

Revision of the fungus-growing ant genera *Mycetophylax* Emery and *Paramycetophylax* Kusnezov rev. stat., and description of *Kalathomyrmex* n. gen. (Formicidae: Myrmicinae: Attini)

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Abstract

Based on the morphology of workers, gynes and males, we revise the taxonomy of nominal taxa traditionally included by authors in the fungus-growing ant genus *Mycetophylax*. Our results indicate that *Mycetophylax* Emery (*Myrmicocrypta brittoni* Wheeler, 1907, type species, by designation of Emery, 1913; junior synonym of *Cyphomyrmex conformis* Mayr, 1884 by Kempf, 1962) includes *M. conformis*, *M. simplex* (Emery, 1888), and *M. morschi* (Emery, 1888) **new combination** (formerly in *Cyphomyrmex*), with several synonymies. *Mycetophylax bruchi* (Santschi, 1916) does not belong to the same genus and is diagnosed, in addition to other characters, by a psammophore arising at the anterior margin of the clypeus. For this species we are resurrecting from synonymy *Paramycetophylax* Kusnezov, 1956 (*Mycetophylax bruchi* as type species, by original designation, with *M. cristulatus* as its **new synonym**). *Myrmicocrypta emeryi* Forel, 1907 is the only attine in which females lack the median clypeal seta and have the antennal insertion areas very much enlarged and anteriorly produced, with the psammophore setae arising from the middle of the clypeus and not at its anterior margin as in *Paramycetophylax*. Notwithstanding its inclusion in *Mycetophylax* by recent authors, it is here recognized as belonging to a hitherto undescribed, thus far monotypic genus, *Kalathomyrmex* **new genus** (*Myrmicocrypta emeryi* as its type species, here designated). We redescribe workers, gynes and males of all species in the

three genera and describe for the first time gynes of *Mycetophylax conformis* and *M. simplex*, males of *M. simplex* and *M. morschi*, and gynes of *P. bruchi*. Furthermore we present a key to the workers of the taxa treated here (most formerly included under the name *Mycetophylax*), a key to workers of the *Mycetophylax* in the revised sense, SEM pictures and high resolution AutoMontage© photographs of the species, along with maps of collection records and a summary of biological observations.

Key words: Taxonomic revision, Attini, *Mycetophylax*, *Paramycetophylax* revalidated, *Kalathomyrmex* new genus

Introduction

Mycetophylax is currently one of the most poorly known genera of the fungus-growing ant tribe Attini (Myrmicinae). The catalogues listing the Neotropical ants (Kempf, 1972; Brandão, 1991; Bolton, 1995, Bolton *et al.* 2006) register twenty species, subspecies and varieties of *Mycetophylax* as nomenclaturally valid, but there is no recent and reliable taxonomic revision of the genus. Interestingly Kempf noted in 1962 that *Mycetophylax* "certainly is an ill-defined assembly of heterogeneous forms, a residue of classification. Whereas some of its members, such as *emeryi*, *cristulatus* and *bruchii*, are quite distinct from *Cyphomyrmex s. str.*, the type species *brittoni* (= *conformis*) is dangerously close to *Cyphomyrmex morschi*, as Emery already pointed out in 1922 (p. 343). The only good generic difference for workers consists in the absence of a clearly defined and circumscribed antennal scrobe in *Mycetophylax*." Actually *C. morschi* does not show a true antennal scrobe, which in general is bordered by a strong carina; *C. morschi* females present lateral depressions on the head, distinctly less developed than in *Cyphomyrmex* species.

Mayr (1884) described the first species currently included in *Mycetophylax*, *Cyphomyrmex conformis*. In 1907, Forel and Wheeler each described a species in *Myrmicocrypta*, now accepted as *Mycetophylax* (respectively *M. emeryi* and *M. brittoni*), both authors suspecting that these species might not belong to *Myrmicocrypta*. Wheeler (1911) described the alate forms of *M. brittoni* (junior synonym of *M. conformis* by Kempf, 1962) and reinforced the argument for their inclusion in a different genus. Finally, in 1913, Emery recognized *Mycetophylax* as a distinct taxon, but as a subgenus of *Cyphomyrmex*, designating *M. brittoni* Wheeler (1907) as type-species. However, Gallardo (1916) recognized *Mycetophylax* as a subgenus of *Myrmicocrypta*. In 1923, *Mycetophylax* was raised to generic level by Santschi. The same author, in 1922, published a comprehensive but now very much outdated key for the species, subspecies and varieties of the genus.

Paramycetophylax was described by Kusnezov in 1956, with *Sericomyrmex bruchi* as the type species by original designation. Weber (1958) synonymized *Paramycetophylax* with *Mycetophylax*, based on similarities of *S. bruchi* with *M. cristulatus*. We studied the *M. cristulatus* types and consider this species a junior synonym of *S. bruchi*.

In 1962, Kempf transferred *Cyphomyrmex conformis* Mayr (1884), *Myrmicocrypta brittoni* Wheeler (1907), and *Myrmicocrypta emeryi* Forel (1907) to *Mycetophylax*.

In 2002, Villesen *et al.* presented a phylogenetic hypothesis for the tribe Attini. In their analysis *Mycetophylax* appears as a paraphyletic taxon. Also, in the phylogenetic hypothesis on the fungus symbiosis with Attini ants (Mueller *et al.* 1998, Mueller 2002) there is no support for the monophyly of the genus, strengthening Kempf's (1962) argument that *Mycetophylax*, in its traditional conception, is not monophyletic. In the most recent phylogeny of the attine fungus-growing ants (Schultz & Brady, 2008), *Mycetophylax* also appears paraphyletic, with *M. emeryi* as the sister-group of all Neoattini, and *M. conformis* and *Cyphomyrmex morschi* forming a clade diverging later on. Unfortunately, this phylogenetic study did not include *Mycetophylax bruchi* specimens.

Moreover, the very imprecise descriptions of the species included in *Mycetophylax* by previous authors do not afford easy separation from other Attini genera, and we found grounds to question the present taxonomic status of the species grouped under *Mycetophylax*, justifying its revision. As *Mycetophylax* was never

properly described, most authors accept the sum of the species descriptions as a working definition for the genus.

A careful comparative morphological examination of all *Mycetophylax* species led us to confirm that the genus as accepted until now is paraphyletic in relation to other Attini lineages, which occupy different positions in the phylogeny proposed by Schultz & Brady (2008), and we suggest the division of *Mycetophylax* into three taxa, as justified below. The genus *Mycetophylax* Emery, 1913, in the new sense, includes *M. conformis* (Mayr, 1884), *M. simplex* (Emery, 1888), and *Cyphomyrmex morschi* Emery, 1888 (transferred here to *Mycetophylax*), along with their subspecies and varieties. The species *Mycetophylax bruchi* (Santschi, 1916), *M. cristulatus* (Santschi, 1922), also with their subspecies and varieties are hereby synonymized and transferred to *Paramycetophylax* Kusnezov (1956), which we resurrect in the current study. The species *Mycetophylax emeryi* (Forel, 1907), along with its subspecies and varieties, is designated as type species of a new monotypic genus, *Kalathomyrmex* Klingenberg & Brandão **new genus**. This revised classification of the species formerly included in *Mycetophylax*, based on the comparative morphology only, agrees perfectly with the time-calibrated molecular phylogeny of the Attini (Schultz & Brady, 2008), although we came to these results independently. It should be noted that *M. bruchi* was not included in the molecular analysis.

The authors who described *Mycetophylax* species (Emery 1888; Wheeler 1907, 1911; Forel 1912; Santschi 1916, 1922, 1923, 1925, 1929; Weber 1948 and Kempf 1962) used different character traits for diagnosing these ants. Here we present illustrated redescriptions and descriptions of the workers, gynes and males, along with digital high resolution AutoMontage© photographs and scanning electron micrographs (SEM). In collections, specimens of *Mycetophylax*, *Paramycetophylax*, and *Kalathomyrmex* are relatively rare. This may be due to the habitat preference of these ants, as few myrmecologists collect along the beaches of the sea coast or in river margins (but see Gonçalves & Mayhé-Nunes 1984, Bonnet & Lopes 1993, Diehl-Fleig *et al.* 2000, and Albuquerque *et al.* 2005). Even in the few available studies, *Mycetophylax* species are in general listed only as morpho-types. We provide many new collection records, maps showing the known geographic distribution of all species, and a summary of habits and other biological observations.

