they should represent an undescribed species.

Distribution. Costa Rica, Panama and Ecuador.

Cylindromyrmex antillanus n. sp.

Figs. 1 & 28

Holotype: Winged gyne in the amber sample Do-4130-1 from the SMNS.

Derivatio nominis. The name *antillanus* is a neologism indicating the provenance of this amber sample from the Antilles.

Diagnosis. A species resulting as outgroup of *longiceps* and *meinerti*, and differing from both for the CI > 77 (instead of ≤ 70) and HFeI < 46 (instead of > 50).

Gyne (Figs. 1 & 28). Head slightly less than 1/3 longer than broad. Occiput low. Vertexal angles convex. Frontal carinae about 1/3 broad as the maximum head width. Sides of the frontal carinae parallel and reaching at least the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed median sulcus anteriorly. Frontal carinae as long as the anterior border of the clypeus. Antero-median border of the clypeus with a minute pair of denticles. Compound eyes large, flat and on the middle of the head. Impar ocellus developed. Scapes reaching the anterior border of the eyes. Proximal third of the scapes 1/2 narrower than the distal parts. Mandibles gently convex dorsally. Masticatory margin of the mandibles each with a set of 4 irregular denticles followed by an apical tooth.

Mesosoma slightly convex dorsally. Pronotum with parallel sides. Parapsidal furrows superficially impressed. Propodeum with the sides gently convex and converging posteriorly. Basal face of the propodeum separated from the declivous one by a thin margin.

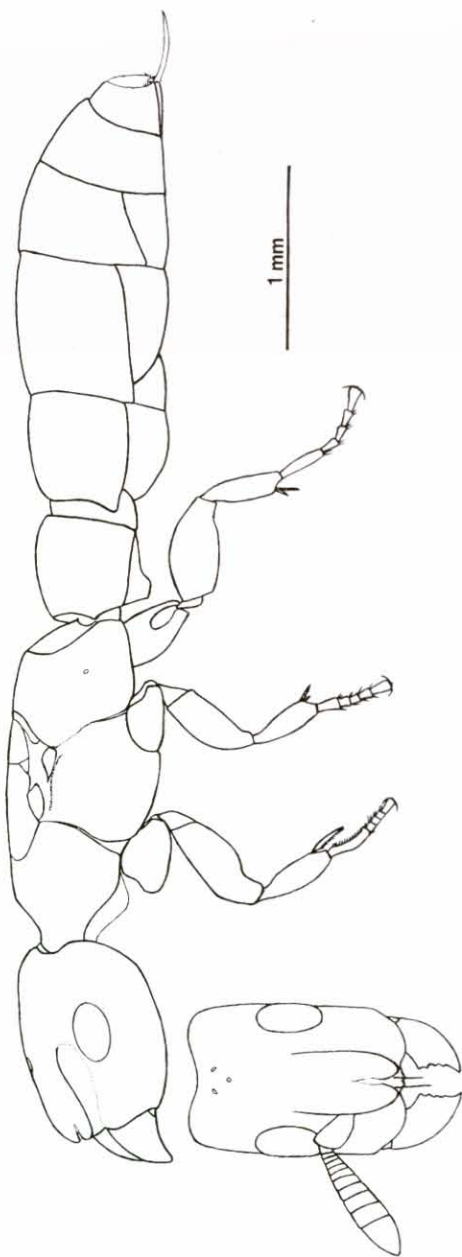


FIG. 28
C. antillanus de Andrade. Gyne from Dominican amber. Body in profile (top), head in full dorsal view (bottom).

Petiole subquadrate, slightly broader than long, anteriorly truncate and dorsally gently convex. Petiolar sides diverging backwards. Ventral process of the petiole large and subround. Postpetiolar sides gently diverging posteriorly. Postpetiolar sternite antero-medially with a marked, triangular "lip" pointing backwards. Pygidium in side view truncate. Posterior half of the pygidium in full dorsal view with the sides bearing a row of small denticles converging to a deep notch.

Legs. Femora and tibiae slightly inflated. Hind basitarsi short, slightly less than 1/3 shorter than the maximum length of the tibiae. Outer apical edge of the hind and of the mid basitarsi respectively with 3,5 spine-like setae.

Wings as in Fig. 4.

Sculpture. Head covered by thin, longitudinal striae, slightly thicker on the posterior third of the head dorsum. Mesosoma longitudinally striated. Dorsum of the pronotum with about 30 longitudinal striae similar to those on the posterior part of the head dorsum; some pronotal striae bifurcated. Mesonotum and propodeum covered by longitudinal striae thinner than those on the pronotum. Scutellum, pleurae, declivous face of the propodeum, petiolar sides and ventral face of mid and hind femora with very thin, longitudinal striae, thinner on the scutellum, propleurae, petiolar sides and mid femora. Petiolar dorsum with about 28 striae similar to those on the propodeum. Anterior face of the petiole smooth. Dorsum of the postpetiole densely covered by striae as those on the petiole. First gastric tergite with thin, superficial, longitudinal striae on the center only. Second gastric sculptured as the first tergite but the striae extremely thin. Postpetiolar sternite, remaining gastric segments and legs smooth and with sparse punctures. Hind coxae covered by thin, longitudinal striae; mid coxae with similar sculpture but sparser and fainter.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, one on the external border of the scape, a pair between the frontal carinae and clypeus, rare on the mandibles, on the mesosoma, on the gaster and on the legs, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), suberect on the head dorsum and mesosoma, subdecumbent on the pedicel, decumbent on the ventral part of the head, on the gaster and on the legs. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour dark brown. Tibiae yellowish to light brown.

Measurements (in mm) and indices: TL 6.36; HL 1.08; HW 0.84; EL 0.35; SL 0.32; SW 0.15; WL 1.68; PeL 0.524; PeW 0.56; HFeL 0.53; HFeW 0.24; HTiL 0.44; HTiW 0.16; HBaL 0.25; HBaW 0.07; CI 77.8; SI 46.9; HFeI 45.3; HTiI 36.4; HBaI 28.0.

Material examined. **Dominican amber:** 1 gyne (reference number Do-4130) [SMNS].

Discussion. *Antillanus*, *longiceps* and *meinerti* share the narrow frontal carinae, the eyes on the middle of the sides of the head, the mesosoma 2/3 longer than high, and the petiole with a short anterior face. The workers of *longiceps* and *meinerti* possess reduced and flat eyes. It is likely that the unknown worker of *antillanus* also has similar eyes.

Distribution. Dominican amber.

***Cylindromyrmex longiceps* André**

Figs 29-30

Cylindromyrmex longiceps André, 1892: 47. Worker. Original description. Type locality: Brazil. Type material: 1 worker labelled: "Brésil. Type, Museum Paris, Collection Ernest André, 1914, *longiceps* André", in MNHN, examined.

Cylindromyrmex longiceps André, KEMPF 1968: 372. Gyne.

Diagnosis. *Longiceps* is the sister species of *meinerti* and differs from it in the worker and gyne by the narrower frontal carinae not reaching the anterior border of the clypeus.

Worker (Fig. 29). Head about 1/3 longer than broad and with parallel sides. Occiput very low. Vertex angles round and protruding backwards. Frontal carinae slightly less than 1/3 broad as the maximum head width. Anterior fourth of the frontal carinae diverging backwards and not reaching the anterior border of the eyes posteriorly. Dorsum of the frontal carinae with a median sulcus anteriorly. Frontal carinae shorter than the anterior border of the clypeus. Antero-median border of the clypeus superficially notched and bearing a minute denticle. Compound eyes very small (Fig. 30), flat and behind the mid line of the head. Ocelli reduced to a superficial pit, some specimens with the impair ocellus more developed than the pair ones. Scapes stout and short. Anterior fourth of the scapes half narrower than the distal parts. Mandibles short and flat dorsally. Masticatory margin of the mandibles edentated and with a pointed apical tooth.

