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# A New Fungus-Growing Ant Genus, *Mycetagroicus* gen. n., with the Description of Three New Species and Comments on the Monophyly of the Attini (Hymenoptera: Formicidae)

by

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## ABSTRACT

We describe a new fungus growing ant genus, *Mycetagroicus* new genus (Hymenoptera: Formicidae: Myrmicinae), with three new species, *M. cerradensis* (workers), *M. triangularis* (workers and one queen), and *M. urbanus* (workers), recorded from eastern South America, exclusively in Brazil. A key for the identification of species based on workers is provided. We comment the biology of the genus, and discuss the soil-binding properties of their integument. From comparisons of *Mycetagroicus* with other attine, we propose the first workers and queens' morphological synapomorphy for the tribe, and discuss the relationships of the genus with "higher" attines, and among *Mycetagroicus* species.

## INTRODUCTION

Establishing the monophyly of the Attini, a primarily Neotropical myrmicine ant tribe, would answer the question of whether fungus (or yeasts in certain cases) growing behavior has been acquired once by a single lineage, or two or several times independently in the Myrmicinae history. Recently, Schultz & Meier (1995; see also Chapela *et al.* 1994) have addressed this question, studying the largely neglected characters of prepupae morphology in Attini and several other myrmicine genera. Until now the monophyly of Attini is supported only by their exclusive primary ability to cultivate a basidiomycete fungus, and by three morphological characters (Schultz & Meier, *op. cit.*) of the prepupae: short, narrow labrum; fleshy, nearly straight, subconical mandibles; and presence of the leg vestiges as open slits in the integument.

In the present paper we describe a new genus of Attini, discussing the first workers and queens morphological synapomorphy for the tribe. We base our study on material accumulated especially in the Museu de Zoologia da USP (MZSP).

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The Borgmeier-Kempf ant collection was transferred to the MZSP in 1977, where the Hermann von Ihering, Hermann von Lüderwaldt, and Karol Lenko collections were already deposited. Father Walter Wolfgang Franz Kempf (1920 - 1976) was engaged in a revision of the fungus-growing ant genus *Trachymyrmex* at the time of his sudden death, in Washington, D.C., while attending the International Congress of Entomology. We have found at the MZSP collection material identified by him as "Attini new genus" belonging to at least two different species, along with correspondent handwritten material and drawings pertinent to his studies on the fungus-growing ant tribe, but no draft of a description of these specimens. We have identified in the collection a third species, not studied by Kempf.

We hereby describe this new genus, adopting one of the names we have found in Kempf's notes, including a drawing made by Kempf of a worker head for one of the species we described here. From Kempf and Lenko notebooks, deposited in the MZSP, and from Cincinnati Rory Gonçalves notebook deposited at the "Coleção Entomológica Costa Lima" at the Instituto de Biologia da Universidade Federal Rural do Rio de Janeiro (IBUS), we obtained valuable information on the biology of the species.

#### MATERIAL AND METHODS

Four worker paratypes (recorded at the proper sections below) were cleaned in acetone using a Thornton ultra-sound for 30 minutes, then coated with gold in a Balzer critical point dryer for 90 seconds at 50 mA. The scanning electron micrographs were prepared in a Leo 440 Scanning Electron Microscope.

Terminology follows Bolton (1994). We call anteclypeus the acute narrow anterior flange of the clypeus, distinguished from the anterior margin of the clypeus itself by the lack of sculpture (Torre-Bueno, 1989). Measurements follow Kempf (1967). The abbreviations for the measurements are: TL, total length; HL, head length (without mandibles); HW, head width (including eyes); IFW, inter frontal width (distance between the lateral margins of frontal lobes); ScL, scape length; TrL, alitrunk length (= Weber's length); HfL, hind femora length.

Acronyms for collections follow Brandão (2000). We have deposited paratypes in several collections, recorded under each species description, to allow a efficient dispersal of duplicates. As we are donating paratypes to several institutions, we record where specimens are herewith deposited.

BMNH - The Natural History Museum London, London, UK.

CASC - California Academy of Sciences, San Francisco, California.

USA.

CPDC - Centro de Pesquisas do Cacau, Comissão Executiva do Plano da Lavoura Cacaueira (CEPLAC), Itabuna, BA, Brazil.

IBUS - Instituto de Biologia, Universidade Federal Rural do Rio de Janeiro (Coleção Entomológica Angelo Moreira da Costa Lima - CECL) Seropédica, RJ, Brazil. Note: Recently, researchers at this institution have adopted the acronym CECL instead.

INPA - Instituto Nacional de Pesquisas da Amazônia, Manaus, AM, Brazil.

LACM - Los Angeles County Museum of Natural History, Los Angeles, CA, USA

MCZC - Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA.

MZSP - Museu de Zoologia da Universidade de São Paulo, São Paulo, P, Brazil.

USNM - United States National Museum of Natural History, Washington, DC, USA.

When citing label data, we present additional information, explanation of codes in the labels, eventual corrections to the misprints, and reference to the notebooks from which we took information regarding the localities and/or the biology of the species between brackets.

#### *Mycetagroicus* new genus

(Figs 1- 24)

**Type-species:** *Mycetagroicus cerradensis* new species (present designation).

**Etymology.** From latinized Greek *Myketus* (myketus) = fungus; *agroikos* (agroikos) = of the country, in the sense of cultivation.

**Diagnosis (worker).** Monomorphic attine ants. All body surfaces covered with regularly spaced, round, minute pits (only seen at higher magnifications, up to 70 times), bearing each a deeply set hair, one third the diameter of the pit (Fig. 4), sometimes effaced by soil particles. Antennal scrobes absent. Each pronotum shoulder in the format of a pine-like triangular lateral projection (better seen with the pronotum in frontal view, as in Figs 4, 10, 19). Mesonotum without conspicuous projections on the anterior region; the posterior dorsal margin oblique to vertical or nearly so, in lateral view. Petiole compact, petiolar peduncle very short indistinct from node (in lateral view). Postpetiole always larger and broader than the petiole. Disk of tergum I of the gaster covered by a net of coarse rugulae, more evident anteriorly, sometimes joining similar-sized hair pits.

**Description (worker).** Integument shagreened, opaque. The hair



pits and the overall texture of the integument capture fine grained soil particles, that as the workers age, accumulate in a thin uniform mud camouflage layer (Fig. 17). Triangular mandibles longitudinally striate on dorsal surface till the smooth flange from where the teeth arise; the maxillary palps covered by the labrum in all studied specimens, labial palpi two segmented; the mouth apparatus clean of any soil particle, contrary to all other body surfaces (Fig. 23). Clypeus antero-mesially convex, always with a median seta arising from the limit of the anteclypeus and clypeal anterior margin, that bears a small median notch. Preocular carinae start at the level of a rounded projection that interrupts the lateral margin of the head in full face view, evenly curving inwards, ending at the level or behind the posterior margin of the compound eyes, and not reaching the frontal carinae; antennal scrobe absent. Interfrontal width scarcely surpassing one half of its maximum width across the eyes; supraocular projections represented by minute tubercles; occipital margin slightly notched; occipital corners rounded, without noticeable projections but also covered all over by minute tubercles similar to those of the supraocular region; compound eyes notably convex, surpassing the lateral margin of the head and placed anteriorly on the head capsule, closer to the mandibular insertions than to the occipital corners.

Pronotum dorsal and lateral faces meeting in a triangular acute projection (in *M. cerradensis* and *M. triangularis* the anterior and lateral faces of the pronotum separated by a carina); antero-inferior corners of the pronotum projected, angulated or ending each in a small blunt tooth; mesonotum without relatively high projections at the anterior dorsal surface, except for low tubercles; posterior face of mesonotum, when seen laterally, oblique or vertical; anepisternum and katepisternum always distinct, sometimes separated by a carina; small metanotum interrupting the dorsal margin of the alitrunk; basal face of propodeum with two longitudinal crenulated ridges; the meeting of dorsal and declivitous faces of the propodeum as two short triangular projections, in one species truncated and blunt; metapleura and declivity continuous, without noticeable ridges or carinae. Hind femora length shorter than alitrunk length.

Petiole without conspicuous peduncle and dorsal projections, at most a low posterior triangular tubercle; petiolar ventral process pointing forward, below the metasternum; postpetiole longer, twice as long as the petiole, and large, without dorsal projections; sides almost parallel. Rugulae on the gaster tergum I more conspicuous on the anterior half, the rugulae often linking hair pits to one another; tergum I of the gaster at anterior half margined on the sides, sometimes

prestigially; sternum I with a longitudinal median sagittal carina, as long as half of its length.

**Comments.** *Mycetagroicus* belongs to an informal group of genera called by authors as the "higher Attini", which includes most of the tribe, and the true leaf-cutting ants, the polymorphic *Atta* and *Acromyrmex*. Among the "higher Attini", the species of *Sericomyrmex* clearly differ from *Mycetagroicus* by the abundant silky pilosity and by the heart-shaped head. Several species of *Cyphomyrmex* (belonging to the two recognized species groups) possess auriculated occipital lobes; workers of the *strigatus* group have relatively deep antennal scrobes, and the frontal lobes of the *rimosus* group species workers are largely expanded laterally. Both *Cyphomyrmex* species groups workers share with *Mycetagroicus* only the presence of a short petiole. The mesonotum of *Mycetarotes* is very thorny; the petiolar node has small but noticeable spines, and its species have occipital projections - characters never observed in *Mycetagroicus*.