Material and methods

For this revision we examined specimens deposited in the Museu de Zoologia da Universidade de São Paulo (MZSP, curator C. R. F. Brandão), that includes many Attini types (Klingenberg & Brandão, 2005), recently collected specimens of *Mycetophylax*, and donations by Eduardo Diehl-Fleig, Alex Wild and Scott Solomon, along with specimens loaned from institutions listed below. Collection acronyms follow Brandão (2000), and are cited followed by the names of the curators of the respective collections or responsible for the loans.

AMNH	American Museum of Natural History, New York, USA, Dr. James M. Carpenter.
INPA	Instituto Nacional de Pesquisas de Amazônia, Manaus, Brazil, Dr. Heraldo Vasconcelos.
MCSN	Museo Civico di Storia Naturale “Giacomo Doria”, Genova, Italy, Dr. Valter Raineri.
MNHB	Museum für Naturkunde der Humboldt-Universität Berlin, Berlin, Germany, Dr. Frank Koch.
NHMB	Naturhistorisches Museum Basel, Switzerland, Dr. Daniel Burckhardt.
SMNK	Staatliches Museum für Naturkunde Karlsruhe, Germany, Dr. Manfred Verhaagh.
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA, Dr. Ted Schultz.

For the list of examined specimens, we have adopted the following abbreviations: w (worker), q (queen/gyne), and m (male).

The specimens were analyzed under a binocular stereomicroscope Wild M8® with ocular lenses 10 to 16 X. Digital photos were taken with a Leica MZ 6 binocular, coupled to a high resolution JVC KY-F70B camera. To produce a single image with extended focus of a series of in-focus images, we used the software

package AutoMontage©. SEM photographs were taken using the scanning electron microscope (SEM) model Zeiss Leo 440® of the MZSP. For that, the specimens were previously cleaned with 99% alcohol and kept in an ultrasonic bath (Thornton®) for three minutes in a frequency of 40 kHz. After that, a series of washings were made, reducing the alcohol and increasing the acetone part in steps of 25%. Then the specimens were submersed in a 100% acetone solution for at least 20 minutes and the ants glued on aluminum triangles, which were fixed on a stub support for the SEM. Finally the specimens were metalized with gold using a Bal-Tec SCD 050® sputter.

Morphometric characters follow Bolton (2000) and were obtained using a micrometric reticule adapted to a binocular stereomicroscope. The following characters and indices were registered and calculated for each measured specimen. All measurements are presented in millimeters (mm).

Interocular distance (IOD): maximum width of the head in full-face view, taken at the middle of the internal margins of the compound eyes.

Head length (HL): maximum length of the head in full-face view, from the midpoint of the clypeal border, in a transverse line, to the mid-point of the transverse line that spans the apices of the posterolateral corners of the head.

Cephalic Index (CI): $IOD/HL \times 100$.

Scape length (SL): maximum chord length of the scape, excluding its basal condyle.

Scape Index (SI): $SL/IOD \times 100$.

Mandible length (ML): maximum length of the mandible at full closure, in full-face view, from the tip of the apical tooth, in a transverse line, to the midpoint of the clypeus.

Mandibular Index (MI): $ML/HL \times 100$.

Pronotal width (PrW): maximum width of the pronotum in dorsal view.

Weber's length of the mesosoma (WL): diagonal length of the mesosoma in lateral view, measured from the anteriormost portion of pronotum collar to the posteroventral corner of the mesopleuron.

Petiole length (PL): maximum length of the petiole, in lateral view.

Postpetiole length (PPL): maximum length of the postpetiole, in dorsal view.

Gaster length (GL): maximum chord length of the gaster, from the meeting of abdominal tergum 4 and sternum 4 at its anterior end to the most posterior point of the last segment, in lateral view.

Metafemoral length (FL): maximum chord length of metafemora.

Total length (TL): sum of ML, HL, WL, PL, PPL and GL.

Morphological terms follow Bolton (1994). To distinguish among *Mycetophylax* species based on females, we found it useful to compare the expansion of the frontal lobes in relation to the head width, although we have not actually measured the expansion. We present these observations always in comparison to the head width (IOD), describing roughly how much of the head capsule is “covered” by the frontal lobes. For males, we found it useful to describe how much of the pronotum is “covered” by the scutum, that is, looking at the antero-dorsal margin of the pronotum in side view, if one third or two thirds of the margin is free. The terminology for the wing venation follows Klingenberg & Dietz (2004).

Results and discussion

Recent publications on the Attini phylogeny suggest that some genera, as traditionally treated by authors, are paraphyletic, for instance *Mycetosoritis* (Mueller *et al.* 1998), *Mycetophylax* (Mueller 2000) and *Trachymyrmex* (Villesen *et al.* 2002, but see Mayhé-Nunes & Brandão, 2002). Our comparative morphological studies confirm this for *Mycetophylax* in its present conception, and we divide it into three monophyletic genera - *Mycetophylax*, *Paramycetophylax* and ***Kalathomyrmex* new genus** - based on several characters, discussed in the appropriate sections.

Taxonomic synopsis

Mycetophylax Emery 1913

Cyphomyrmex conformis Mayr 1884. Brazil, French Guiana, Puerto Rico, Trinidad, Venezuela.

= *Myrmicocrypta brittoni* Wheeler 1907

= *Mycetophylax brittoni* var. *litoralis* Weber 1937

Mycetophylax morschi (Emery 1888). **New combination.** Brazil

= *Cyphomyrmex* (*Mycetoritis*) *personatus* Santschi 1923

Mycetophylax simplex (Emery 1888). Brazil.

***Kalathomyrmex* New genus**

Myrmicocrypta emeryi Forel 1907. **New combination.** Argentina, Bolivia, Brazil, Colombia, Guyana, Paraguay, Peru, Venezuela

= *Mycetophylax hummelincki* Weber 1948

= *Myrmicocrypta emeryi* var. *arenicola* Forel 1912. **New Synonymy.**

= *Myrmicocrypta* (*Mycetophylax*) *emeryi* var. *argentina* Santschi 1916. **New Synonymy.**

= *Myrmicocrypta emeryi* var. *fortis* Forel 1912. **New Synonymy.**

= *Mycetophylax bolivari* Weber 1948. **New Synonymy.**

= *Myrmicocrypta* (*Mycetophylax*) *emeryi* st. *gallardoi* Santschi 1922. **New Synonymy.**

= *Mycetophylax emeryi* st. *hubrichi* Santschi 1925. **New Synonymy.**

= *Mycetophylax emeryi* st. *weiseri* Santschi 1929

= *Mycetophylax glaber* Weber 1948. **New Synonymy.**

***Paramycetophylax* Kusnezov 1956. Revised status**

Sericomyrmex bruchi Santschi 1916. **New combination.** Argentina.

= *Mycetophylax bruchi* var *pauper* Santschi 1923. **New Synonymy.**

= *Myrmicocrypta* (*Mycetophylax*) *cristulata* Santschi 1922. **New Synonymy.**

= *Mycetophylax cristulatus* var. *emmae* Santschi 1929. **New Synonymy.**

Identification key to the genera formerly considered *Mycetophylax*, based on workers and gynes

1. Subtriangular head, without psammophore. Posterior margin of postpetiole straight, without any median impression. Color light to dark brown. Lives exclusively in dunes and “restingas” of the Atlantic Ocean; preferring arid habitats with sandy soil *Mycetophylax* (Figs 1–3, 6a–g, 7)
- Quadrate or subquadrate head, long setae at clypeus forming a psammophore. Posterior margin of postpetiole with a median impression. Color reddish-brown or brownish. Not restricted to Atlantic Ocean beaches..... (2)
2. Clypeal psammophore setae arising close to the anterior margin of the clypeus; median clypeal seta present; clypeal latero-posterior margins not strongly produced as rounded ridges. Postpetiole triangular when seen from above. Frontal lobes triangular and well developed (Fig. 5). Color brownish..... *Paramycetophylax* (Figs 5, 7)
- Clypeal psammophore setae arising from the midportion of the clypeus medially and at the posterior margin laterally; median clypeal seta lacking; clypeal latero-posterior margins strongly produced as rounded ridges, resulting in a large circular area where the antennal scapes articulate. Postpetiole heart-shaped when seen from above. Frontal lobes reduced, but almost covering the antennal insertions. Color reddish-brown *Kalathomyrmex* (Figs 4, 5h–I, 7)

***Mycetophylax* Emery, 1913**

(Figs. 1–3, 6 a–g, 7a)

Cyphomyrmex (in part) Mayr, 1884: 9

Myrmicocrypta (in part) Wheeler, 1907: 728; Forel 1907: 144

Cyphomyrmex (*Mycetophylax*) Emery 1913: 251; key to species, Santschi, 1922: 357; raised to genus by Santschi 1923: 268

Myrmicocrypta (*Mycetophylax*) Santschi, 1916: 383, Gallardo, 1916: 320

Sericomyrmex (in part) Santschi, 1916: 383

Type species: *Myrmicocrypta brittoni* (Mayr, 1884) (original designation) (junior synonym of *Mycetophylax conformis*)

Worker: Monomorphic ants belonging to the Attini tribe. Integument areolate, smooth and shiny at the metapleural gland. Sculpture of the mandible discs varies between species. Hairs short, appressed.