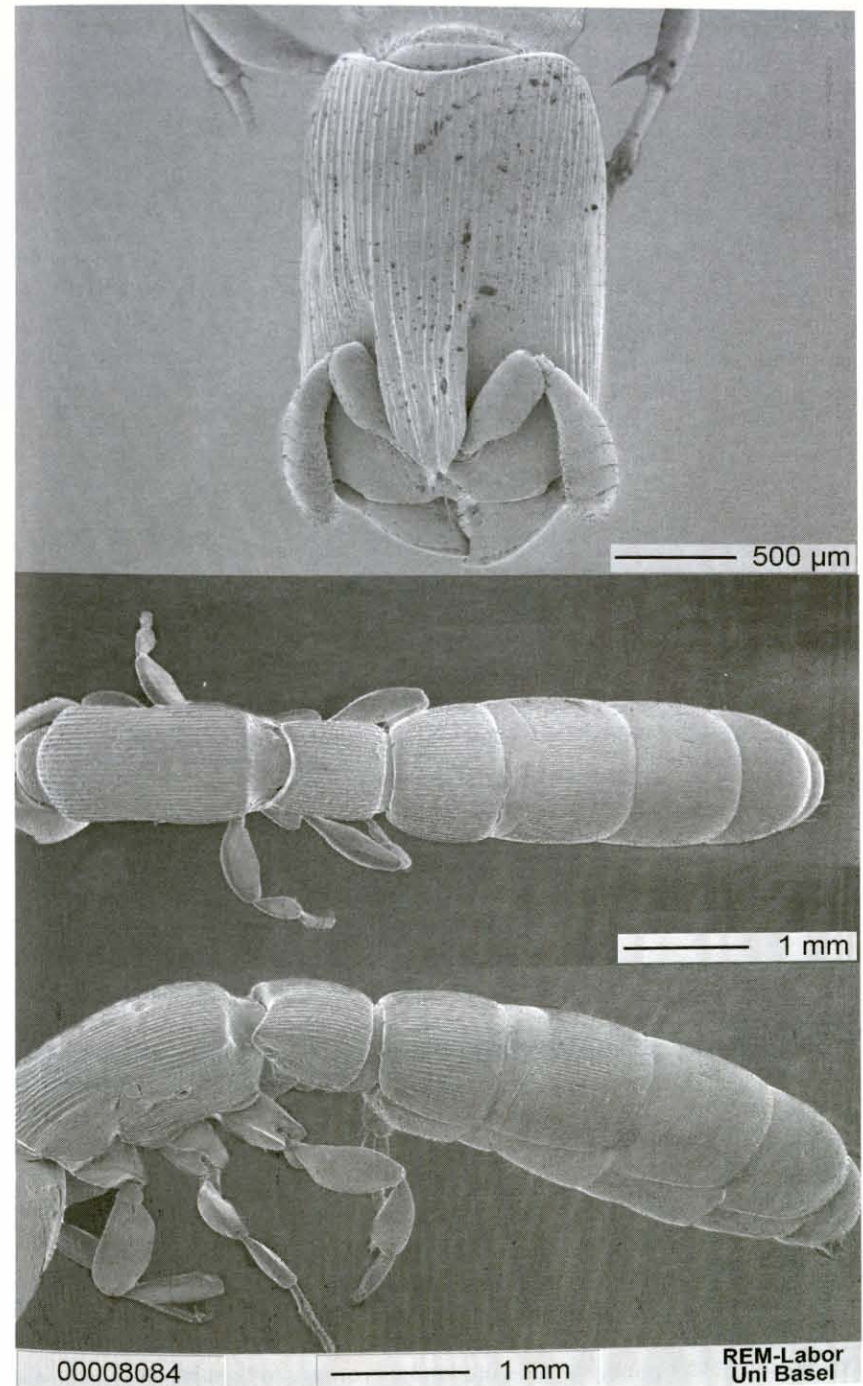
Mesosoma weakly convex dorsally and about 1/5 shorter than the head (mandibles included). Sides of the mesosoma slightly narrower in the mesonotum. Propodeum with the sides gently convex and converging posteriorly. Declivous face of the propodeum ca. 1/3 of the length of the basal face. Basal face separated from the declivous one by a very superficial margin.

Petiole subquadrate. Anterior face of the petiole very short and deeply concave; dorsal face of the petiole weakly convex. Ventral process of the petiole small and subround. Postpetiole broader than long. Postpetiolar sides gently diverging posteriorly. Postpetiolar sternite antero-medially with a triangular "lip" pointing backwards. Pygidium truncate; its border with a semicircle of small teeth of similar size.

Legs. Femora and tibiae inflated. Hind basitarsi slightly less than 1/2 shorter than the maximum length of the tibiae. Outer apical edge of the hind and of the mid basitarsi respectively with 5,6 spine-like setae.

Sculpture. Head dorsum covered by thin longitudinal striae, more superficial and thinner close to the antennal scrobes. Ventral part of the head with small, superficial, oval piligerous foveae and with longitudinal striae, fainter on the posterior half, absent on the middle and on the posterior angles. Mesosoma with longitudinal striae thicker on the pronotum. Pronotum with 22-25 striae thicker than those on the posterior half of the head dorsum. Pleurae and petiolar sides with longitudinal striae similar to those on the antennal scrobes. Petiolar dorsum with 24-26 striae similar to those on the propodeum. Declivous face of the propodeum and anterior face of the petiole minutely

FIG. 29. *C. longiceps* André. Worker from Rio de Janeiro, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).



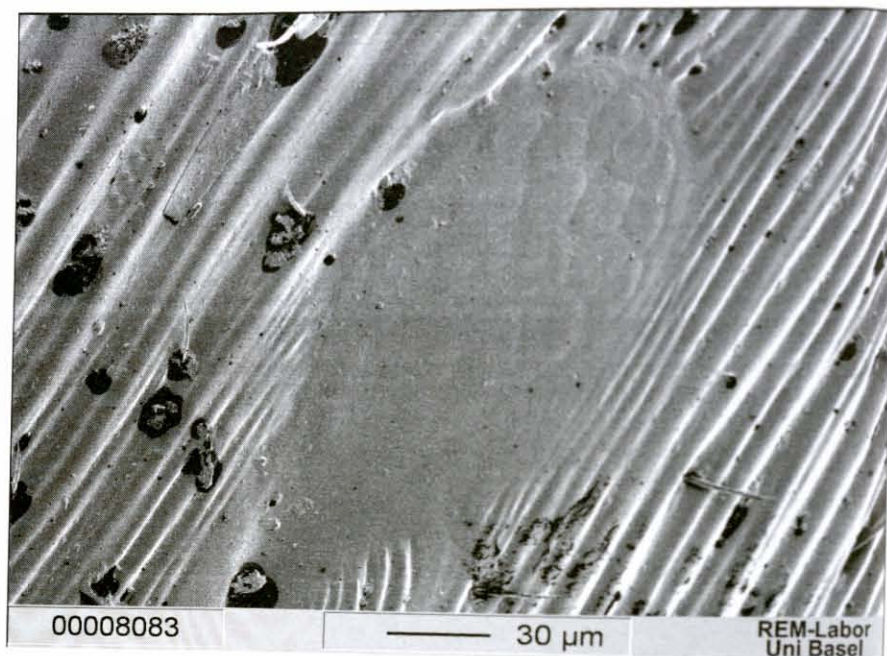


FIG. 30

C. longiceps André. Worker from Rio de Janeiro, Brazil. Compound eye.

punctate. Dorsum of the postpetiole and of the first gastric tergite covered by striae thinner than those on the petiole. Second gastric tergite with thin and superficial striae on the center only. Remaining gastric tergites and sternites sparsely and minutely reticulate and densely punctate. Legs with very superficial, minute punctures. Hind coxae covered by thin, longitudinal striae; mid coxae with similar sculpture but sparser and fainter.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, one pair on the clypeus, one close to each pronotal angle, rare on the gaster, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), sparse and suberect on the head dorsum and on the mesosoma, sparse and subdecumbent on the pedicel, and on the first gastric tergite, decumbent but sparse on the ventral part of the head and on the legs, dense on the postpetiolar and on the remaining gastric sternites. In addition the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour black. Mandibles and anterior third of the head dark ferruginous. Scapes, first funicular joints and tarsi brown. Legs orange to light brown.

Measurements (in mm) and indices: TL 7.44-8.50; HL 1.68-1.92; HW 1.08-1.28; EL 0.15-0.22; SL 0.47-0.52; SW 0.20-0.22; WL 1.68-1.96; PeL 0.57-0.70; PeW 0.70-0.83; HFeL 0.69-0.78; HFeW 0.33-0.38; HTiL 0.65-0.76; HTiW 0.25-0.29; HBaL 0.36-0.38; HBaW 0.10-0.11; CI 64.3-66.7; SI 42.3-42.5; HFeI 47.8-48.7; HTiI 38.1-38.5; HBaI 27.8-28.9.

Gyne. Very similar to the worker but differing from it in the following details: compound eyes very large, flat and on the middle of the dorsolateral part of the head; ocelli well defined and marked; mesosoma broad medially; parapsidal furrows superficially impressed; petiole slightly longer than broad; pronotum with about 28 striae; mesonotum and scutellum with very superficial, short, thin striae; postpetiolar striae as thick as on the pronotum.

Wings as in Fig. 4.

Measurements (in mm) and indices: TL 9.94; HL 1.84; HW 1.18; EL 0.54; SL 0.49; SW 0.21; WL 2.76; PeL 0.74; PeW 0.76; HFeL 0.73; HFeW 0.38; HTiL 0.75; HTiW 0.27; HBaL 0.44; HBaW 0.11; CI 64.1; SI 42.8; HFeI 52.0; HTiI 36.0; HBaI 25.0.