In the notebooks of Kempf and Gonçalves, we have found samples numbers 1492 and 482 registered as *Mycetophylax* and *Mycetosoritis*, respectively. Unlike the genus we are describing, however, workers of *Mycetophylax* have the whole integument smooth, their dorsal pronotal projections are low and blunt, and the preocular carinae is almost straight. Among the species of *Mycetosoritis* there is a considerable morphological heterogeneity, comparable only to that found in *Trachymyrmex*. *Mycetosoritis* and *Trachymyrmex* differ from *Mycetagroicus* by the presence of an antennal scrobe, and by the presence of tubercles or spines in the dorsum of the gaster.

#### KEY FOR THE IDENTIFICATION OF SPECIES OF MYCETAGROICUS NEW GENUS (WORKERS):

1. Lateral clypeal projections present (Figs 1-2, 5, 11), better seen with head in oblique view; frontal lobes differently shaped; median pronotal projections present or absent; posterior face of mesonotum oblique in side view (Figs 3, 9) ..... 2
- 1'. Lateral clypeal projections absent (Figs 17, 20); frontal lobes rounded, their largest width posterior to the antennal insertions, from where they curve inwards, not forming a strong constriction; median pronotal projections present (Figs 18-19); posterior face of mesonotum vertical in side view, with a high median projection (Fig. 18) ..... *M. urbanus* n. sp.
2. Lateral clypeal projections conspicuous (Figs 1-2, 5), flat, narrow, curved inwards with rounded apex; frontal lobes subtriangular, the



- anterior borders rounded, crenulated, and almost as long as the straight posterior borders; median pronotal projections very short or absent (Fig. 4) ..... *M. cerradensis* n. sp.
- 2'. Lateral clypeal projections small, triangular (Fig. 11); frontal lobes rounded, their largest width posterior to the antennal insertions, from where they curve inwards, forming a constriction stronger than in *M. urbanus* (Fig. 8; compare with the Fig. 17); median pronotal projections present (Fig. 9-10) ..... *M. triangularis* n. sp.

***Mycetagroicus cerradensis* new species**

Figs. 1-7

**Holotype**: Worker, BRAZIL. São Paulo State: Rancharia [22° 15' S, 50° 55' W], 5.x.1969, E. Amante [MZSP # 6004 Kempf's notebook], deposited at MZSP.

**Paratypes** (all from Brazil): 41 workers, same data as holotype (38 MZSP - one prepared for SEM; 3 USNM; 3 CPDC); 4 workers, Distrito Federal: Brasília [15° 47' S, 47° 55' W], Parque Nacional de Brasília, 13-14. v. 1971, "cerrado", W. L. & D. E. Brown [col.] (2 MZSP; 2 MCZC); 33 workers, Goiás: Faz. Cachoeirinha, Jataí [17° 53' S, 51° 43' W], 20. vii. 1964, Exp. Dep. Zool. col. [MZSP # KL 4264] (20 MZSP; 3 CASC; 4 IBUS; 3 LACM; 3 USNM); 3 workers, Mato Grosso [today Mato Grosso do Sul]: Fazenda Fortaleza, Paranaíba [19° 40' S, 51° 11' W], 19. ii. 1976, J. L. M. Diniz [Diniz's field book # 951] (MZSP); 3 workers, Minas Gerais: Paraopeba [19° 18' S, 44° 25' W], iii. 1990, J. A. Barcelos [leg.] (2 MZSP; 1 IBUS); 2 workers, Minas Gerais: Lassance [17° 54' S, 44° 34' W], 18. ix. 1985, P. Pacheco col. (MZSP); 5 workers, Paraná: Sengés [21° 59' S, 48° 23' W], 03. xi. 1965, W. Kempf leg. [MZSP # 4154] (3 MZSP; 2 IBUS); 19 workers, São Paulo: Fazenda Itaquerê, Boa Esperança do Sul [21° 59' S, 48° 23' W], 20. vii. 1964, K. Lenko leg. [MZSP # 4472, Lenko notebook] (10 MZSP - one prepared for SEM; 3 IBUS; 3 INPA; 3 BMNH); 6 workers, São Paulo: Agudos [22° 28' S, 49° 00' W], 13. xii. 1955, W. Kempf leg. [MZSP # 1492; "Parque do Seminário" Kempf's notebook] (4 MZSP; 2 IBUS); 2 workers, São Paulo: Botucatu [22° 52' S, 48° 26' W], 11. iv. 1985; 11. x. 1984, M. F. Barros Pereira col. (MZSP).

**Etymology.** The name refers to the distribution of this species, known only from the Brazilian "cerrados", a savanna-like formation that once covered most of the Brazilian Central Plateau.

**Description.** Worker. Measurements (in mm): TL 3.36; HL 0.92; HW 0.92; IFW 0.52; ScL 0.78; TrL 1.34; HfL 1.23. Uniformly brown-yellowish to medium brown; gaster darker than the rest of the body in the two Minas Gerais samples; the Paraopeba workers have also the frontal disk of the head darker than the rest of the body. Long and dense

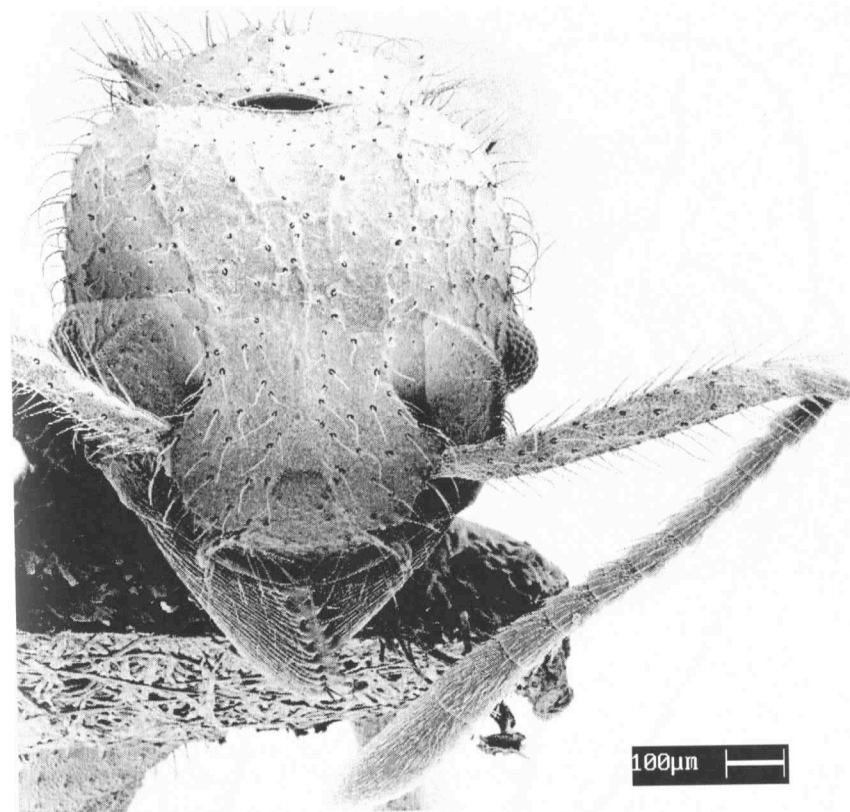


Fig. 1. *Mycetagroicus cerradensis* new species, worker paratype, Brazil, SP: Rancharia. Head in frontal view.

pilosity all over the body, hairs mostly erect, but flexuous, little shorter on the appendages than in other regions of the body (Figs 1, 3-5, 7).