Head longer than wide, almost triangular, the greatest width of head at posterior third. Compound eyes at the anterior third of head capsule, convex, surpassing the lateral margin in frontal view. Anterior margin of labrum slightly concave in the middle otherwise rounded. Triangular mandibles with seven to ten teeth at masticatory margin, which is smooth, without any trace of sculpture. Apical teeth longer than the others, which are reduced in size basally; the most basal tooth appearing as a denticle. Posterior portion of clypeus extending up to the level of the antennal insertions. Posterior margin of clypeus visible as a distinct suture; frontal area triangular and shallowly impressed. Area between preocular carina and frontal carina free of hairs, distinct (in *M. morschi* this area is particularly impressed, although the lateral expansion covers only the base of the scapes, and not as in the true antennal scrobes of *Cyphomyrmex*, where most if not all of the scape can be lodged inside the scrobe). Frontal lobes laterally produced and covering the antennal insertions; frontal carinae reaching the posterior third of the head. Vertexal margin concave; posterolateral lobes rounded.

Mesosoma without spines, smooth or bearing only rounded protuberances. Pronotal shoulders rounded. Promesonotum moderately convex in profile. Propodeal spiracle clearly visible, as well as the opening of the metapleural gland. Petiole longer than high; in lateral view, peduncle very short, with an undifferentiated node. Subpetiolar process always distinct, blunt, with rounded apex. In dorsal view, postpetiole always wider and longer than the petiole. Posterior margin of postpetiole straight, without an impression or distinct lobes. Gaster without tubercles or protuberances; a little smaller than the head.

Gyne: Color, pilosity and sculpture as in conspecific workers, but with three equally developed ocelli in the middle of the head. Anteriorly rounded scutum, scutum-scutellar sulcus convex in relation to the scutum. Axilla well developed. Parapsides almost indistinct, set between parapsidial lines and latero-posterior margin of the scutum which is limited by a carina. Anepisternum and katepisternum divided by a suture. Katepisternum anterior border sinuous. Petiole, postpetiole and gaster like those of the workers. Gaster with the same width as the head.

Male: Pilosity similar to that of conspecific workers and gynes. Triangular mandibles with five to seven teeth; the apical always longer than the others. Clypeus bulging until the frontal area. Head without antennal scrobes, at most with a depressed area where the antennae articulate; antennal scapes almost twice as long as the funiculus and always surpassing the posterolateral corners of the head. Small, impressed, hairless frontal area. Compound eyes set at the anterior half of head, occupying almost half to one fourth of its lateral margin, in full face view. Three equally developed ocelli. Antennae with 12 to 13 segments. Anterior part of scutum smooth with a median hairless furrow. Parapsidial lines parallel in relation to the main body axis. In dorsal view, prescutellum slender and scutellum narrower posteriorly. Posterior border of scutellum concave, with two protuberances directed backwards. Katepisternum and anepisternum divided by a distinct suture. Petiole and postpetiole like those of conspecific workers. Gaster slender, twice as wide as the postpetiole, with the same width as the head including compound eyes.

Comments: The species of the more narrowly defined *Mycetophylax* can be easily separated from other Attini by the subtriangular head shape, well developed frontal lobes which completely cover the antennal insertions, absence of deeply impressed antennal scrobes (see comments for *M. morschi* below), triangular mandibles, median clypeal seta present, mesonotum without spines or protuberances, and the posterior margin of postpetiole straight without any impression; in alate forms the radial cell of forewing is closed (see diagnoses and descriptions). The lack of a well supported phylogeny for the Attini does not afford hypotheses on the evolutionary history of most characters, but these character states in combination are exclusive to *Mycetophylax* in the revised concept.

Mycetophylax, in this new definition, is a rather compact taxon, including three species that nest only in “restingas” (sandy dunes) along the South Atlantic coast, where they may be locally abundant, and in

Venezuela and Puerto Rico, along beaches of the Caribbean Sea. *Mycetophylax conformis* was found inland only once in French Guiana (U. Mueller, pers. comm.), but also nesting in sandy soil. For geographic distribution see map (Fig. 7 a).

At the Isle of Florianópolis (state of Santa Catarina, Brazil), *M. simplex* and *M. morschi* occur at the same beaches, but do not compete for fungus substrate. *M. simplex* builds nests in the bare sandy area, while *M. morschi* prefers areas covered with permanent vegetation. Biological data or life history observations are too scant to afford any interpretation. For observations on nest and colony structures of these species see Klingenberg *et al.* (2007).

Identification key for workers and gynes of *Mycetophylax*

1. Head as long as wide or a little longer than wide (CI 91–106). Vertexal carina absent. Antennal scapes not attaining the posterolateral corners of the head. Mesosoma smooth without acute spines or protuberances, dorsal profile almost straight in lateral view 2
- Head longer than wide (CI 82–97). Vertexal carina present. Antennal scapes surpassing the posterolateral corners of the head. Dorsal profile of mesonotum, in lateral view, with an anterior, low, but discernible tumulus. Also in lateral view, scutum of gynes lower in relation to the other *Mycetophylax* gynes (Fig. 2 c, d, h, 6 c) ... *Mycetophylax morschi*
2. Color brownish to yellow. Mandibles with eight to nine teeth. Integument of the frontal lobes semitransparent, resulting in a pair of round transparent structures above the antennal insertions. Juncture of posterior and dorsal margins of propodeum angulate in side view, not spinose. Gaster without ventral keel (Fig. 3 c, d, h, 6 e) *Mycetophylax simplex*
- Color dark brown to black. Mandibles with eight to ten teeth. No transparent integument patch on frontal lobes. Propodeum armed with a pair of spines. Gaster with a faint ventral keel (Fig. 1 c, d, h, 6 a) *Mycetophylax conformis*

Identification key to *Mycetophylax* males

1. Head wider than long, vertexal margin convex or straight. Antennal insertions not fully covered by frontal lobes. Pronotum mostly concealed by the scutum, barely visible with the mesosoma in dorsal view (Figs 1 e, f, 3, e, f, 6 a, b, e, f 7). Propodeum unarmed 2
- Head longer than wide, vertexal margin concave to straight. In larger specimens, posterolateral corners of the head with protuberances. Frontal lobes covering antennal insertions. In dorsal view scutum covering pronotum only at posterior two thirds (Figs. 2 e, f, 6 c, d). Posterior margin of scutellum convex, with distinct short projections. Propodeum armed with a pair of spines *Mycetophylax morschi*
2. Antennae with 13 segments. Clypeus not separated from the frontal area by a distinct suture. In lateral view, scutum higher than pronotum at the level of the pronotal posterior margin. Posterior margin of scutum slightly convex *Mycetophylax simplex*
- Antennae with 12 segments. Posterior border of clypeus distinct from the frontal area by a rounded suture. At the level of the posterior margin of the pronotum, in lateral view, the pronotum and scutum have the same height. Posterior margin of scutum straight *Mycetophylax conformis*

Mycetophylax conformis (Mayr, 1884)

(Figs. 1, 6 a, b, 7 a)

Cyphomyrmex conformis Mayr, 1884: 38; (worker) Holotype, French Guiana, Cayenne (NHMW, not examined); Kempf, 1962: 34 (combination in *Mycetophylax*); Kempf, 1972: 145 (catalogue); Jaffé, 1993: 183 (biology), Bolton, 1995: 268 (catalogue).