Material examined. BRAZIL: no further locality, 1 worker (holotype), MNHN. SÃO PAULO: São Paulo, 5.I.1974, 1 gyne, R. L. Araujo [MZSP]. RIO DE JANEIRO: Rio de Janeiro, 25.VIII.1962, 28 workers, R. L. Araujo [MZSP, NHMB].

Discussion. *Longiceps* is the species of the genus with the highest number of autapomorphies. They are the following: hypostomal bridge Y-shaped, broad and semi-transparent; head very elongate; frontal carinae very narrow; mandibles edentate; anterior border of the clypeus medially notched and denticulate; ventral process of the petiole very short; pygidium with a semicircle of small teeth.

The largest known series of *longiceps* was collected by Araujo (a Brazilian termitologist). It is very likely that all these specimens were collected in termite nests.

Distribution. Brazil.

Cylindromyrmex meinerti Forel

Figs 31-34

Cylindromyrmex meinerti Forel, 1905: 155. Worker. Original description. Type locality: Venezuela. Type material: 4 workers, two of which labelled: "*C. meinerti*, type, Forel, Las Trincheras, Venezuela, Meinert, in altem Baume", in MHNG, MCZC and MCSN; examined.

Cylindromyrmex schmidt Menozzi, 1931: 192, fig. 4. Partim. Gyne. Nec worker (= *whymperi*). Original description. Type locality: Costa Rica. Type material: 2 gynes labelled: "La Caja: 8 kil. w. San José, C. R., Heinr. Schmidt", in IEGG, examined. Synonymia nova.

Cylindromyrmex parallelus Santschi, 1932: 410, fig. 19. Gyne. Original description. Type locality: Panama. Type material: 1 gyne labelled: "Panama, France Field, Bierig, VI-30, *Cylindromyrmex parallelus* Sant. type", in NHMB, examined. Synonymia nova.

Cylindromyrmex parallelus Santschi, WHEELER 1937: 443. Misidentification.

Cylindromyrmex parallelus Santschi, BROWN 1975: 38. Figs. 117 & 130, male genitalia. Misidentification.

Diagnosis. *Meinerti* is the sister species of *longiceps* and differs from it in the worker and gyne by the frontal carinae as long as the anterior border of the clypeus instead of shorter.

Worker (Fig. 31). Head ca. 1/4 longer than broad and with parallel sides. Occiput very low. Vertex angles round. Frontal carinae at most slightly broader than 1/3 as the maximum head width. Anterior third of the frontal carinae diverging, remaining parts parallel and reaching the eyes posteriorly. Dorsum of the frontal carinae

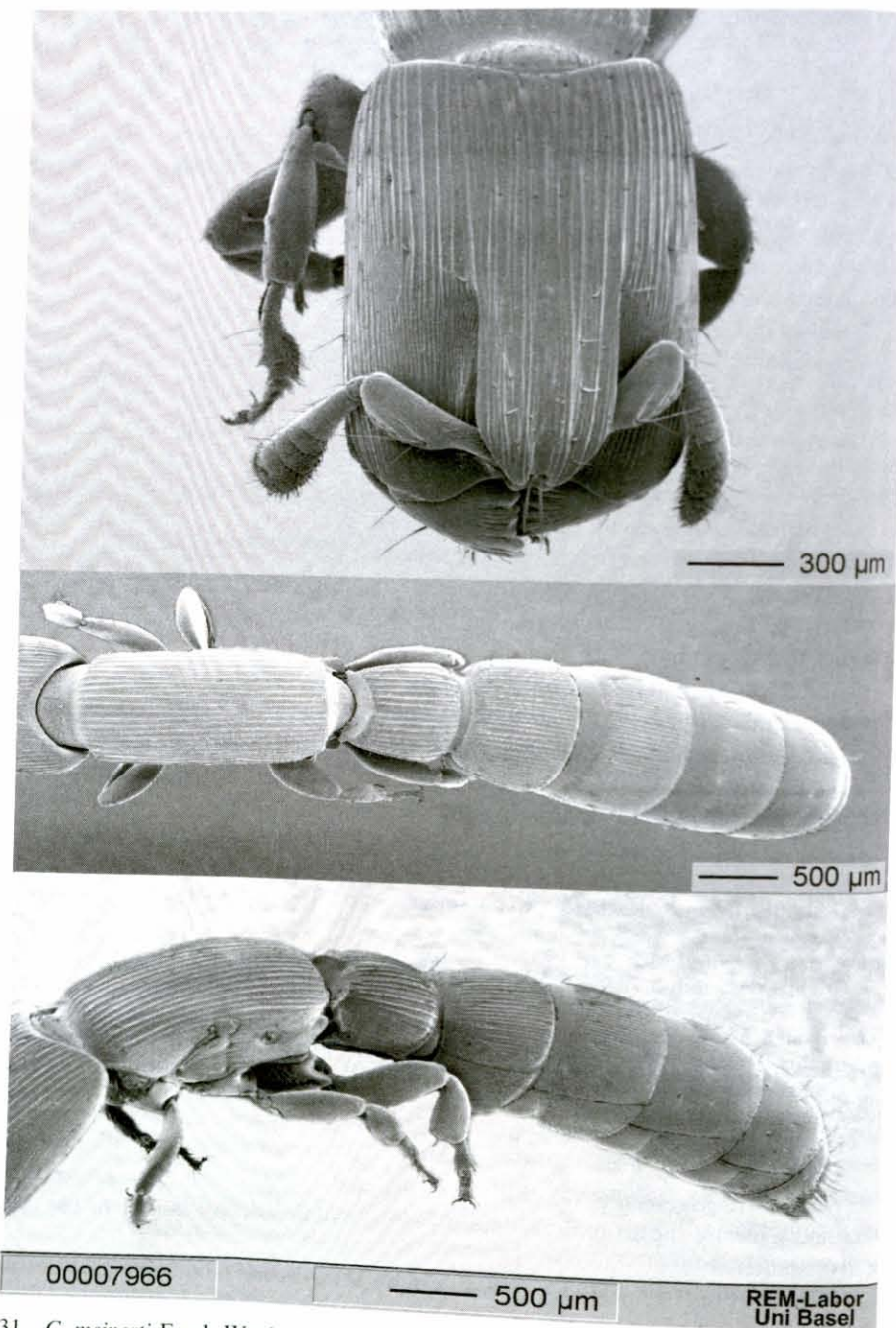


FIG. 31. *C. meinerti* Forel. Worker from Panama. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

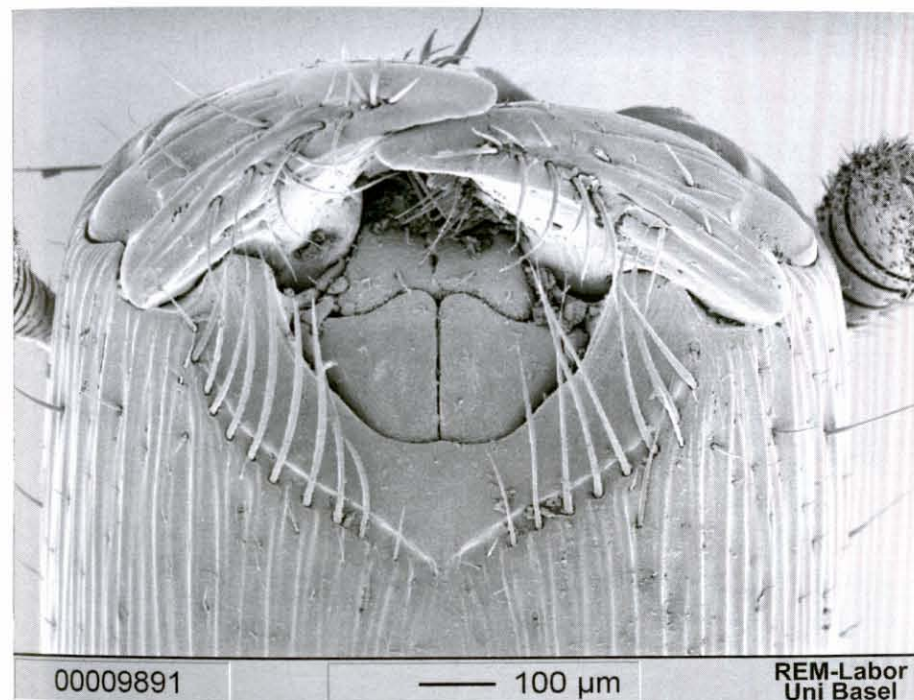


FIG. 32

C. meinerti Forel. Worker from Panama. Anterior portion of the cephalic capsule and mandibles in ventral view to show the broad hypostomal bridge (character 6 state 1). Notice the convexity of the anterior margin of the hypostomal bridge, a character not verified in all species of the genus.

with a median sulcus anteriorly. Frontal carinae as long as the clypeus. Anterior border of the clypeus laterally convex, medially concave and bearing a pair of small denticles. Compound eyes very small, flat and on the mid of the dorsolateral part of the head. Ocelli reduced to superficial pits, more developed in large specimens. Scapes not reaching the anterior border of the eyes. Proximal fourth of the scapes $1/2$ narrower than the distal parts. Mandibles flat. Masticatory margin of the mandibles with 4 irregular denticles followed by an apical tooth. Hypostomal bridge broad, with the antero-lateral margin convex (Fig. 32).