Head as in Figs 1-3, 5. Dorsal surface of the mandibles with some 30 rugulae over a straight line perpendicular to the external margin at midlength, ending abruptly at the smooth flange parallel to the masticatory margin (Fig. 5). Masticatory margin with an apical tooth followed by 7-10 minute regularly spaced teeth (Fig. 5), except for the basal one which is separated from the others by a small diastema; the subapical teeth of similar size and triangular in young workers; external margin almost straight at base, weakly concave at apex, curving inwards at the level of the third subapical tooth. Clypeus (Fig. 1-2, 5) with pronounced concave anterolateral projections with rounded apex, at each side, arising near the base of the frontal lobes. Frontal area triangular, depressed but mostly inconspicuous. Frontal lobes subtriangular, the anterior border rounded, crenulated, and almost as



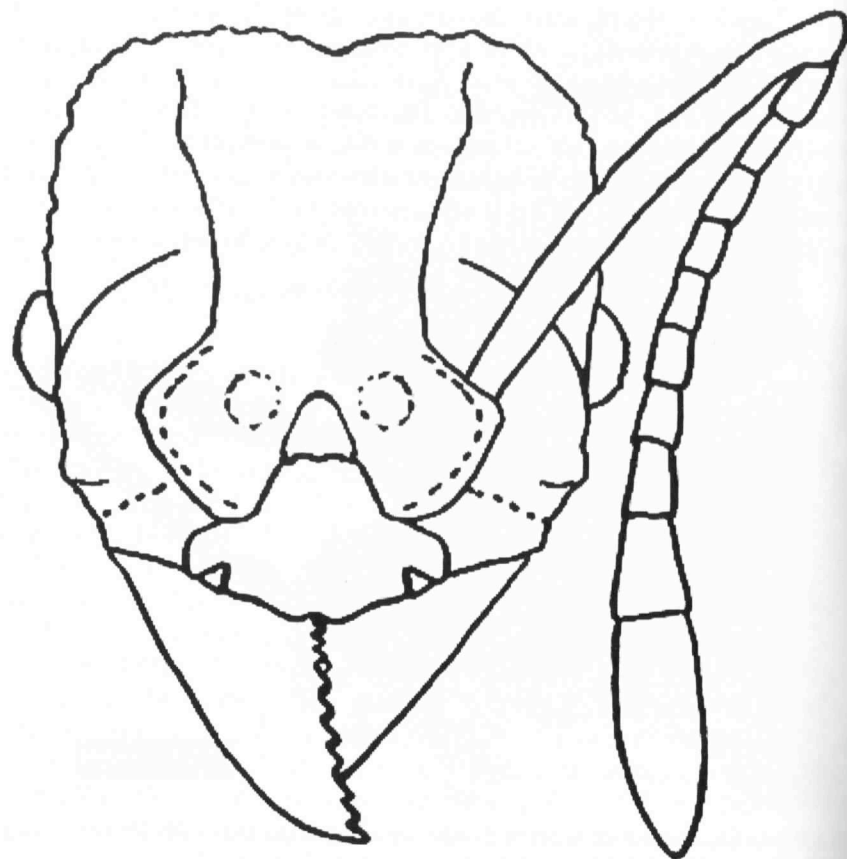


Fig. 2. *Mycetagroicus cerradensis* new species, worker paratype, Brazil, SP: Agudos. Head in frontal view; drawing by W. W. Kempf, no date.

long as the straight posterior borders; faces meeting in an attenuated angle of *circa* 120°. Frontal carinae sinuous, weakly diverging caudad, fading before reaching the occiput. Eyes with 12 facets across its greatest diameter. Antennal scapes surpassing the occipital corners by near one third of their length, when laid back over the head as much as possible. All funicular segments longer than broad.

Alitrunk (Figs 3-4, 6). Lateral pronotal spines triangular when seen from above, projecting laterad when seen in frontal view (Fig. 4). Pair of median projections on pronotum very short or absent; middle of the mesonotum with a low protuberance, better seen in side view, microscopically tuberculated (Fig. 3). Anepisternum separated from katepisternum by a strong ridge. Metanotal groove relatively large in side view, shallowly impressed. Propodeal spiracle opening slit-shaped in side view.

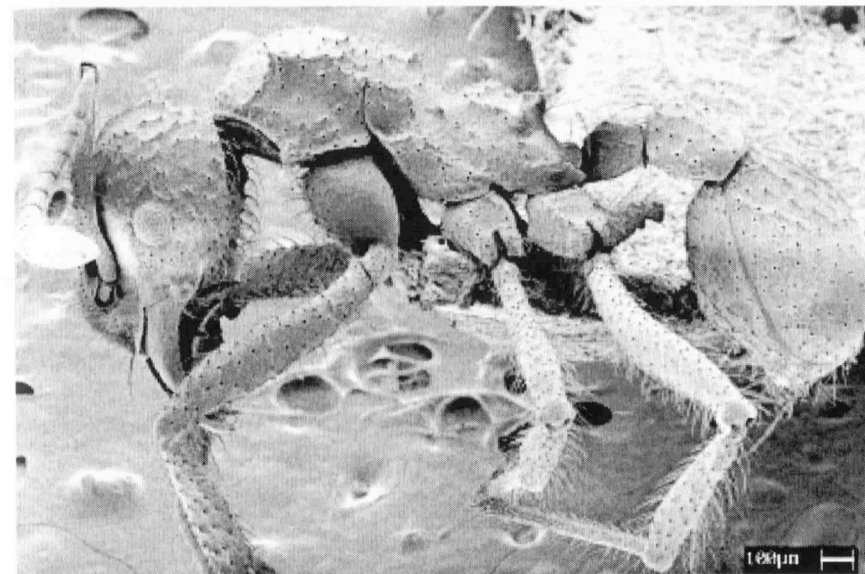


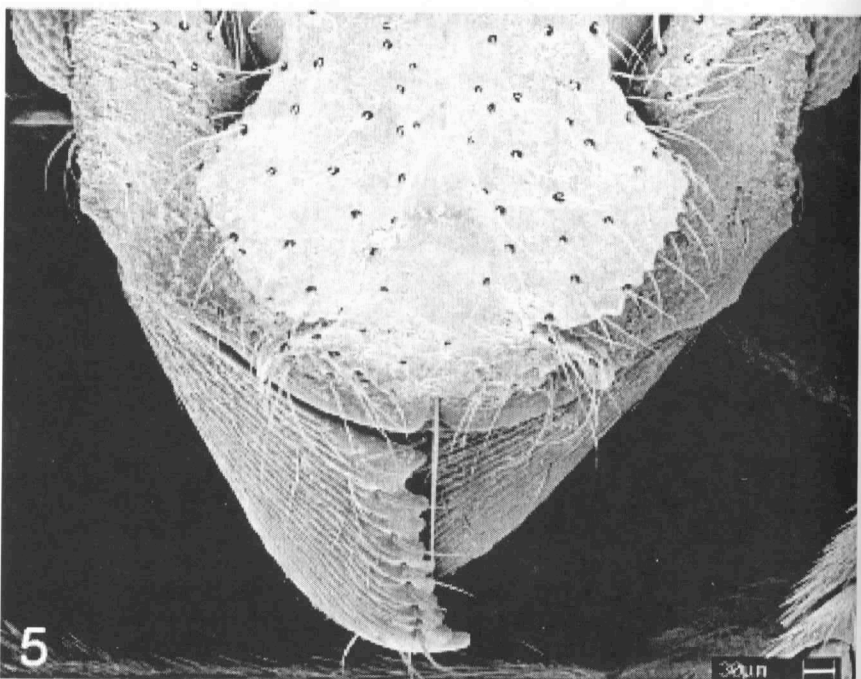
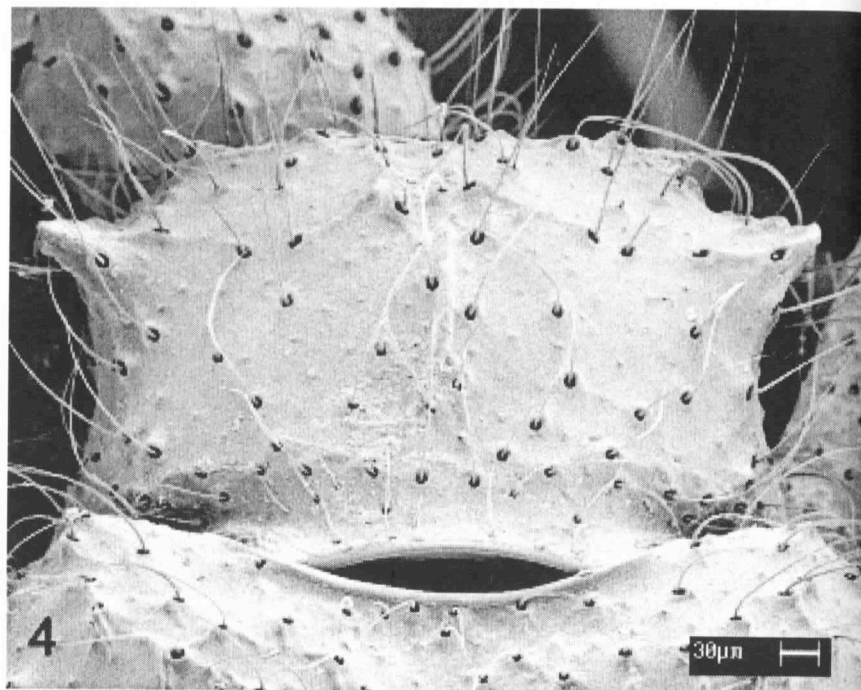
Fig. 3. *Mycetagroicus cerradensis* new species, worker paratype, Brazil, SP: Fazenda Itaquerê. Habitus in lateral view.

Petiole, postpetiole, and gaster (Figs 3, 6-7). Petiole without conspicuous projections; the node proper as seen from above slightly longer than broad, and broader anteriorly (Fig. 6). Postpetiole slightly broader than long in dorsal view. Gaster (Fig. 7) with regularly spaced hair pits, almost in straight parallel lines. The dorsal disk of the gaster marked by two faint widely spaced longitudinal keels.