Myrmicocrypta brittoni Wheeler, 1907: 728 (worker) Syntype, "Porto Rico (sic), Santurce (Wheeler), no coll. date" (AMNH, examined); Wheeler, 1911: 170 (male); *Cyphomyrmex* (*Mycetophylax*) *brittoni* Emery, 1913: 251; Santschi, 1922: 355 (key); Kempf, 1962: 34 (synonym of *Mycetophylax conformis*).

Mycetophylax brittoni var. *littoralis* Weber, 1937: 401 (worker) Syntype, "Trinidad, B. W. I. Mayaro Bay, 11.iii.1935, N. A. Weber" (MZSP, examined); Kempf, 1962: 34 (synonym of *Mycetophylax conformis*); Klingenberg & Brandão, 2005: 45 (syntype worker in MZSP).

Worker (Figs. 1 a, b, g and 7 a). Range of measurements (in mm) and indices of examined specimens (N = 80): IOD 0.58–0.78; HL 0.63–0.82; CI 91–101; SL 0.49–0.70; SI 76–98; ML 0.28–0.43; MI 39–59; WL 0.78–1.13; PrW 0.37–0.58; PL 0.10–0.20; PPL 0.17–0.29; GL 0.53–0.78; FL 0.64–0.92; TL 2.62–3.41.

Color dark brown to black, legs brownish. Entire body covered by short golden hairs, sparse and appressed. Legs and antennae covered by the same type of hairs, only the area between the preocular carinae and frontal carinae hairless, and masticatory border of mandibles with longer hairs. Sculpture shiny and areolate; mandibles shining.

Head slightly longer than wide (see CI). Compound eyes at anterior fourth of head with eleven ommatidia at major length and nine ommatidia at major width. Mandibles triangular with nine to ten regular teeth. Median portion of clypeus attaining posterior level of antennal insertions, ending in a rounded suture followed by a small but distinctly impressed hairless frontal triangle. External margins of frontal lobes gently rounded, their maximum expansion little more than half the distance between the median line and external borders of the head. Lateral carinae parallel to the head lateral margin in frontal view, touching the internal margins of the compound eyes, but not reaching the vertexal margin. The space between the lateral and frontal carinae depressed, mostly smooth or vestigially areolate. Antennal scapes slightly curved, surpassing the posterolateral corners of the head by a distance smaller than their diameter at apex. Antennae ending in a two-segmented club, last antennal segment as long as the two anterior together.

Mesosoma. In lateral view, profile of dorsal surface evenly convex and continuous, with a low vestigial tumulus at mid mesonotum. Inferior margin of pronotum mostly rounded, sometimes with a recognizable inferior spine, varying in size among individuals. Metapropodeal impression barely distinct. Basal face of propodeum slightly convex and armed with a pair of small but conspicuous spines, directed up-and backwards. Declivous face of propodeum concave and nearly with the same length as the basal face. Propodeal spiracle distinct, with rounded opening obliquely directed circa 30° in relation of the main body axis. Node of petiole twice as wide as the peduncle and, in lateral view, as long as high; postpetiole wider than long. Posterior area of postpetiole with a slight impression, however the posterior margin straight. Gaster with a small median ventral keel at first sternite.

Gyne (undescribed) (Figs. 1 c, d, h, 6 a and 7 a)

Range of measurements (in mm) and indices of examined specimens (N = 10): IOD 0.82–0.96; HL 0.84–0.95; CI 96–102; SL 0.66–0.78; SI 77–87; ML 0.36–0.50; MI 36–46; WL 1.28–1.46; PL 0.22–0.30; PPL 0.22–0.26; GL 1.06–1.24; TL 4.00–4.65.

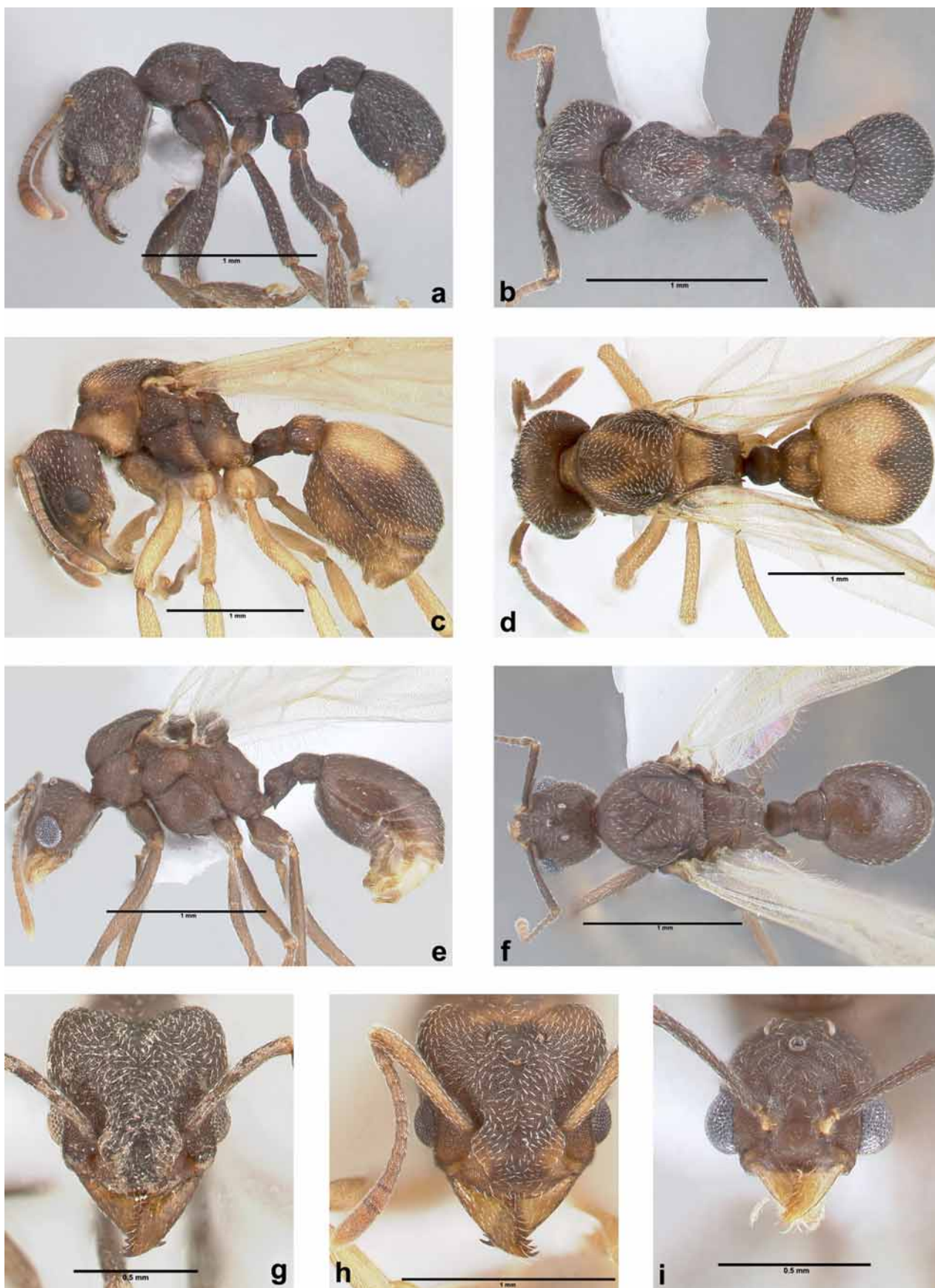


FIGURE 1. AutoMontage© images of *Mycetophylax conformis* from Brasil, Rio de Janeiro, Cabo Frio, Praia das Dunas: a, b, g) worker in lateral, dorsal and frontal view; c, d, h) gyne in lateral, dorsal and frontal view; e, f, i) male in lateral, dorsal and frontal view.