Mesosoma gently convex dorsally and slightly shorter than the head (mandibles included). Mesosoma $2/3$ longer than high. Sides of the mesosoma parallel. Propodeal sides gently convex. Declivous face of the propodeum ca. $1/2$ of the length of the basal face. Basal face of the propodeum separated from the declivous one by a faint margin.

Petiole subquadrate. Petiolar sides diverging backwards. Anterior face of the petiole very short and concave; dorsal face of the petiole slightly convex. Ventral process of the petiole very large and subround. Postpetiole broader than long. Postpetiolar sternite antero-medially with traces of a triangular "lip" pointing backwards. Pygidium

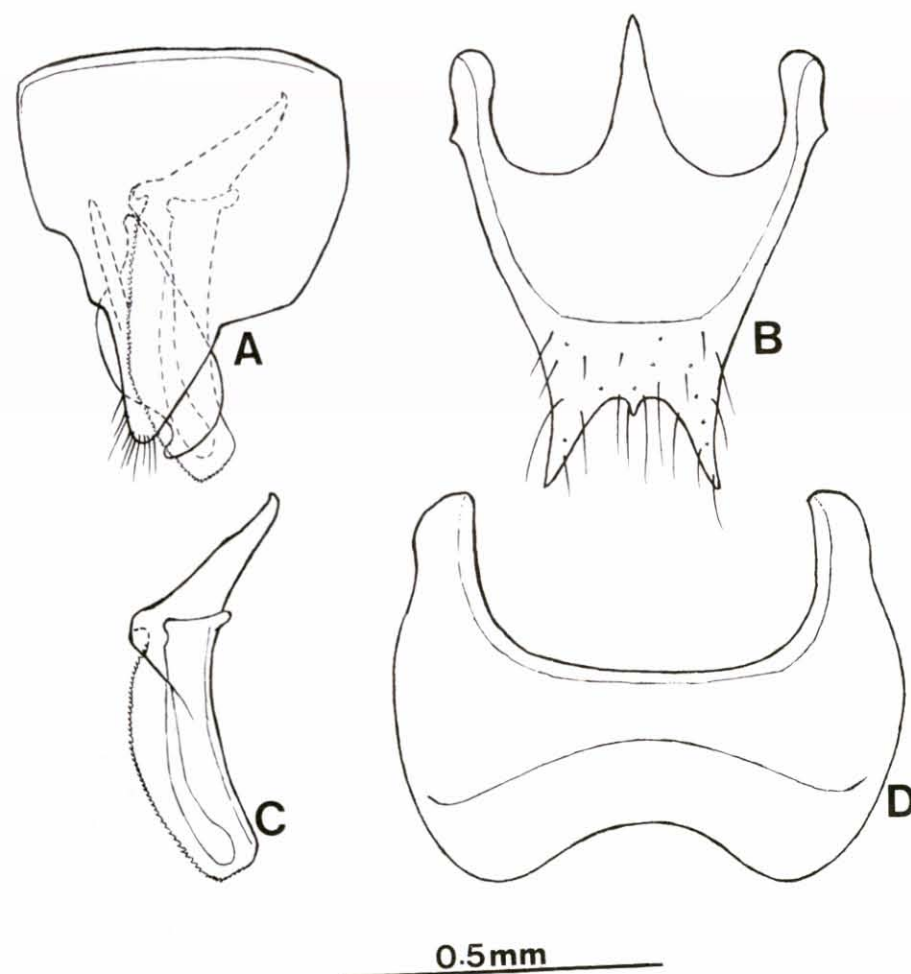
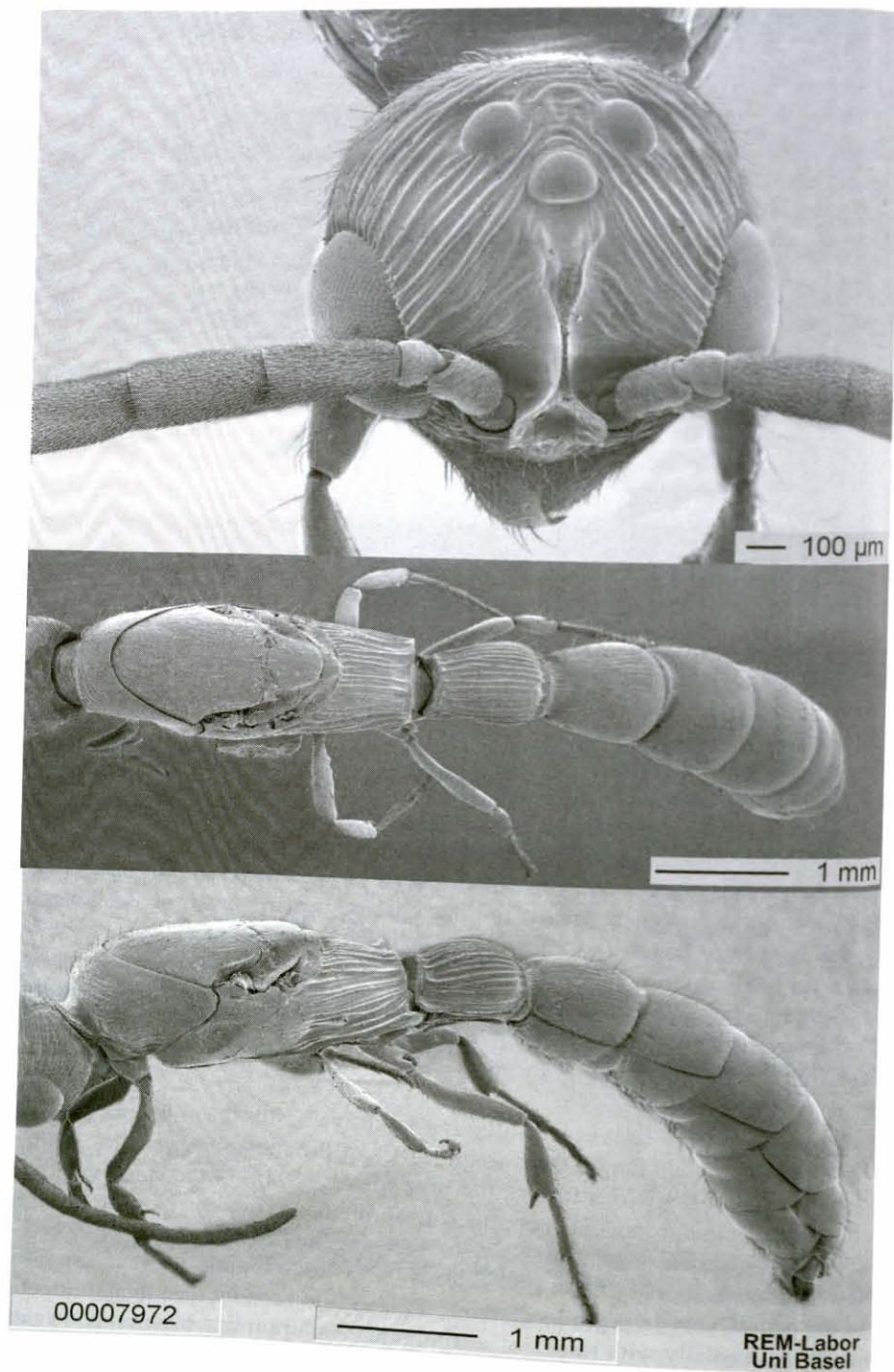


FIG. 34

C. meinerti Forel. Male from Barro Colorado Is., Panama. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

truncate; its sides with a row of small teeth converging to a pair of larger teeth separated by a variably impressed notch over the sting.

Legs. Femora and tibiae inflated. Hind basitarsi ca. 1/2 shorter than the maximum length of the tibiae. Outer apical edge of the hind and of the mid basitarsi with 3 spine-like setae.