**Biology.** Combining information from labels and field notes of Kempf and Lenko, we can say that this species occurs in the "cerrado" (samples # 4151, 4246, and 4472). Although we have no clear information on the collecting sites of most samples, all localities we listed above are (or were) cerrado areas. Lenko recorded nests as subterranean, with one circular entrance circled by a 3 mm sand crater, surrounded by a 5 cm high mound with 12 cm at base. He has also recorded the workers of sample # 4472 carrying minute plant fragments and very small seeds of grasses and other unspecified items. The Botucatu sample label says "pasture".

**Comments.** The recognition of *Mycetagroicus cerradensis* new species is very easy by three main features: the presence of two prominent clypeal concave projections, rounded at apex, the subtriangular frontal lobes, and the absence of the median pronotal teeth.





Figs 4-5. *Mycetagroicus cerradensis* new species, worker paratypes. Fig. 4. Pronotum in frontal view, Brazil, SP: Rancharia. Fig. 5. Detail of anterior portion of head. Brazil, SP: Fazenda Itaquerê.

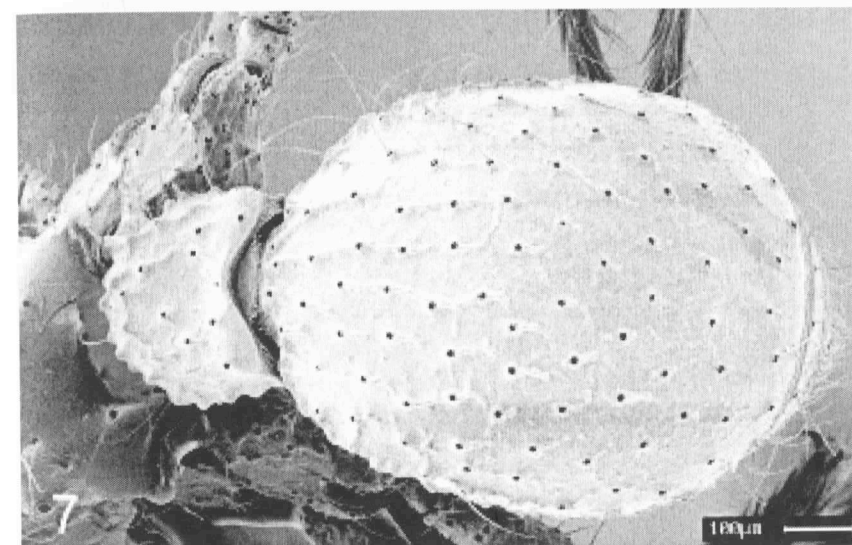
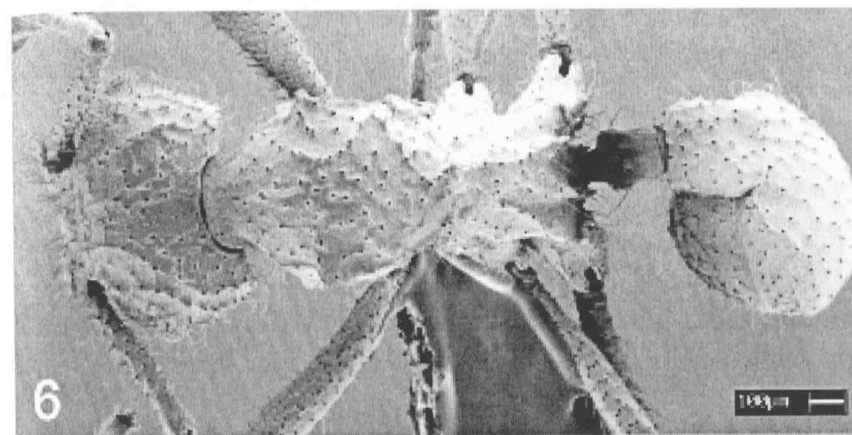


Fig. 6. *Mycetagroicus cerradensis* new species, worker paratype, Brazil, SP: Fazenda Itaquerê. Habitus in dorsal view. Fig. 7. *Mycetagroicus cerradensis* new species, worker paratype, Brazil, SP: Fazenda Itaquerê. Postpetiole and gaster in dorsal view.

### *Mycetagroicus triangularis* new species

Figs 8-16

**Holotype** : Worker BRAZIL, Mato Grosso State: Gustavo Dutra [15° 49' S, 55° 24' W], 25. x. 1953, RCG [C. R. Gonçalves col.] # 1677 [Gonçalves notebook], deposited at MZSP. Notes: on the original label, the acronym for the collector is wrongly spelled as RCG. Information on this collector and locality, related however to different species, matches



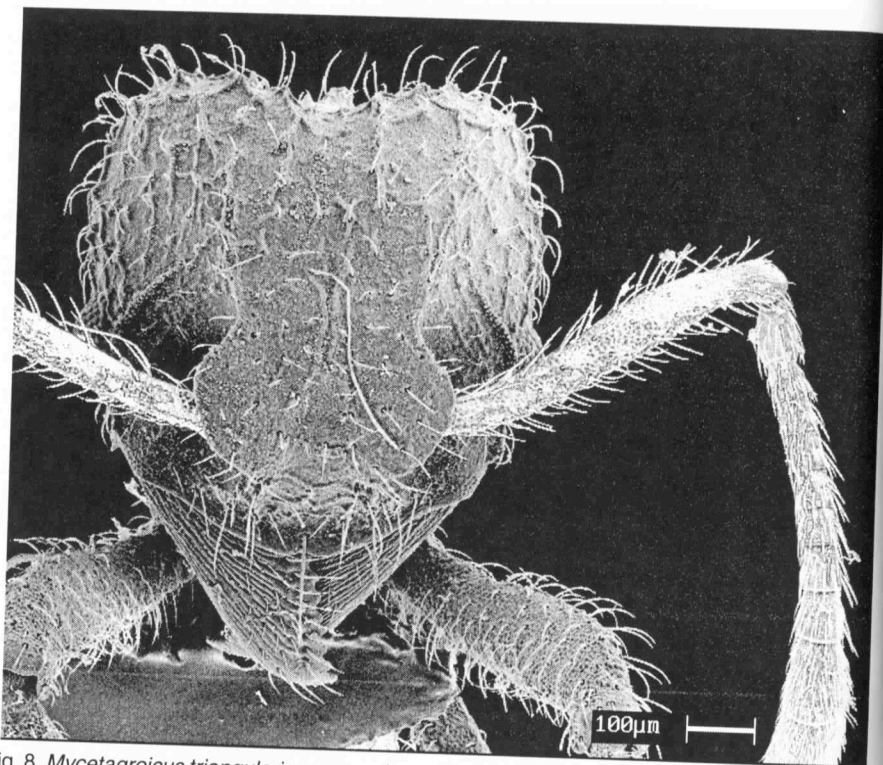


Fig. 8. *Mycetagroicus triangularis* new species, worker paratype, Brazil, MT: Gustavo Dutra. Head in frontal view.

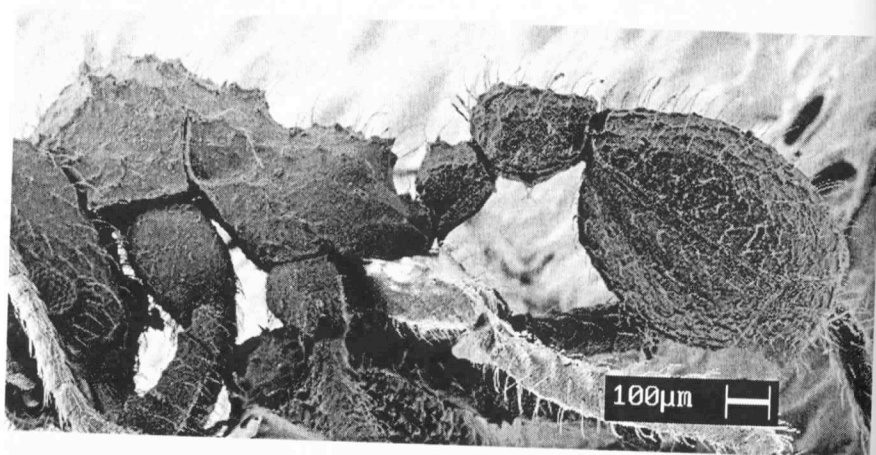
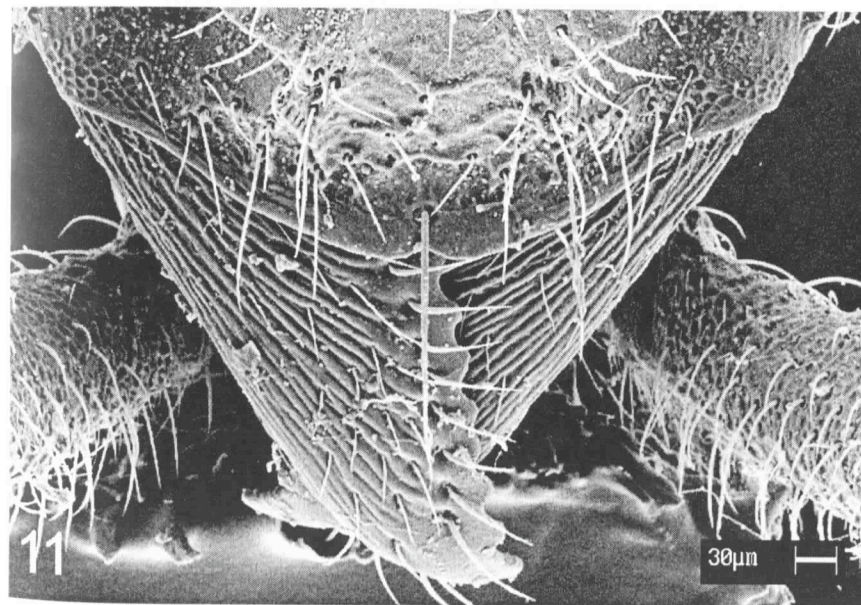
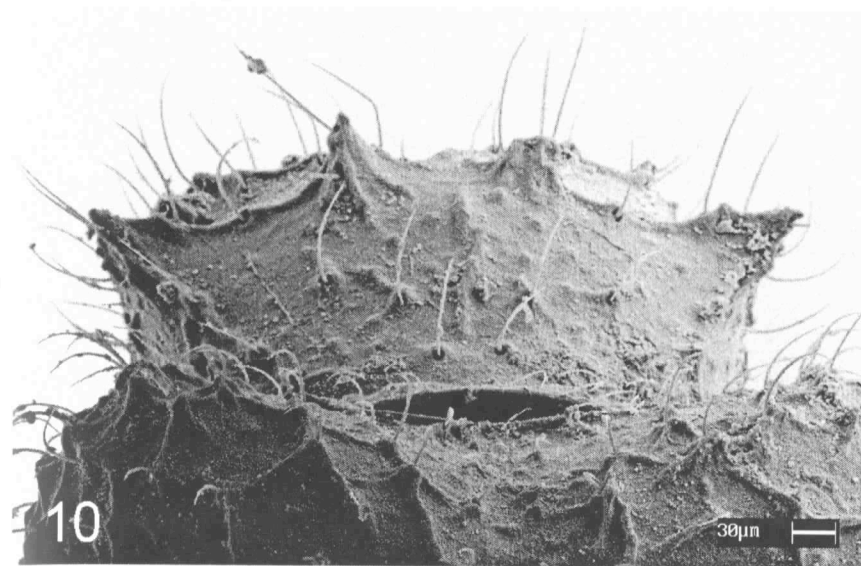