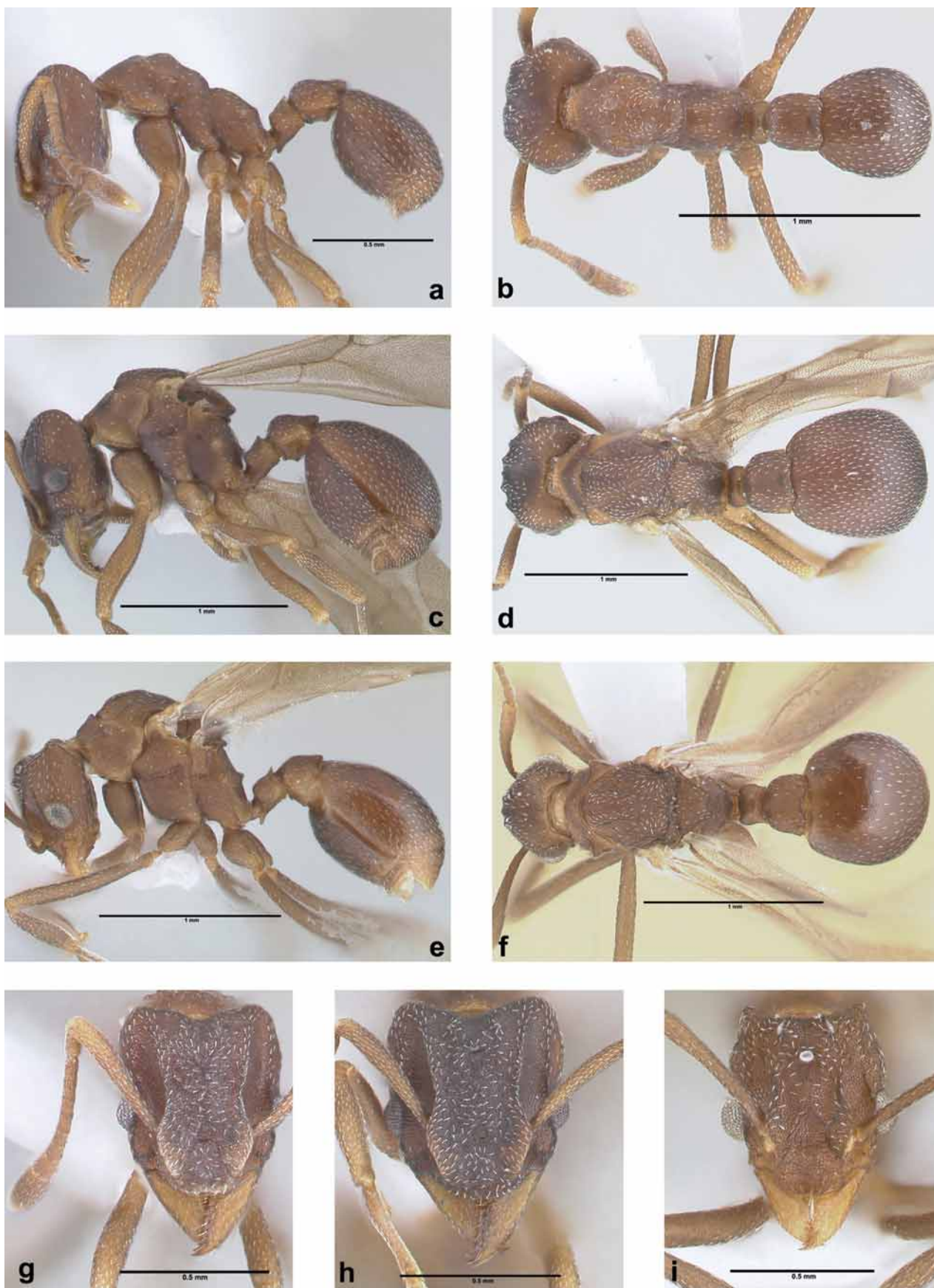


FIGURE 2. AutoMontage© images of *Mycetophylax morschi* from Brasil, Santa Catarina: Florianópolis, Pântano do Sul: a, b, g) worker in lateral, dorsal and frontal view; c, d, h) gyne in lateral, dorsal and frontal view; e, f, i) male in lateral, dorsal and frontal view.

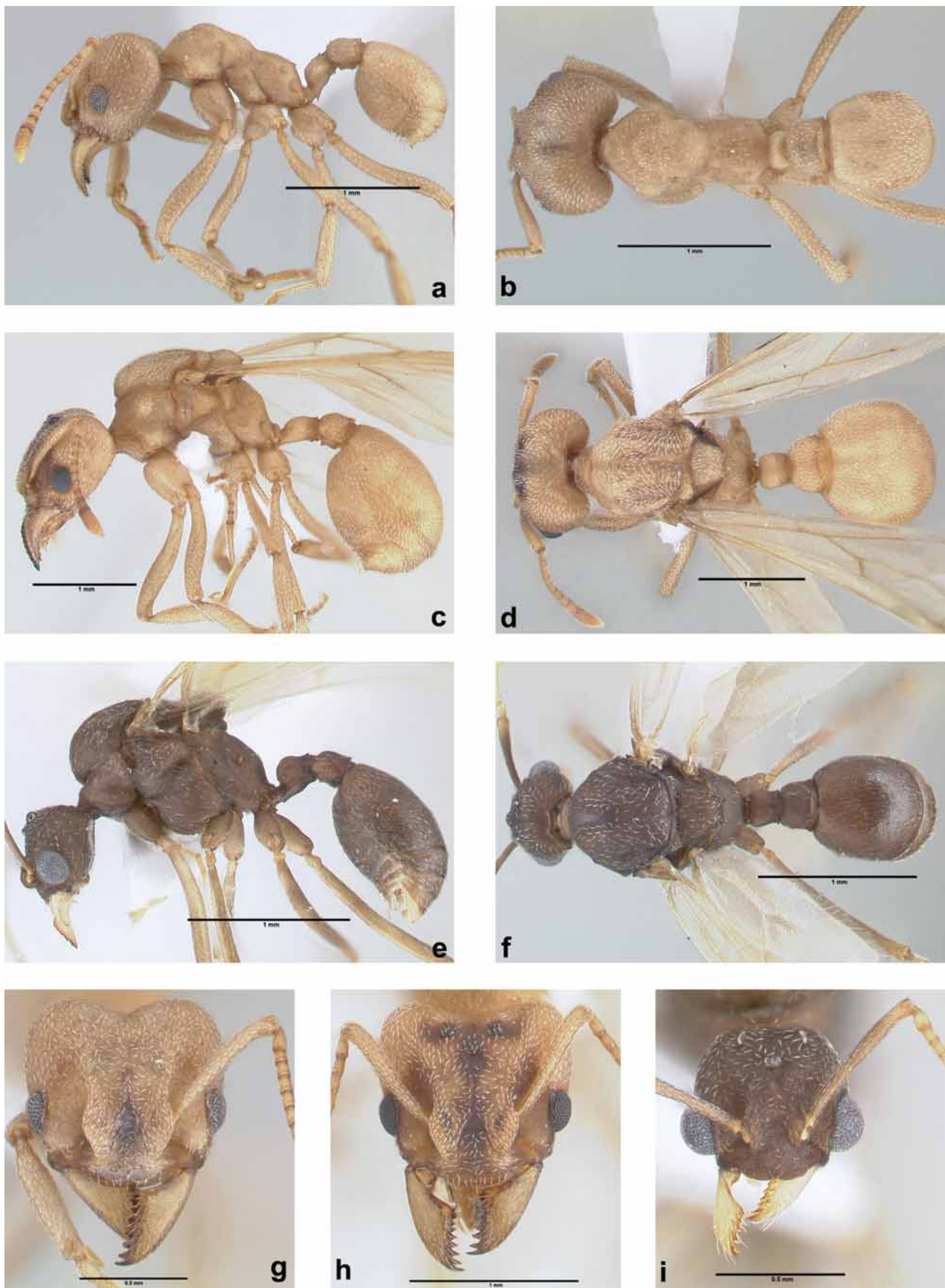


FIGURE 3. AutoMontage© images of *Mycetophylax simplex* from Brasil, Santa Catarina: Florianópolis, Praia da Joaquina: a, b, g) worker in lateral, dorsal and frontal view; c, d, h) gyne in lateral, dorsal and frontal view; e, f, i) male in lateral, dorsal and frontal view.