FIG. 33. *C. meinerti* Forel. Male from Barro Colorado Is., Panama. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Sculpture. Head dorsum covered by thin longitudinal striae, fainter and thinner on the antennal scrobes. Anterior half of the ventral part of the head with longitudinal striae as thick as those on the posterior part of the head dorsum but sparser; posterior half of the ventral part of the head with striae similar to those on the antennal scrobes. Mesosoma with longitudinal striae similar to those on the posterior part of the head dorsum. Pronotum with 20-21 striae. Pleurae and petiolar sides with longitudinal striae similar to those on the antennal scrobes. Petiolar dorsum with 17-19 striae similar to those on the mesosoma. Declivous face of the propodeum and anterior face of the petiole minutely punctate. Dorsum of the postpetiole covered by striae thinner than those on the petiole. First gastric tergite covered by striae thinner than those on the postpetiole. Second gastric tergite with thin and very superficial striae on the center only. Remaining gastric tergites and sternites sparsely and minutely reticulate and densely punctate. Legs with very superficial, minute punctures. Hind coxae covered by longitudinal striae; mid coxae with similar sculpture but fainter and sparser.

Pilosity. Body with pointed hairs of at least of three lengths and distributed as follows: (1) long, erect to suberect, one pair between the frontal carinae and clypeus, one close to on each pronotal angle, rare on the on the gaster, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), sparse and suberect on the head dorsum and on the mesosoma, sparse and subdecumbent on the pedicel, and on the first gastric tergite, decumbent but sparse on the ventral part of the head and on the legs, dense on the postpetiolar and on the remaining gastric sternites. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour black. Mandibles and anterior third of the head dark ferrugineous. Antennae, coxae, femora, tarsi and tarsomeres light brown. Tibiae yellowish.

Measurements (in mm) and indices: TL 5.32-6.58; HL 1.20-1.28; HW 0.88-0.94; EL 0.11-0.15; SL 0.40-0.41; SW 0.17; WL 1.32-1.50; PeL 0.44-0.51; PeW 0.52-0.62; HFeL 0.53-0.60; HFeW 0.26-0.30; HTiL 0.44-0.49; HTiW 0.19-0.21; HBaL 0.22-0.25; HBaW 0.07-0.08; CI 72.0-73.4; SI 41.5-42.5; HFeI 49.0-50.1; HTiI 41.7-43.2; HBaI 30.4-32.0.

Gyne. Very similar to the worker but differing from it in the following details: compound eyes very large; ocelli well defined; impar ocellus higher than the posterior border of the compound eyes; mesosoma broad medially; parapsidal furrows superficially impressed; petiole as broad, as long; pronotum with about 22-27 striae as thick as in the worker; mesonotum with thinner striae than on the pronotum; some specimens with striae only on the middle of the mesonotum; scutellum smooth or with striae on the anterior half only; propodeal striae thinner than on the pronotum.

Wings as in Fig. 4.

Measurements (in mm) and indices: TL 7.56-8.60; HL 1.24-1.44; HW 0.86-1.00; EL 0.40-0.41; SL 0.41-0.42; SW 0.18; WL 1.96-2.24; PeL 0.71-0.72; PeW 0.70-0.72; HFeL 0.56; HFeW 0.28-0.32; HTiL 0.48-0.56; HTiW 0.20-0.23; HBaL 0.26-0.31; HBaW 0.09-0.10; CI 69.3-70.0; SI 42.8-43.9; HFeI 50.0-50.8; HTiI 41.1-41.8; HBaI 32.2-34.6.

Male (Fig. 33) (previously undescribed). Head longer than broad. Vertexal margin convex. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior part of the head. Frontal carinae with raised borders and partially covering the antennal socket. Sides of the frontal carinae subparallel anteriorly, slightly convex

medially, and strongly converging and almost touching each other posteriorly. Frons concave anteriorly, raised medially and declivous posteriorly. Anterior border of the clypeus gently convex medially. Mandibles long; their masticatory margin edentate and with a pointed apical tooth. Scapes slightly less 1/2 longer than broad. Funicular joints stouts.

Mesosoma robust. Pronotum in dorsal view with subparallel sides. Mesonotum slightly convex. Scutellum at the same level as the mesonotum. Pair Mayrian and parapsidal furrows superficially marked. Impar Mayrian furrow absent. Basal face of the propodeum separated from the declivous one by a developed and well marked carina.

Petiole subcylindric; anteriorly truncate and dorsally convex. Ventral process of the petiole small and subtriangular. Postpetiole broadening backwards and smaller than the first gastric tergite.

Genitalia as in Fig. 34.

Legs. Femora not inflated. Mid and hind basitarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum covered striae converging from the internal border of the eyes to the ocelli; striae behind the pair ocelli thinner, transversal, irregular and mixed with small piligerous foveae. Ventral part of the head variably punctate and with small, piligerous foveae; some specimens with diverging striae on the anterior part only. Pronotum punctate and with transversal, irregular striae, sometimes mixed with irregular piligerous foveae. Mesonotum and scutellum smooth and with minute punctures, denser on the mesonotum. Basal face of the propodeum, metapleurae and petiole covered by longitudinal striae. Declivous face of the propodeum smooth; some specimens with transversal striae on the middle of the posterior half only. Propleurae punctate and with traces of thin, longitudinal striae. Mesopleurae smooth, minutely punctate and with rugosities on the posterior border. Postpetiole, first gastric segment and legs smooth and with sparse, superficial punctures; some specimens with longitudinal, irregular rugosities on the postpetiole. Remaining gastric segments superficially reticulate-punctate; this sculpture more impressed posteriorly.

Pilosity. Body covered by pointed hairs of three types: (1) long, sparse, subdecumbent, denser on the gaster, rare on the head; (2) shorter than the type (1), sparse on the head and legs, dense on the mesosoma and gaster; (3) short and thick on the funiculus.

Colour. Head, mesosoma and petiole black. Anterior third of the head dorsum, mandibles, antennae and legs yellowish to light brown. Postpetiole, first and second gastric segments dark brown, remaining gastric segments lighter.

Measurements (in mm) and indices: TL 7.90-8.30; HL 1.08-1.16; HW 0.92-1.04; EL 0.56-0.59; SL 0.22; SW 0.13; WL 2.48-2.64; PeL 0.70-0.72; PeW 0.64-0.68; HFeL 0.77-0.84; HFeW 0.20-0.24; HTiL 0.68-0.82; HTiW 0.18-0.19; HBaL 0.52-0.61; HBaW 0.07-0.08; CI 85.2-89.6; SI 59.1; HFeI 26.0-28.6; HTiI 23.2-26.5; HBaI 13.1-13.5.

Material examined. **COSTA RICA:** no further locality, 1 gyne, F. Nevermann [MZSP]; no further locality, 1 gyne, 1920, P. Serre [MNHN]; La Caja, 8 km W of San José, 2 gynes (corresponding to the description and drawing of Menozzi, 1931), H. Schmidt [IEGG]; Santa Rosa, Natural Park, Guanacaste Province, May-August 1984, 300 m, 1 gyne, D. H. Janzen & I. Gauld [BMNH]; Hambrug Farm, Santa Clara Province, 23.IV.1926, 1 worker, 2 gynes, 2 males, F. Nevermann [USNM]; same locality, Reventazón River, 1 worker, F. Nevermann [USNM]; same locality, IV.1921, 4 gynes, 3 males, 1 pupa, F. Nevermann [USNM]. **PANAMA:** France Field, VI.1930, 1 gyne (holotype of *parallelus*), A. Bierig [NHMB]; Barro Colorado Is. Canal Zone, 9.VI.1935, 1 gyne, 3 gynes pupae, A. Emerson [MCZC]; same locality, 4.V.1935, 4 males, A. Emerson [MCZC, USNM]; same locality, 2 workers, in termite nest, L. Schneider [IAVH, MZSP]; same locality, 1 worker, in termite nest, [WEMC]; same locality, III.IV.1949, Zetek, 1 male [USNM]. **VENEZUELA:** ZULIA: El Tucuco 45 km SW of Machiques, 5-6.VI.1976, 1 male, A. S. Menke & D. Vincent [WEMC]; same locality, IV.1984, 1 male, E. Inciarte & E. Rubio [MIZA]. **DISTRITO FEDERAL:** Los Canales, 120 m, 23.III.1938, 1 male, G. Vivas-Berthier [WEMC]. **BOLIVAR:** Las Trincheras, in alterm Baume, 4 workers (syntypes of *meinerti*), Meinert [MHNG, MCZC, MCSN]. **BRAZIL:** AMAZONAS: Ilha de Curari, várzea, 2.IX.1976, 1 gyne, J. Adis [LACM].