Fig. 9. *Mycetagroicus triangularis* new species, worker paratype, Brazil, MT: Gustavo Dutra. Habitus in lateral view.



Figs 10-11. *Mycetagroicus triangularis* new species, worker paratypes, Brazil, MT: Gustavo Dutra. Fig. 10. Pronotum in frontal view. Fig. 11. Detail of anterior portion of head.

exactly the same information as for this sample (Brandão, 1990). Mayhé Nunes visited the area recently and found that Gustavo Dutra was the name of an Agricultural School, now a small village known as São



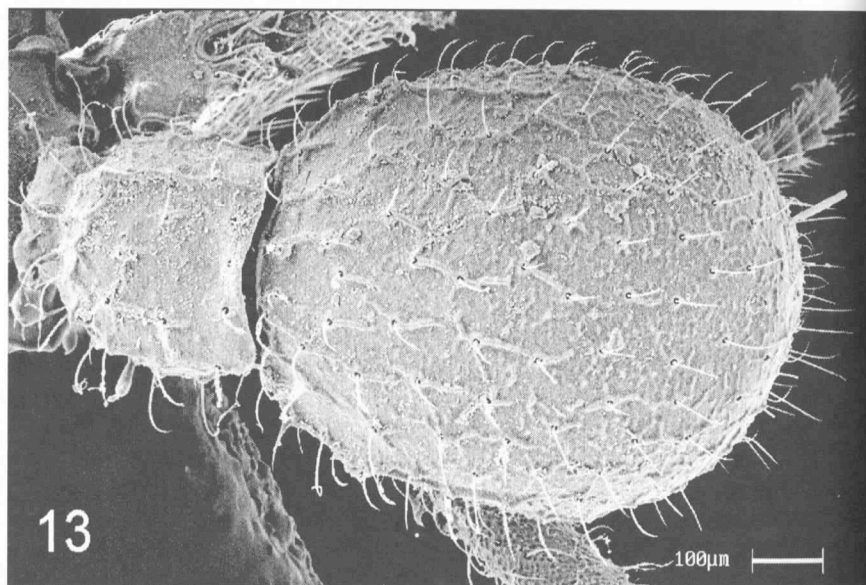


Fig. 12. *Mycetagroicus triangularis* new species, worker paratype, Brazil, MT: Gustavo Dutra. Habitus in dorsal view. Fig. 13. *Mycetagroicus triangularis* new species, worker paratype, Brazil, MT: Gustavo Dutra. Postpetiole and gaster in dorsal view.

Vicente, at the Santo Antonio do Leverger county, some 100 Km SE of the State capital, Cuiabá.

**Paratypes:** 3 workers, same data as holotype (one specimen at each

collection: MZSP - one intact plus one prepared for SEM; IBUS, USNM); one worker, BRAZIL, Distrito Federal: Brasília [15° 47' S, 47° 55' W], Fazenda Água Limpa "cerrado", 2. viii. 1988, T. Schultz col. TRS # 92 0802 03 (USNM); one dealated queen, BRAZIL, Bahia: Encruzilhada [15° 31' S, 40° 54' W], 960 m, xi. 1972, Seabra & Alvarenga col. # 8869 [Kempf notebook] (MZSP).

**Etymology.** The name was given in reference to the triangular shape of the clypeal teeth (Latin: *triangularis*).

**Description.** Worker. Measurements (in mm): TL 2.72; HL 0.80; HW 0.75; IFW 0.43; ScL 0.62; TrL 1.07; HfL 0.85. Color brown. Hairs all over the body, denser on antennae and legs.

Head (Figs 8, 11). Mandibular external margin strongly rugulose (Fig. 11), irregularly sculptured in relation to *M. cerradensis* (some 20 rugulae in a perpendicular line arising from the mandible external margin, at midlength) with an apical tooth and 7 regularly developed teeth; external margin straight from the base to the subapical tooth level, where it curves inwards. Clypeus (Fig. 11) lateral region near the base of frontal lobes with a triangular teeth, better seen in oblique view. Frontal area inconspicuous. Frontal lobes rounded, their largest width posterior to the antennal insertions, from where they curve inwards, forming a constriction. Frontal carinae slightly sinuous, fading well before reaching the occiput. Eyes with about 10 facets across the greatest diameter. Antennal scapes surpassing the occipital corners by near 5/6 of their chord length, when laid back over the head as much as possible. Only funicular segments I and VIII-X longer than broad, the other sub-equal.

Alitrunk (Figs 9-10, 12). Height of pronotal anterior face shorter than in the other *Mycetagroicus* species (Fig. 10, compare with Figs 4, 19). Lateral pronotal spines triangular, projecting from lateral margin. Pronotum with a pair of short but conspicuous median projections, widely separated; antero-inferior corners (Fig. 9) angulated or each with a minuscule tooth at apex. Mesonotum without projections on anterior portion; middle of posterior portion with a relatively low triangular protuberance microscopically tuberculated. Anepisternum separated from katapisternum by a strong ridge. Metanotal groove shallowly impressed. Propodeum spiracle opening slit shaped in side view.

Petiole, postpetiole and gaster (Figs 9, 12-13). Dorsum of petiole with two faint longitudinal ridges; the node proper, as seen from above, slightly broader than long (Fig. 12). Postpetiole longer than broad in dorsal view. Gaster (Fig. 13) with irregularly spaced hair pits. Dorsal disk of the gaster without longitudinal keels.