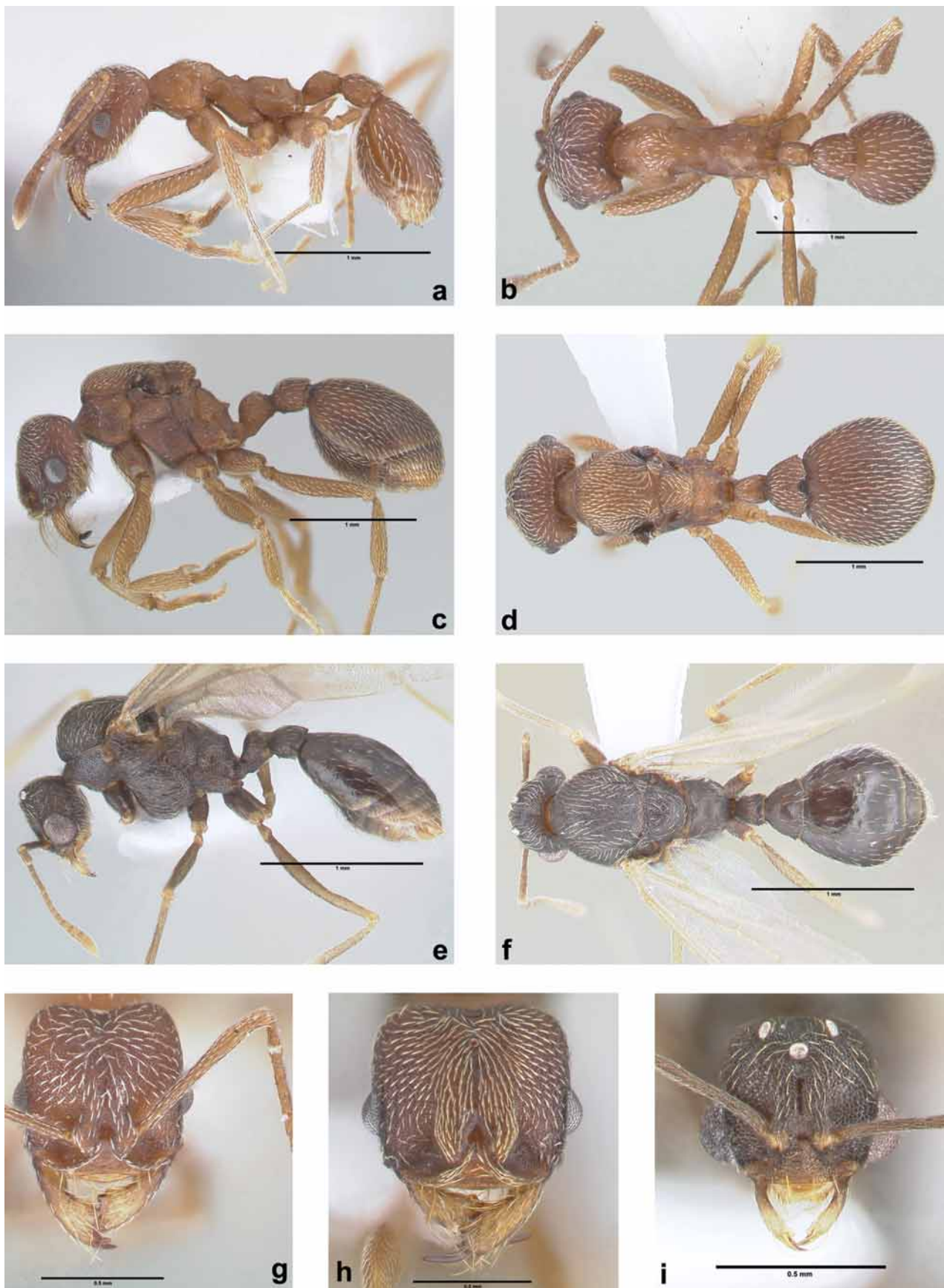


FIGURE 4. AutoMontage© images of *Kalathomyrmex emeryi*: a, b, g) worker from Peru, Huánuco ("Panguana"), Rio Yuyapidris in lateral, dorsal and frontal view; c, d, h) gyne from Argentina, Chaco Province, Chaco National Park in lateral, dorsal and frontal view; e, f, i) male (same locality as gyne) in lateral, dorsal and frontal view.

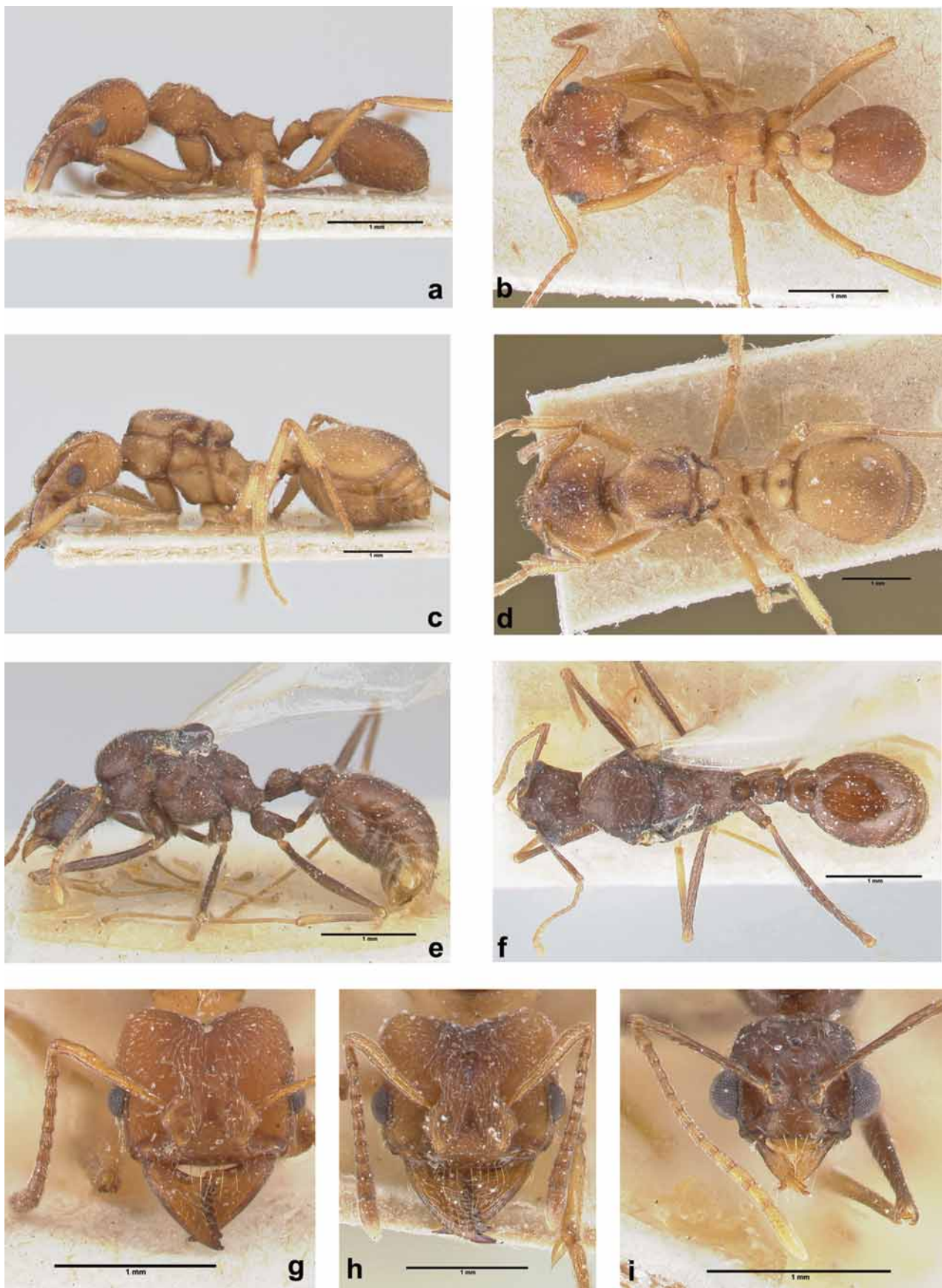


FIGURE 5. AutoMontage© images of *Paramycetophylax bruchi* from Argentina: Tucumán, El Bañado, Valle Santa Maria: a, b, g) worker in lateral, dorsal and frontal view; c, d, h) gyne in lateral, dorsal and frontal view; e, f, i) male in lateral, dorsal and frontal view.