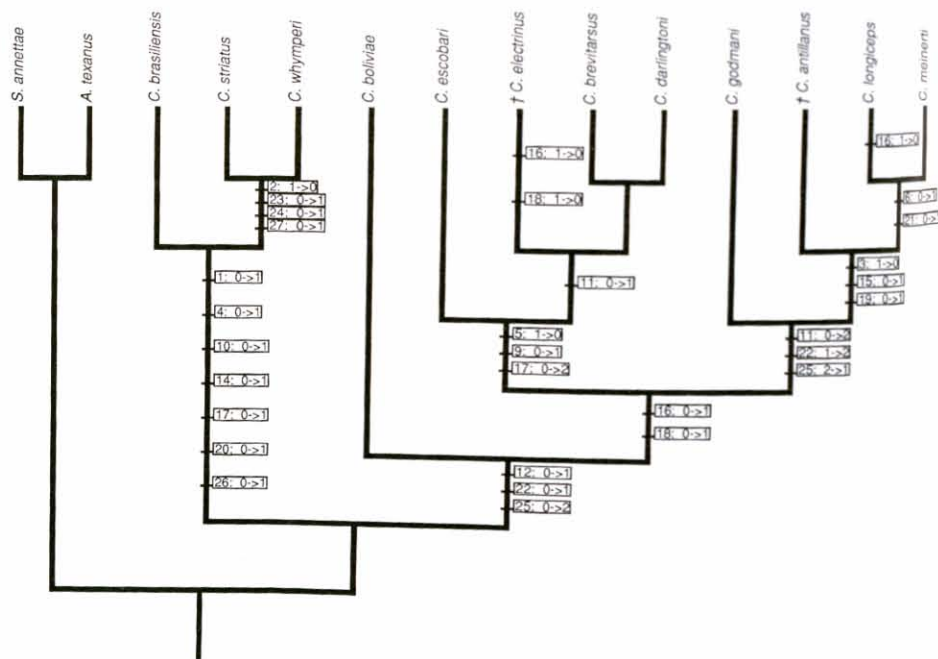


FIG. 35

Unique most parsimonious phylogeny of the known species of *Cylindromyrmex*. *Acanthostichus texanus* and *Simopone annettae* have been included into the analysis for outgroup comparison. The frames include the character changes at each branch with their respective identification number as given in the text and the apomorphic state change.

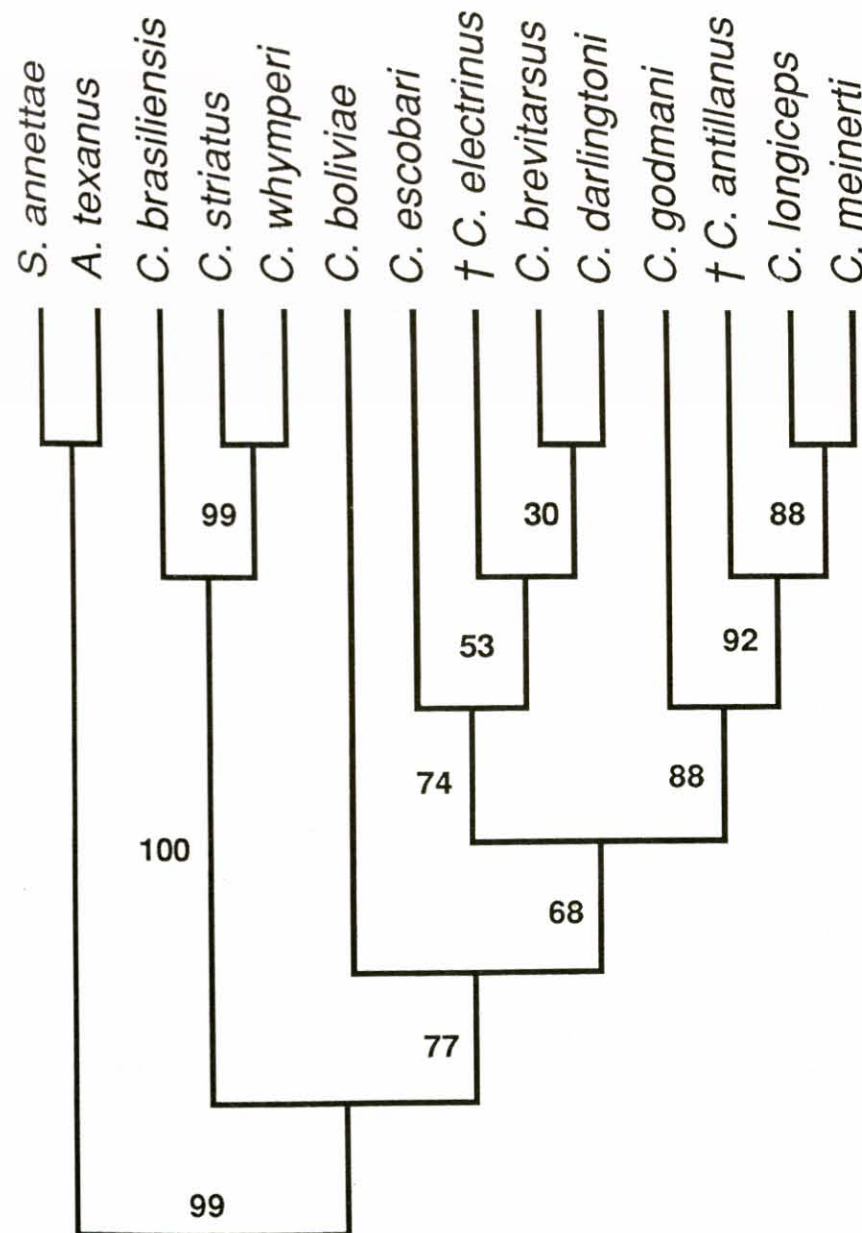


FIG. 36

Same phylogeny as in Fig. 35 with the frequency of the clades resulting from 1,000 bootstrap replicates. Further explanations in text.

Discussion. *Meinerti*, from my cladistic analysis, results as the sister species of *longiceps* although it resembles more *antillanus* in body shape. This is because *longiceps* and *meinerti* share synapomorphically the $HFeI \geq 50$ and the broad hypostomal bridge (Fig. 32), the first of which is of doubtful phylogenetic importance.

The composite nature of the type series of *schmidtii* Menozzi has been already described under *whymperi*.

FOREL (1905) reported *meinerti* from an old tree. Some specimens of *meinerti* were collected in termite nests (see material examined).

Distribution. Costa Rica, Panama, Venezuela, Brazil.

DISCUSSION

The nesting place and feeding habits of *Cylindromyrmex* are still fragmentarily known. Part of the specimens examined during this study bear some biological information (see the discussion under each Recent species). WHEELER (1936) listed *brasiliensis* and "*williamsi*" (= *whymperi*) as termite inquilines. OVERAL & BANDEIRA (1985) equally supposed that specimens of *striatus* collected in a termite nest should be termite inquilines. Their statement is partly contradicted by their report in the same paper of *striatus* workers attacking *Nasutitermes surinamensis* in laboratory.

TOMOTAKE & CAETANO (1997) described the digestive tract of *C. brasiliensis* and compare it with the one of the same subfamily *Acanthostichus serratus*. Significant differences have been found neither between the two genera nor between the two Cerapachyinae and other ants.

CLARK *et al.* (1982) reported *williamsi* (= *whymperi*) as "endemic" in the North arid zone of Santa Cruz (Galapagos Is.). They collected "*williamsi*" in two out of 429 samples and mention that "*williamsi*" has escaped the competition with *Wasmannia* because of its adaptation to inhabit the arid zone. LUBIN (1984) uses the term native for "*striatus*" (= *whymperi*) from the Galapagos.

The distribution of the members of the *striatus*, *boliviae*, *brevitarsus* and *longiceps* clades are given respectively in Figs. 37-40. The figures are based only on the material examined during this study. Previous literature records I have been able to verify revealed often erroneous identifications.

The three species of the *striatus* clade appear to be allopatric (Fig. 37). The unique male of *whymperi* from Blumenau in NHMW is likely to be wrongly labelled. The allopatry of *brasiliensis* and *striatus* had been already stressed by FOWLER & DELABIE (1995).