**Female** (Figs 14-16). Measurements (in mm) TL 3.75; HL 0.91; HW



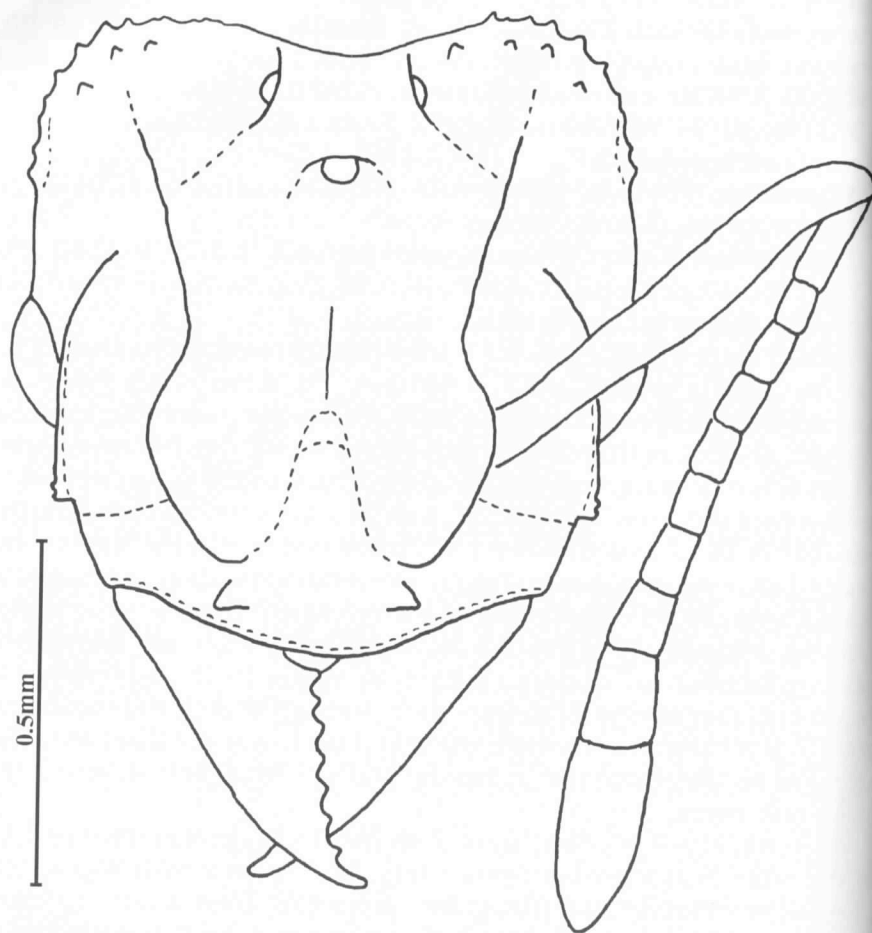
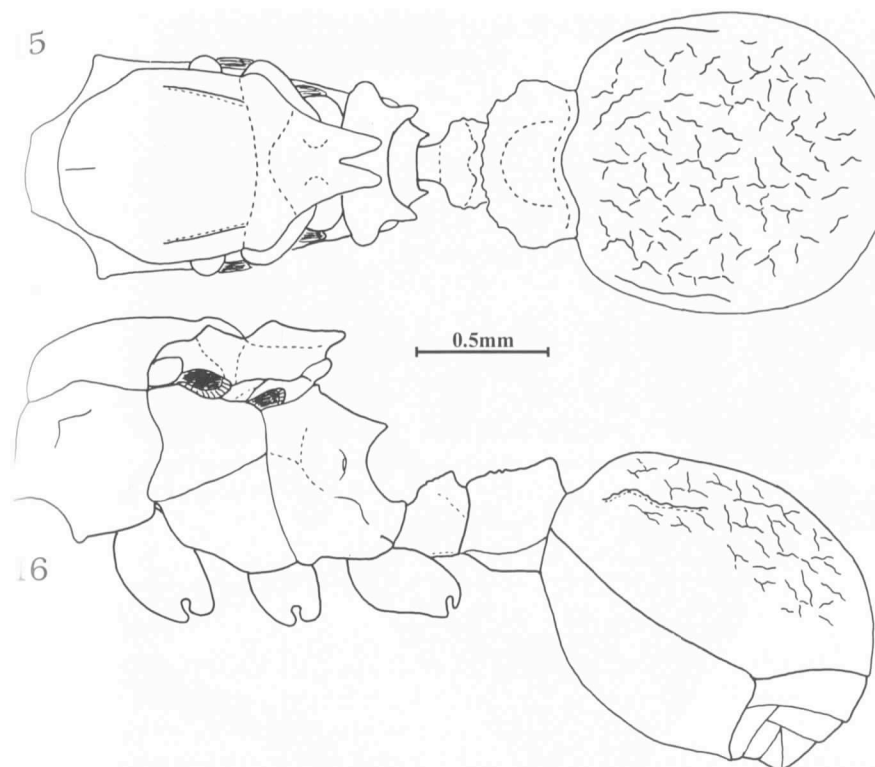


Fig. 14. *Mycetagroicus triangularis* new species, dealated queen paratype. BRAZIL, BA: Encruzilhada; Head in frontal view.

0.94; IFW 0.51; ScL 0.66; TrL 1.38; HfL 1.00. Color ferruginous brown, with the front of the head and gaster darker. Except by the short hairs on appendages, the whole body covered by moderately long curved or inclined hairs.

Head (Fig. 14). Very similar to those of the workers, except for the presence of three similarly developed ocelli; the presence of a distinct median longitudinal ridge posterior to the frontal area; and the more pronounced triangular clypeal projections.

Alitrunk (Figs 15-16). Pronotum without the median projections.



Figs. 15-16. *Mycetagroicus triangularis* new species, dealated queen paratype. BRAZIL, BA: Encruzilhada; Fig. 15. Habitus in dorsal view. Fig. 16. Habitus in lateral view.

Scutum without noticeable divisions; anterior border with a small longitudinal ridge; parapsidal furrows in low longitudinal keels; parapses slightly depressed, each with two minute transversal carinae. Mesothoracic paraptera impressed, with external borders smoothly rounded; the median area narrower than the lateral areas. Scutellum with two low and blunt tubercles; posterior margin with two close, flat and blunt spines, directed backwards; the distance among them at apices similar to their width at base. Metathoracic paraptera small and narrow (Fig. 16), covered by the scutellum spines in dorsal view. Propodeum with two big, blunt and flat spines, at the meeting of the basal and declivitous faces.

Petiole, postpetiole and gaster (Figs 15-16). Dorsum of petiole with two minute projections close to the posterior border. Postpetiole almost two times broader than petiole, shallowly impressed on the middle. Disc of the first gastric tergite with pronounced rugulae, forming a conspicuous net; and a short longitudinal ridge at each side.

**Biology.** In his notebook, Gonçalves recorded for sample #1677:



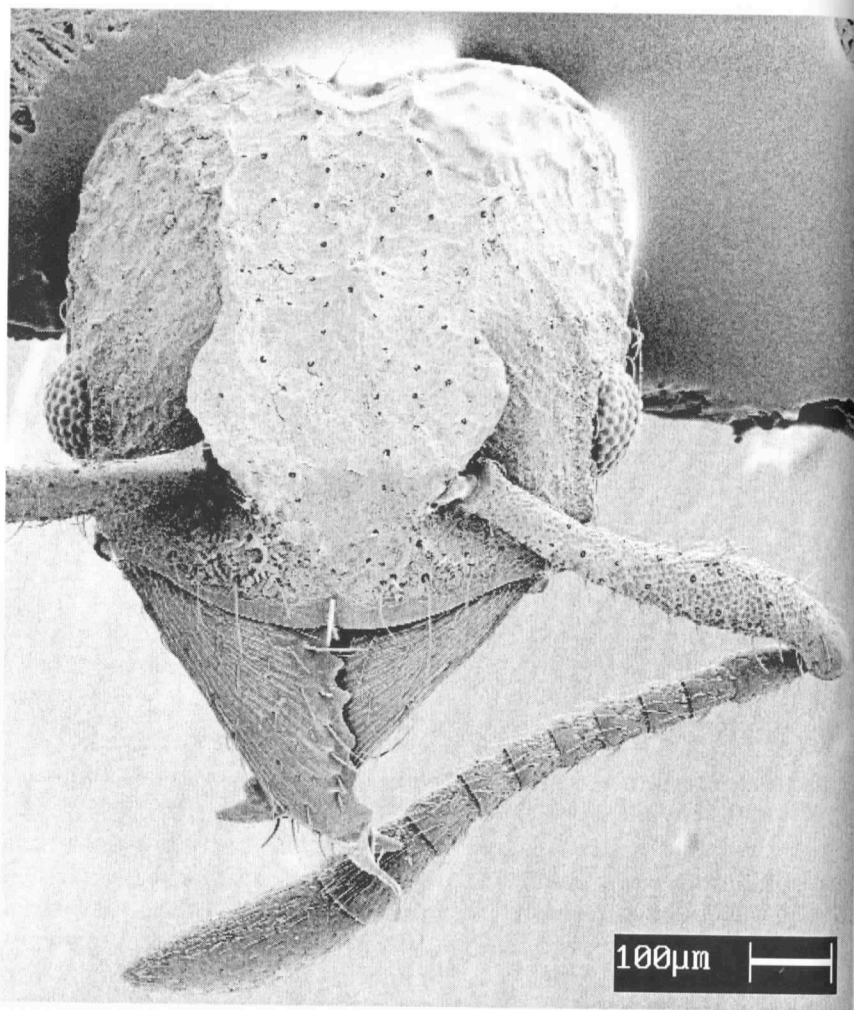


Fig. 17. *Mycetagroicus urbanus* new species, worker paratype, Brazil, SP: SP, Parque Ibirapuera. Head in frontal view.

"Attini. subterranean nest", which is the only available information on the biology of this species. The dealated female was collected in November, at the onset of the rainy season in Eastern Brazil.