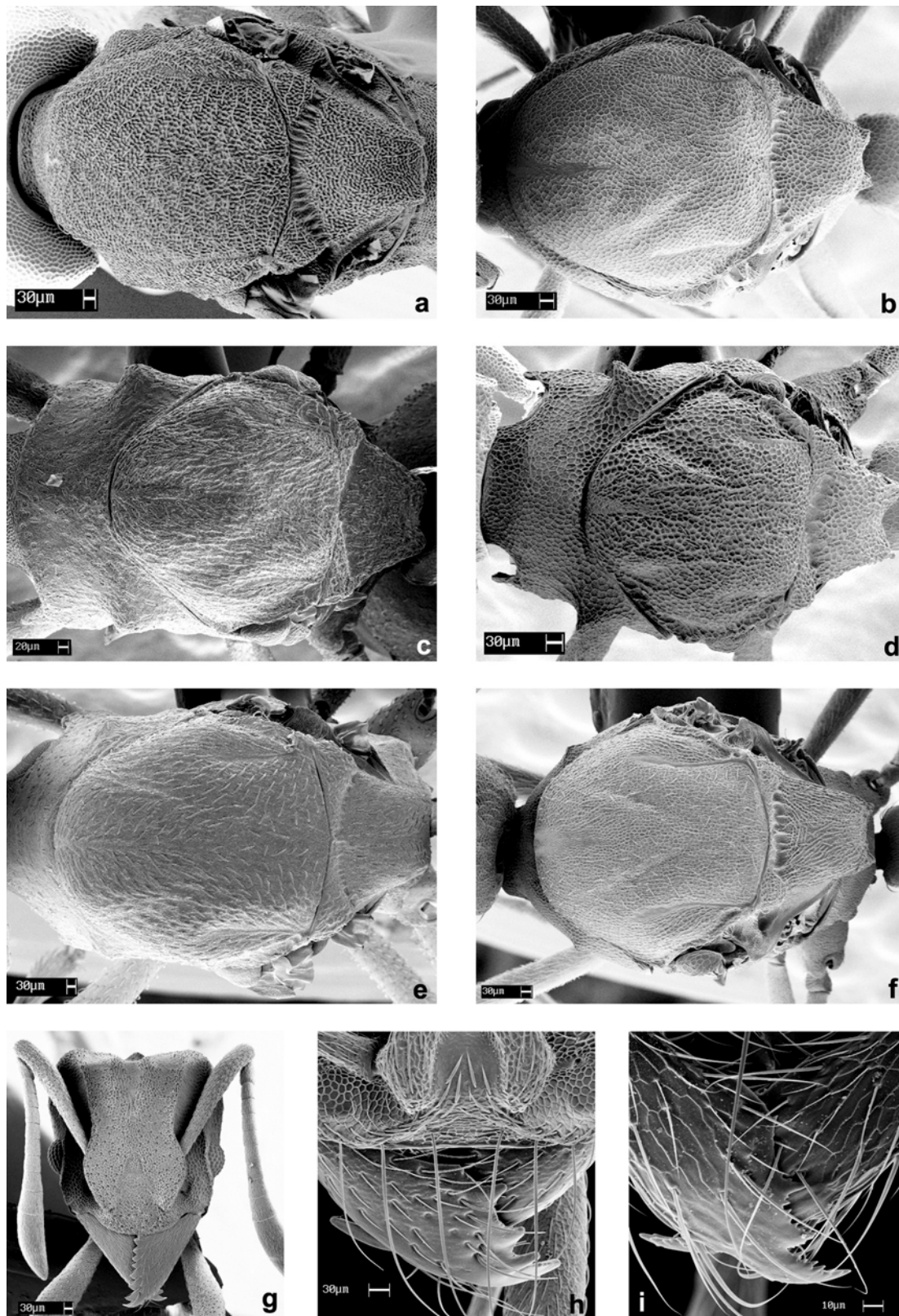


FIGURE 6. SEM images: a, b) *Mycetophylax conformis*, gyne and male from Brasil, Rio de Janeiro, Maricá, Barra da Maricá, mesosoma in dorsal view; c, d) *M. morschi*, gyne and male from Brasil, Santa Catarina: Florianópolis, Praia da Joaquina, mesosoma in dorsal view; e, f) *M. simplex*, gyne and male from Brasil, Santa Catarina: Florianópolis, Praia da Joaquina, mesosoma in dorsal view; g) *M. morschi*, worker from Brasil, Santa Catarina: Florianópolis, Praia da Joaquina, head in frontal view, note single seta coming out of each pore; h) *Kalathomyrmex emeryi*, worker from Brasil: Amazonas: Manaus, Praia de Tupé (Rio Negro), anterior portion of head; i) *K. emeryi*, male from Brasil, Piauí: Canto do Buriti, saw-like mandibular teeth.

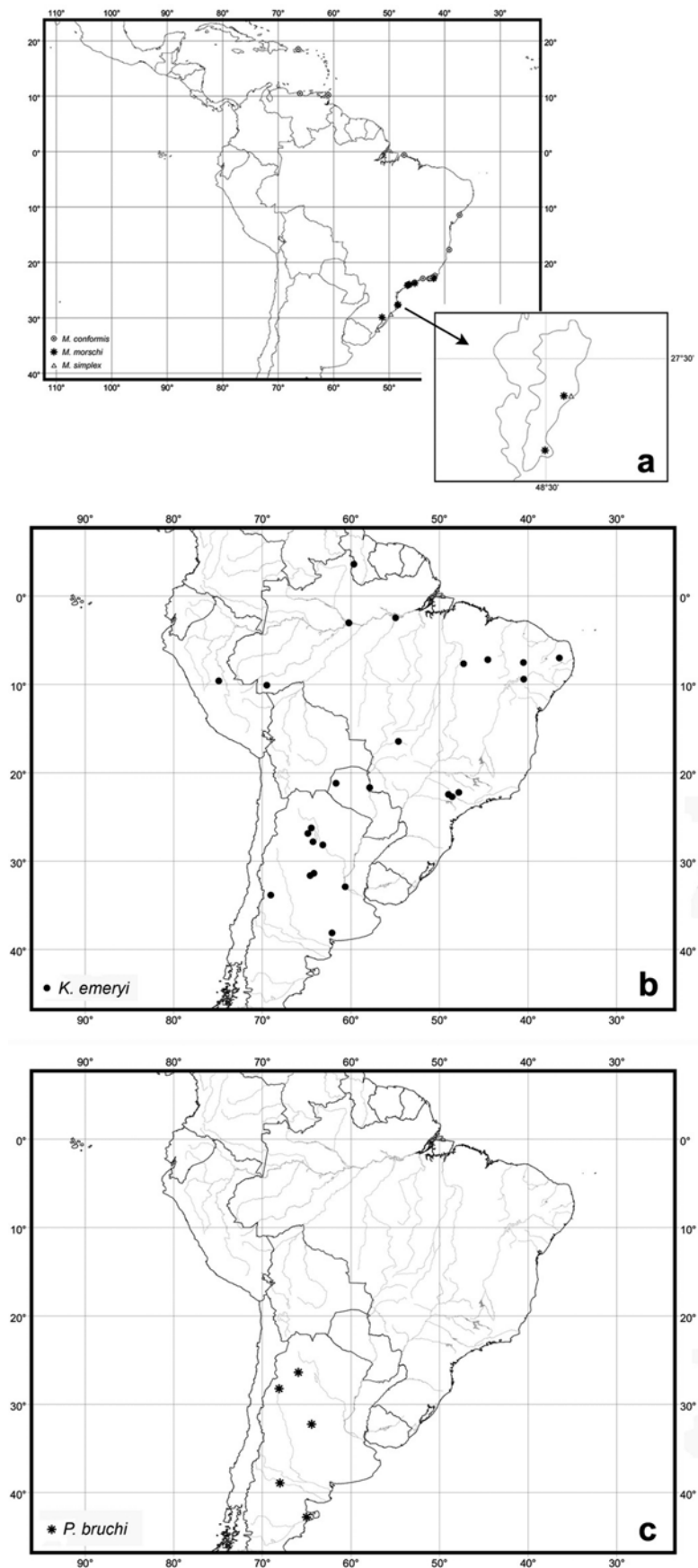


FIGURE 7. Distribution maps of the species a) *Mycetophylax*, with a detailed map of the distribution of *M. morschi* and *M. simplex* at the isle of Florianopolis b) *Kalathomyrmex* and c) *Paramycetophylax*.