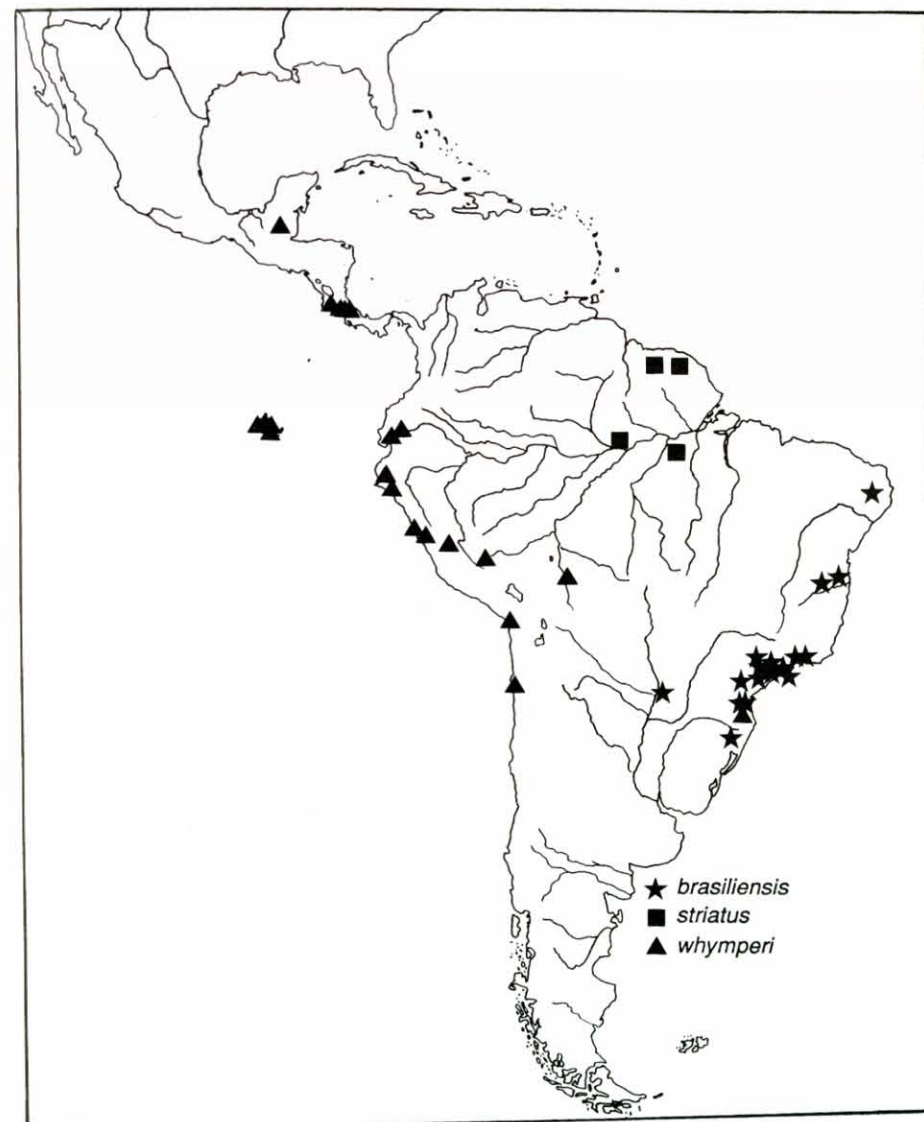


Fig. 37
Distribution of the species of the *striatus* clade.

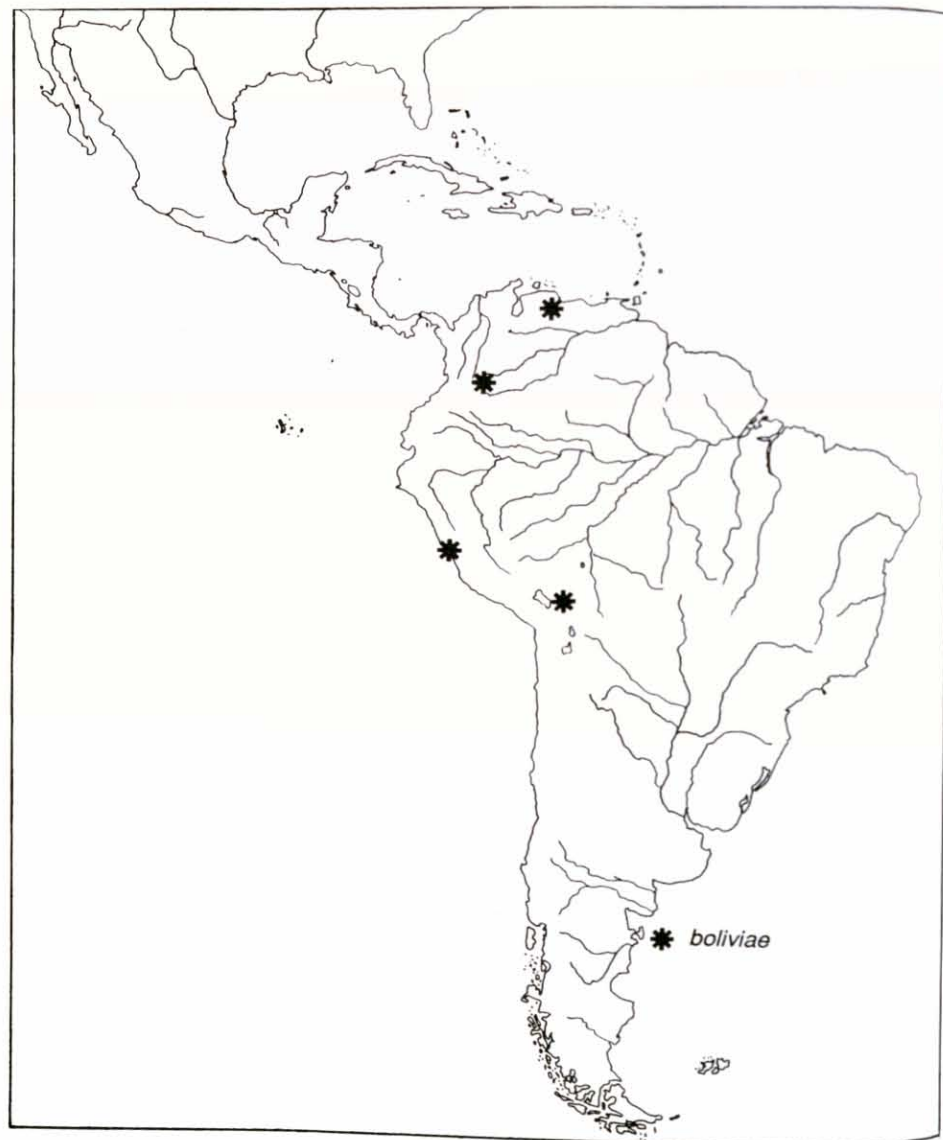


FIG. 38
Distribution of the species of the *boliviae* clade.

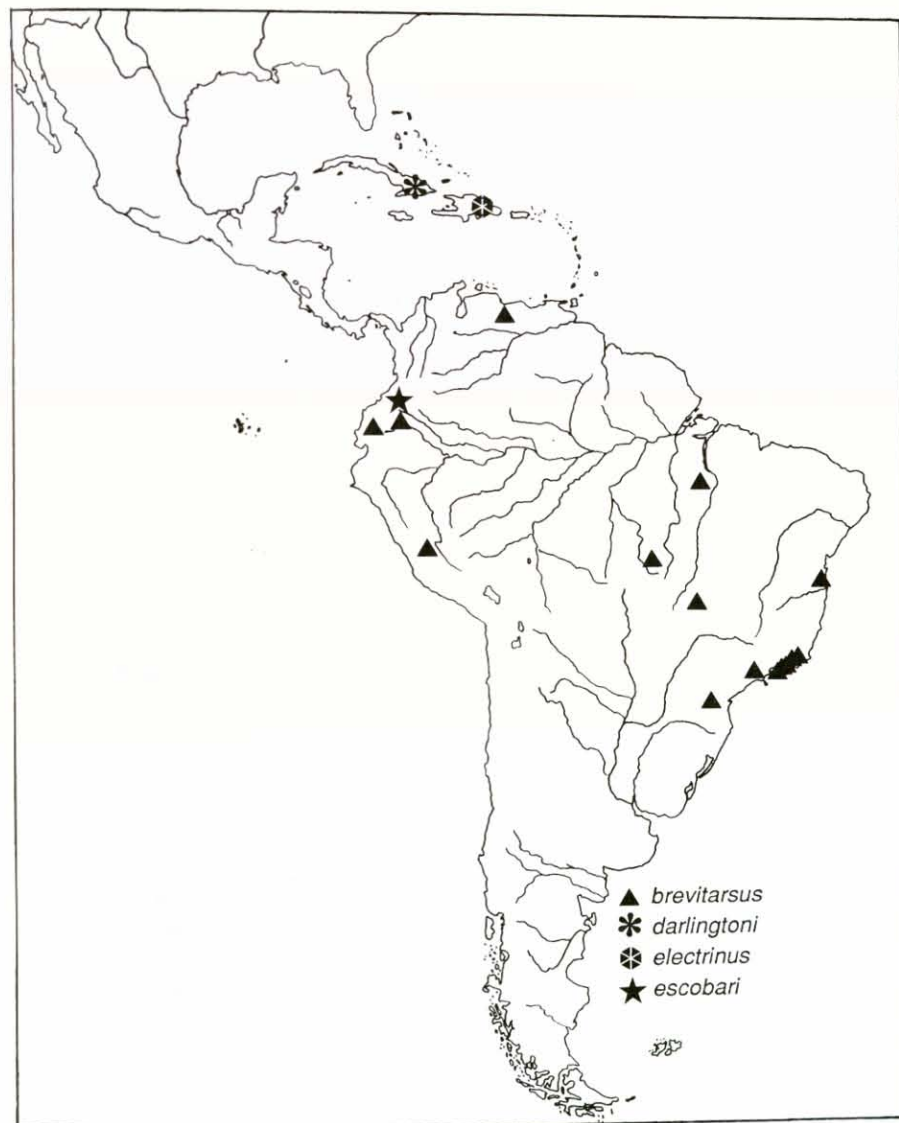


FIG. 39
Distribution of the species of the *brevitarsus* clade.