**Comments.** The triangular teeth or projections at the lateral areas of the clypeus readily distinguishes this species from all other known *Mycetagroicus*. The Fazenda Água Limpa is a typical cerrado reserve that belongs to the Universidade de Brasília, but the lack of further information on the exact collecting place in Encruzilhada, Bahia state, prevents us from deriving any conclusion on its distribution or preferred

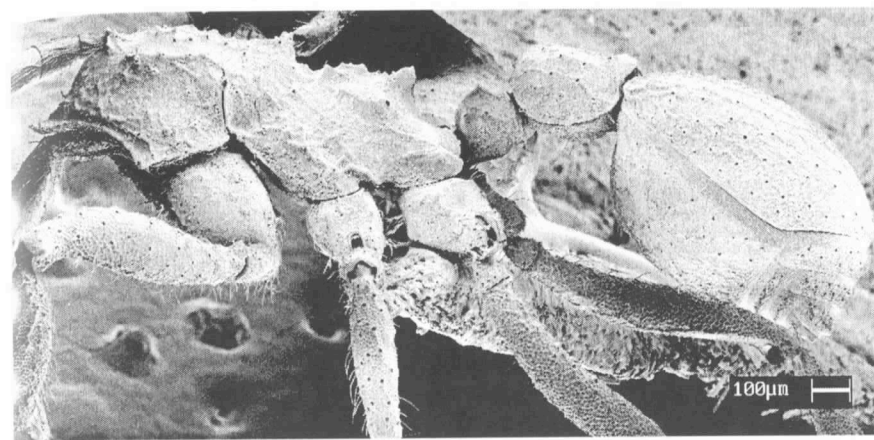


Fig. 18. *Mycetagroicus urbanus* new species, worker paratype (headless), Brazil, SP: SP, Parque Ibirapuera. Habitus in lateral view.

habitats.

### *Mycetagroicus urbanus* new species

Figs 17-23

**Holotype:** Worker BRAZIL, São Paulo State: São Paulo [23° 32' S, 46° 37' W], [Parque do] Ibirapuera, 10. x. 1943, C. R. Gonçalves leg. [# 482 n Gonçalves' notebook], deposited at MZSP.

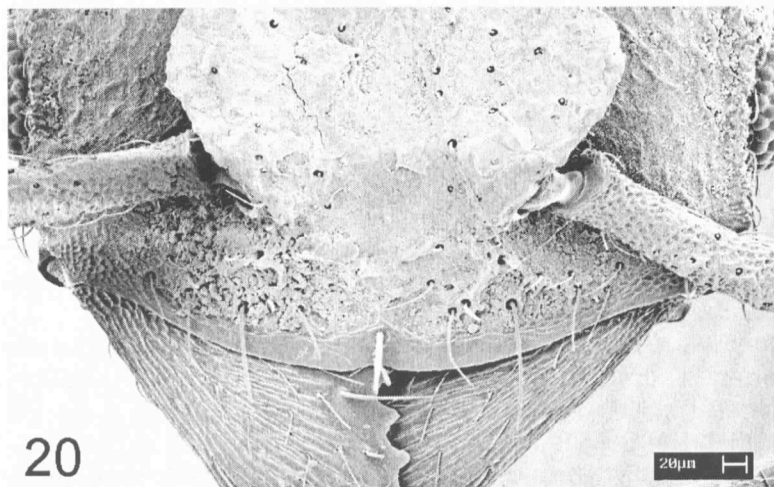
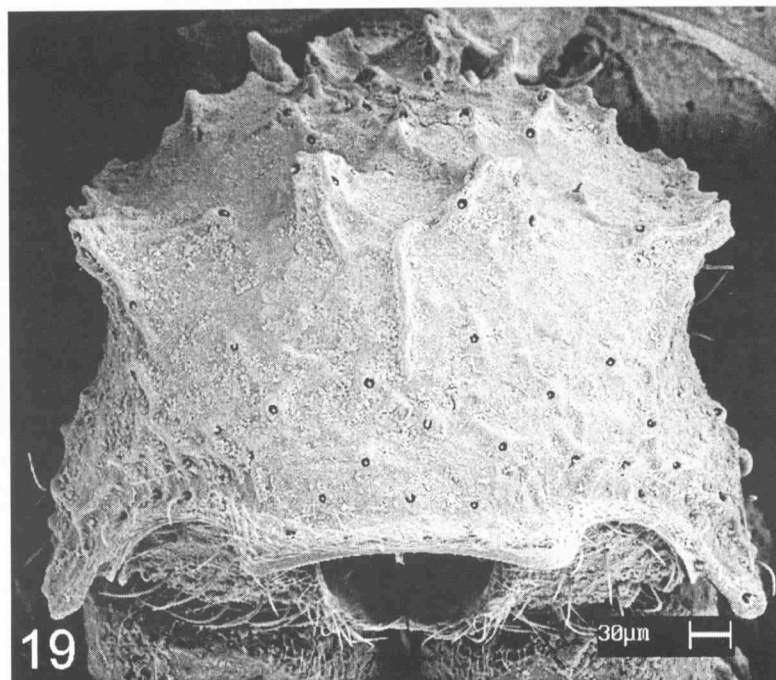
**Paratypes:** 6 workers, same data as holotype [3 MZSP- one prepared for SEM; 1 IBUS, 1 NMNH, 1 BMNH].

**Etymology.** We have chosen the Latin name *urbanus* because the only known sample of this species was collected at the main public park within São Paulo city.

**Description. Worker.** Measurements (in mm): TL 2.64; HL 0.91; HW 0.82; IFW 0.43; ScL 0.71; TrL 1.11; HfL 0.88. Color medium brown, gaster and frons darker. Short and scarce hairs all over the body, denser on appendages (Fig. 17-18).

Head (Figs 17, 20, 23). Dorsal surface of the mandibles (Fig. 20) not so strongly sculptured as in the other species (some 20 rugulae in a straight line perpendicular to the mandible, at midlength), fading but not ending in a straight line as in *M. cerradensis*, each rugula blending with the superficial texture of the mandibles near the smooth flange at the masticatory margin. Masticatory margin of the mandible with an apical tooth and 6 sub-apical irregular teeth, the 3 apical ones rounded and more spaced, while the 3 basal ones are more prominent and closer to each other; outer border straight from the apical tooth level of the second basal tooth. Clypeus lateral regions near the base of frontal





Figs 19-20. *Mycetagroicus urbanus* new species, worker paratype, Brazil, SP: SP, Parque Ibirapuera. Fig. 19. Pronotum in frontal view. Fig. 20. Detail of anterior portion of head.

lobes without projections. Frontal area inconspicuous. Frontal lobes rounded, their largest width posterior to the antennal insertions. Frontal carinae slightly sinuous, fading well before reaching the occiput. Eyes with 10 facets across the greatest diameter. Antennal

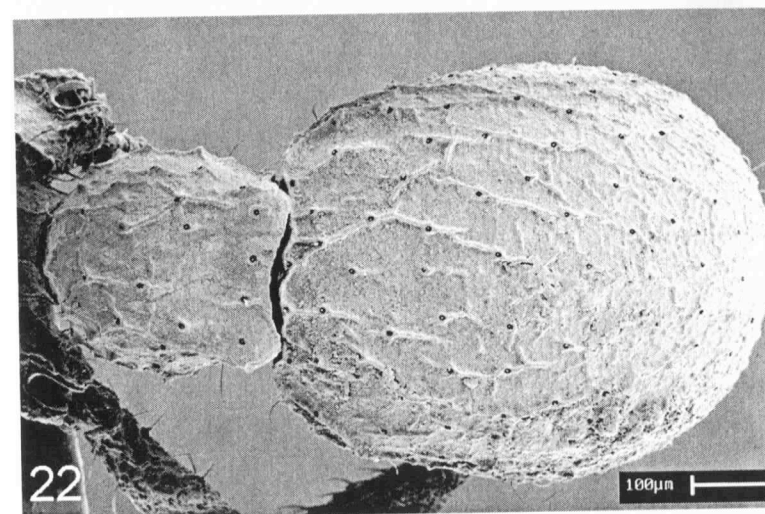
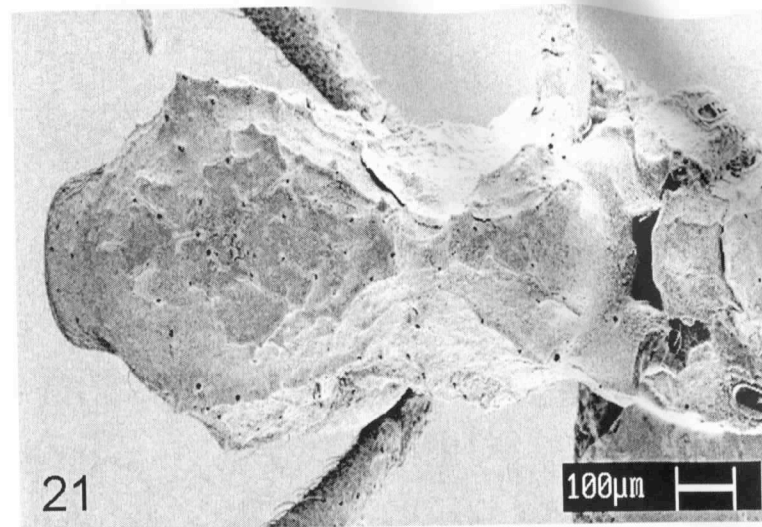


Fig. 21. *Mycetagroicus urbanus* new species, worker paratype, Brazil, SP: SP, Parque Ibirapuera. Habitus in dorsal view.

Fig. 22. *Mycetagroicus urbanus* new species, worker paratype, Brazil, SP: SP, Pq. Ibirapuera. Postpetiole and gaster in dorsal view.

scapes surpassing the occipital margin by 1/6 of its chord length when laid back over the head as much as possible. Only funicular segments I and VIII-X longer than broad, the other subequal to each other.

Alitrunk (Figs 18-19, 21). Lateral pronotal spines (Fig. 19) scarcely projecting from pronotal lateral margin, irregular in shape; pronotum with a pair of short but conspicuous median spines; antero-inferior



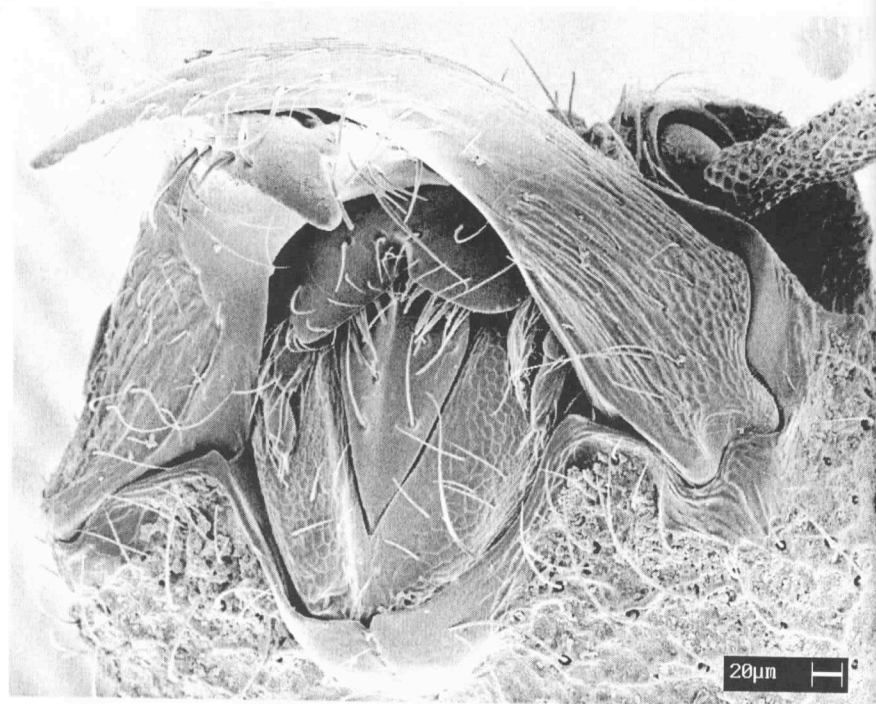


Fig. 23. *Mycetagroicus urbanus* new species, worker paratype, Brazil, SP: SP, Pq. Ibirapuera. Detail of mouthparts in ventral oblique view.

corners angulated (Fig. 18). Mesonotum with a median projection as a relatively high conical protuberance, microscopically tuberculated. Metanotal groove relatively narrow and deeply impressed. Opening of propodeal spiracle almost rounded in side view.

Petiole, postpetiole and gaster (Figs 18, 21-22). Dorsum of petiole with two low longitudinal ridges; in lateral view, triangular and acute; the node proper, as seen from above, slightly broader than long. Postpetiole slightly longer than broad in dorsal view; the posterior margin projected above the level of the postpetiole dorsum, in lateral view (Fig. 18). Gaster hair pits as irregularly distributed as in *M. triangularis*, without dorsal keels (Fig. 22).

**Biology.** At Cincinnato R. Gonçalves' notebook we have found the following information: "# 482 - *Mycetosoritis*. Attini em revoada [in dispersion flight]. Ibirapuera, São Paulo, SP, 10. x. 1943. C. R. Gonçalves". He recorded the nest entrance as narrow and surrounded by a single low mound, made up of fine grains of earth. The fact that Gonçalves collected these specimens while in dispersion flight suggests that he may have collected sexuals along with the workers we have

found in the MZSP. Supporting this idea, we have found in Kempf's notes, records on males of an "unidentified attine genus", supposedly belonging to this sample. However, all attempts made to locate sexuals of this sample failed. Sexuals from this locality with the same label number were not found also at IBUS, where most of Gonçalves material has been deposited.

**Comments.** Unlike *M. cerradensis* and *M. triangularis*, *M. urbanus* does not have lateral clypeal teeth; *M. urbanus* share with *M. triangularis* the presence of two conspicuous median low irregular spines in the middle of the pronotum. Only the funicular segments I and VIII-X are longer than broad, as in *M. triangularis*, but the mesonotal protuberance is higher than in the other species. The *M. urbanus* frontal lobes are rounded, with their largest width posterior to the antennal insertions. The paratype worker in Figs 9-10 is a relatively aged worker, considering the material already accumulated over the integument; its mandibular teeth apices are very much worn out, suggesting that younger workers of *M. urbanus* may have much more acute and long mandibular teeth.

## DISCUSSION

When comparing workers and the only known queen of *Mycetagroicus* with other attine genera and with other myrmicine tribes, we have noticed that all attines share the presence of a long median seta at the anterior clypeal margin, apparently similar to the condition found in Solenopsidini genera and other scattered Myrmicinae. However, a closer look reveals that in Attini the median seta arises below the line on which depart the other clypeal seta; moreover, the anterior border of the Attini clypeus itself is produced into an anteclypeus - a smooth acute flange, parallel to the clypeal margin, at the same plane of the clypeus, and not perpendicular to it as in other Myrmicinae. The median seta, in the case of the Attini, arises from the flange (or very close to the limit of the clypeus and the anteclypeus) which is not the case in any other myrmicine genus. This represents the first morphological synapomorphy for the Attini tribe adult females.

The Attini monophyly is also supported by their exclusive ability to cultivate fungi, on which they depend for nourishment. However, an unidentified Solenopsidini *Megalomyrmex* of the Silvestrii group (Brandão, 1990), eat fungi obtained from attine larval coating they prey upon (Adams *et al.* 2000).

The description of this new taxon increases to twelve the number of extant Attini genera, considering the synonym of the monotypic workless *Pseudoatta* in *Acromyrmex* informally suggested by Hölldobler &





Fig. 24. Geographic distribution of *Mycetagroicus* new genus.

Wilson (1990), and that *Proatta* is now considered a Stenammini (Bolton, 1994).

According to Kusnezov (1963), *Apterostigma*, *Myrmicocrypta* and *Mycocepurus* belong to an informal group, he called "Palaeoattini", representing the first derivation of the ancestral stem of the tribe. In opposition to Kusnezov's ideas, Weber (1982) suggested *Cyphomyrmex* as the most "basal" Attini. Mayhé-Nunes (1995), however, found three morphological features shared by the group of genera in the proposal of Kusnezov: (1) absence of inferior pronotal projections; (2) compound

eyes placed posteriorly on the sides of the head, closer to the occipital corners than to the mandibular insertions and; (3) presence of a furrow between the frontal lobes. Kusnezov (*op. cit.*) called the remaining Attini as "Neoattini", a group that includes most fungus growing ants and especially the leaf-cutting ants, *Atta* and *Acromyrmex*, placed by several authors at the "apex" of the evolutionary history of Attini. *Mycetagroicus* belongs to the "Neoattini".

The workers of true leaf-cutting ants have a notable polymorphism, which is by itself, enough to discard a stronger relationship of *Atta* and *Acromyrmex* with *Mycetagroicus*. It is beyond the scope of this paper to deal with the relationships among the basal genera of the "Higher Attini", but we have provided comparisons of *Mycetagroicus* with the other genera after describing the genus.

Workers of all three species of *Mycetagroicus* have the integument almost completely covered by soil particles in a fashion similar to other myrmecine Basicerotini and Stegomyrmecini (Hölldobler & Wilson, 1986), resulting in the same camouflage effect derived from the thin and continuous mud layer, enhancing the overall resemblance of the ants to the environment they live in. This effect is enhanced in relatively aged workers, supposedly the foragers. However, *Mycetagroicus* does not have specialized hairs, as in Basicerotini and Stegomyrmecini, but their bodies are mostly of a rough texture, and covered with regularly spaced pits, from which depart long, deeply set, unspecialized erect to suberect hairs. Based on the fact that mud particles are firmly attached to the ant's body, it seems likely that the hair pits may produce some adhesive secretion to help hold soil particles in place. The mud layer is not an SEM artifact because: 1. the picture with the *M. triangularis* ventral worker head clearly shows the mouth parts devoid of any soil particles, although otherwise encircled by areas completely covered by dirt; if the coating was the result of long term storage, all body surface would have been evenly covered. 2. it is likely that the specimen from which we took the mouth apparatus picture represents an aged worker, considering the very much worn out mandibular teeth. At the same time we have pictures of two *M. cerradensis* paratypes, a relatively young worker from Rancharia, SP, Brazil (Fig. 1), clean of any soil grains, and a more aged worker from Fazenda Itaquere, SP, Brazil (Fig. 5), showing not only more worn out mandibular teeth, but with many soil particles attached to the integument.

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