FIG. 40
Distribution of the species of the *longiceps* clade.

IDENTIFICATION KEYS

WORKERS

The workers of *antillanus*, *boliviae*, *electrinus* and *godmani* are not included in this key because they are not yet known.

1. Eyes large and convex (≥ 400 ommatidia). Ocelli present and well defined (Figs. 6, 8, 12) 2
- Eyes small or of medium size (> 16 and < 200 ommatidia), flat or slightly convex. Ocelli absent or represented by superficial pits (Figs 17, 19, 29) 3
2. Legs dark orange to light brown. Dorsum of the petiole with thin, irregular striae (Fig. 6). Brazil, Paraguay *brasiliensis*
- Legs dark ferruginous to black, with at least part of the tibiae yellowish. Dorsum of the petiole with thick, regular striae (Figs 8, 12) 4
3. Posterior third of the head dorsum at most with 25 striae. Postpetiole with 19-25 longitudinal striae. Guatemala, Costa Rica, Galapagos Is., Ecuador, Peru, Bolivia, Chile, Brazil *whymperi*
- Posterior third of the head dorsum with more than 34 striae. Postpetiole with about 29-30 striae. Surinam, French Guyana, Brazil *striatus*
4. Head length (mandibles excluded) ca. $1/3$ longer than broad; frons, slightly more than $1/3$ of the head width. Mandibles dorsally flat (Figs 29, 31) 5
- Head length (mandibles excluded) ca. $1/5$ longer than broad; frons broad, slightly less than $1/2$ or more than $1/2$ of the head width. Mandibles dorsally convex (Figs. 17, 19, 20) 6
5. Frontal carinae not reaching the anterior clypeal border. Pygidium with a semicircle of teeth of similar size. Brazil *longiceps*
- Frontal carinae reaching the anterior clypeal border. Pygidium with a semicircle of teeth with two larger ones over the sting. Costa Rica, Panama, Venezuela, Brazil *meinerti*
6. Frontal carinae not reaching the anterior clypeal border. Clypeus strongly convex medially (Fig. 17). Gaster without striation. Mesosoma, petiole and legs elongate. Hind femora Index (HFeI) = 37. Colombia *escobari*
- Frontal carinae reaching or surpassing the anterior clypeal border. Clypeus not strongly convex medially (Fig. 19, 20). At least the first gastric tergite with thin striation on the anterior part. Mesosoma, petiole and legs stout. Hind femora Index (HFeI) ≥ 45 7
7. Frontal carinae surpassing the anterior clypeal border. Mandibles with 9-10 denticles. Scape Index (SI) = 37. Cuba *darlingtoni*
- Frontal carinae reaching the anterior clypeal border. Mandibles with 6-7 denticles. Scape Index (SI) > 42 . Venezuela, Ecuador, Peru and Brazil *brevitarsus*

GYNES

The gyne of *escobari* is not included in this key because it is not yet known.

1. First gastric tergite smooth 2
- First gastric tergite sculptured 5
2. Postpetiole smooth or with very thin, short, superficial striae on the posterior half. Frontal carinae very broad, reaching the internal border of the eyes (Fig. 14). Mandibles not angulate basally, convex dorsally and with 10-12 denticles. Colombia, Venezuela, Peru and Bolivia *boliviae*
- Postpetiole entirely striate. Frontal carinae not reaching the internal border of the eyes. Mandibles angulate basally, slightly convex or flat dorsally, with maximum 7 denticles 3
3. Legs dark yellowish-orange to light brown. Body striation more irregular. Brazil, Paraguay *brasiliensis*
- Legs dark ferrugineous to black with large part of the tibiae yellowish. Body striation regular 4
4. Cephalic Index (CI) ≥ 80 . Posterior third of the head dorsum at most with 25 striae. Guatemala, Costa Rica, Galapagos Island, Ecuador, Peru, Bolivia, Chile, Brazil *whymperi*
- Cephalic Index (CI) ≤ 77 . Posterior third of the head dorsum with more than 34 striae. Surinam, French Guyana, Brazil *striatus*
5. Frons at most slightly more than 1/3 the head width. Eyes on the middle of the head sides 6
- Frons at least slightly less than 1/2 or more than 1/2 of the head. Eyes behind the middle of the head sides 8
6. Frontal carinae not reaching the anterior clypeal border. Pygidium apically without a distinct pair of large teeth. Distal border of hind basitarsi with 5 spine-like setae. Brazil *longiceps*
- Frontal carinae reaching the anterior clypeal border. Pygidium apically with a distinct pair of large teeth. Distal border of hind basitarsi with 3 spine-like setae. 7
7. Outer apical edge of the mid basitarsi with 3 spine-like setae on the outer face. Cephalic Index (CI) ≤ 70 . HFeI ≥ 50 . Costa Rica, Panama, Venezuela, Brazil *meinerti*
- Outer apical edge of mid basitarsi with 5 spine-like setae on the outer face. Cephalic Index (CI) > 77 . HFeI < 46 . Dominican amber *antillanus*
8. Head and mesosoma covered by thick and thin striae. Pygidium apically with a distinct pair of large teeth separated by a deep notch. Size large ≥ 12.5 mm. Cephalic Index (CI) < 71 . Costa Rica, Panama, Ecuador . . *godmani*
- Head and mesosoma covered by uniform thin striae. Pygidium apically with 4-6 large teeth not separated by a notch. Size small < 9.5 mm. Cephalic Index (CI) > 78 9
9. Coxae and femora black. Mid basitarsi with parallel sides and more than half longer than the hind basitarsi. Dominican amber *electrinus*

- Coxae, femora dark brown. Mid basitarsi broad apically and half as long as the hind basitarsi 10
- 10. Frontal carinae not surpassing the anterior clypeal border. Mandibles with 6-8 small denticles. Femora yellowish to light brown. Venezuela, Ecuador, Peru and Brazil *brevitarsus*
- Frontal carinae surpassing the anterior clypeal border. Mandibles with 9-10 small denticles. Femora dark brown. Cuba *darlingtoni*

MALES

The males of *darlingtoni*, *escobari*, *electrinus*, *antillanus* and *longiceps* are not considered because they are not yet known. *Whymperi* and *striatus* are not separated because the unique specimen of *striatus* available for the present study is immature and does not allow a sure recognition of diagnostic characters.

1. Frontal carinae strongly converging and almost touching each other posteriorly and broadly separated anteriorly (Figs 26, 33). Hypopygium with a simple, umpair, median projection between the apodemes (Figs 27b, 34b) 2
- Frontal carinae not strongly converging posteriorly (Figs 10, 15, 22), if almost touching each other posteriorly (few males of *brevitarsus*) then never broadly separated anteriorly. Hypopygium smooth, or finely denticulate, or with a bidentate median projection between the apodemes (Figs 7b, 11b, 23b) 3
2. Total length (TL) > 9.5 cm. Mesosoma massive. Petiole with traces of striae only anteriorly. Postpetiole smooth. Costa Rica, Panama, Ecuador *godmani*
- Total length (TL) < 8.5 cm. Mesosoma elongate. Petiole entirely striate. Postpetiole superficially striate. Costa Rica, Panama, Venezuela, Brazil . . . *meinerti*
3. Head and basal face of the propodeum with thick striae (Fig. 10), sometimes with thick foveae between the striae. Hypopygium smooth or finely denticulate between the distal apodemes 4
- Head and basal face of the propodeum with thinner striae (Figs 15, 22). Hypopygium with a simple, umpair, median projection between the apodemes 5
4. Anterior clypeal border slightly convex. Scape Index (SI) ≤ 53.1 . Hypopygium finely denticulate between the distal apodemes (Fig. 7b). Brazil and Paraguay *brasiliensis*
- Anterior clypeal border straight (Fig. 10). Scape Index (SI) > 57.1 . Hypopygium smooth between the distal apodemes. (Figs 11b, 13b). Guatemala, Costa Rica, Galapagos Island, Ecuador, Peru, Bolivia, Chile, Brazil *whymperi*
- Surinam, French Guyana, Brazil *striatus*

5. Coxae black with the remaining parts of the legs yellow to light brown. Ventral border of the aedeagus with at least 42 denticles. Venezuela, Ecuador, Peru and Brazil *brevitarsus*
- Coxae dark or black, concolour with the remaining parts of the legs. Ventral border of the aedeagus with at most 32 denticles. Colombia, Venezuela, Peru and Bolivia *boliviae*

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