Color yellowish to brown, depending on age. Compound eyes at maximum length with 18 ommatidia and at maximum width with 17 ommatidia. In lateral view, scutum covering almost the whole pronotum, scutum flattened above. Pronotum with blunt and triangular inferior pronotal spines. Parapsidal lines smooth, shiny and free of hairs, almost parallel in relation to the median axis of the body. Notaulices almost indistinct, marked only by the lighter color of the integument; axillae subtriangular. Scutum-scutellar sulcus distinct and prescutellum well developed with longitudinal rugae. Scutellum reduced in width posteriorly; posterior margin slightly concave with two small protuberances at the posterior angles. Anepisternum subtriangular, anterior border of katepisternum sinuous; both divided by a groove. The propodeum with a pair of blunt spines, directed back- and upwards.

Male (Figs. 1 e, f, i, 6 b and 7 a)

Range of measurements (in mm) and indices of examined specimens (N = 13): IOD 0.46–0.52; HL 0.46–0.53; CI 90–104; SL 0.44–0.52; SI 92–108; ML 0.18–0.22; MI 36–46; WL 1.02–1.18; PL 0.20–0.22; PPL 0.16–0.19; GL 0.82–0.94; TL 2.87–3.16.

Color brown. Mandibles, legs, base and apical segments of antennae yellowish. Integument areolate-imbricate, gaster imbricate. Head subquadrate, posterolateral corners rounded, vertexal margin straight. Compound eyes with 25 ommatidia at maximum length and 20 ommatidia at maximum width. Number of teeth on mandibles variable, at most seven. The two subequal apical teeth longer than the preceding. Anterior clypeal margin straight, bearing three fine and long setae. Median portion of clypeus attaining the posterior level of antennal insertions. Posterior clypeal margin rounded. Frontal lobes reduced, not fully covering the antennal insertions, but attaining the posterior level of compound eyes. Lateral carinae following the compound eyes margin until its posterior level, then curving in direction of the middle of the head, converging to the posterior portion of the frontal lobes, and thus forming a rounded almost indistinct arch. Apex of antennal scapes a little wider than base. Antennae 12-segmented, ending in a three-segmented club; the last segment with the same length as the two anterior together. In lateral view, scutum covering more than 2/3 of the pronotum. Anterior pronotal spines vestigial. Notaulices shallowly impressed. Prescutellum reduced, triangular axillae small; scutum-scutellar sulcus distinct and impressed. Scutum subtriangular, with the anterior margin straight. Anepisternum subtriangular with the posterior vertex rounded; antero-inferior corner of katepisternum rounded. Propodeum with a pair of very small spines or teeth.

Examined material: BRAZIL: Bahia: Mangue Seco, 31.xii.1999 (C. Klingenberg), 3 w (MZSP); Caravelas, 5.x.1993 (B. H. Dietz) 3 w (MZSP); Pará: Salinópolis, 13–19.xi.1953 (C. R. Gonçalves) 4 w (MZSP); Rio de Janeiro: Muriqui, 3–8.ii.2002 (C. Klingenberg & D. Couto-Lima) 6 w (MZSP); Cabo Frio, Praia das Dunas, 3–8.ii.2002 (C. Klingenberg & D. Couto-Lima) 53 w, 15 q, 17 m (MZSP, SMNK); Maricá, Barra da Maricá, 3–8.ii.2002 (C. Klingenberg & D. Couto-Lima), 48 w, 4 q, 7 m (MZSP); Macaé, 3.v.1970 (W. W. Kempf) 6 w (MZSP); São Paulo: Caraguatatuba v–vi.1962 (Exp. Dept. Zool.), 20 w (MZSP); no coll. data, 1 w (MCSN) [C. Emery collection]; PUERTO RICO: Tortuguera Camp, x.1950 (W. F. Buren) 17 w (AMNH), 12 w (USNM), 20.ix,27.x.1950, (W. F. Buren) 17 w (MZSP); Santurce, no coll. data (W. M. Wheeler) 28 w (AMNH); TRINIDAD: Mayaro Bay, no coll. data (N. A. Weber) 1 w (Syntype) (MZSP); VENEZUELA: Miranda: Higuerote, xii.1983 (K. Jaffé) 4 w, 1 q (MZSP).

Comments. *Mycetophylax conformis* is the type species of *Mycetophylax*. The species was first described by Mayr in 1884 as a member of *Cyphomyrmex*. Later Wheeler (1907) described *Myrmicocrypta brittoni*, which was synonymized with *M. conformis* by Kempf (1962), with whom we agree. Wheeler's description is rather complete; he suggested the species might belong to a different genus, that should also include *M. emeryi* described by Forel (1907), recognizing that these species actually do not fit in any other described Attini genus. The morphological character traits that define *M. conformis* are very similar across the known distribution of the species, which has been much improved by recent collections. Only the size of the antero-inferior spines and propodeal spines varies. In the state of Rio de Janeiro, Brazil, alates were collected year round.

In 1962 Kempf redescribed *M. conformis*, comparing it with *Cyphomyrmex morschi*. He highlighted the differences between the species and challenged the validity of the genus *Mycetophylax*, taking into account the striking similarity between *M. conformis* and *C. morschi*.

Mycetophylax conformis occurs sympatrically with *M. morschi* in São Paulo and Rio de Janeiro Atlantic beaches, but their nest distribution does not overlap, as *M. conformis* nests close to the sea, at the pre-dunes, while *M. morschi* nests at the dune and “restingas” areas. Klingenberg *et al.* (2007) published detailed information on *M. conformis* nest architecture, position and size of the fungus chamber, composition of the waste, and colony population.

***Mycetophylax morschi* (Emery, 1888) new combination**

(Figs. 2, 6 c, d, g, 7 a)

Cyphomyrmex morschi Emery, 1888 ("1887"): 9, (worker) Syntypes, Brazil, Rio Grande do Sul, São Lourenço (von Ihering), (MZSP, examined); Kempf, 1972: 93 (catalogue); Bolton, 1995: 168 (catalogue), Klingenberg & Brandão, 2005: 44 (syntype worker in MZSP); **new combination in *Mycetophylax*.**

Cyphomyrmex sp. (in part): Mayr 1887: 556 (key)

Cyphomyrmex (*Mycetoritis*) (sic) *personatus* Santschi, 1923: 268: (gyne) Argentina: Prov. de Buenos Aires, Monte Hermoso, no coll. data (C. Bruch); (type specimens not localized); Kempf, 1964: 25: synonym of *Cyphomyrmex morschi*. Kempf, 1972: 93 (catalogue); Bolton, 1995: 168 (catalogue)

Worker (Figs. 2 a, b, g, 6 g and 7 a)

Range of measurements (mm) and indices of examined specimens (N = 10): IOD 0.53–0.67; HL 0.6–0.71; CI 82–97; SL 0.49–0.60; SI 79–98; ML 0.20–0.28; MI 32–42; WL 0.80–1.00; PrW 0.40–0.50; PL 0.10–0.20; PPL 0.20–0.30; GL 0.54–0.70; FL 0.66–0.93; TL 2.54–3.03.

Color brown to light brown. Mandibles, antennae and legs opaque brown to yellowish. Surface of frons with small irregular pores; a single seta coming out of each of them (only visible with higher magnifications). Mandibular disc almost entirely covered by very fine longitudinal rugae. Whole body, legs and antennae covered by bright, short and sparse appressed white hairs; only the area between frontal carinae and preocular carinae hairless. Hairs of masticatory border of mandible somewhat longer than in the other areas. Sculpture areolate. The individual submitted to SEM is covered by a thin layer of "dirt", detritus adhering at the integument, leaving the sculpture with a punctate appearance (Fig. 6 g).

Head longer than wide, subrectangular; posterior portion slightly wider than anterior one. Compound eyes with eight ommatidia at maximum length and six ommatidia at maximum width. Mandibles with nine triangular teeth, the four most apical larger and the remaining slightly smaller. Anterior margin of clypeus gently rounded and with a short and hardly visible median seta. Frontal lobes maximum expansion less than half the distance between the median line and external border of the head, external margins gently rounded. Frontal and lateral carinae almost reaching the posterolateral lobes, forming a scrobe-like impressed area, where the ants accommodate the antennal scapes. Lateral carinae distinct for half of head length, posterior part of carinae obsolete, faintly developed. Antennal scapes straight, surpassing the posterolateral corners by a distance similar to their diameter, when laid back. Antennae ending in a three-segmented club, last antennal segment as long as the three preceding together. Vertexal margin concave, impressed, posterolateral corners rounded.

Pronotum in lateral view with the dorsum marked by a very low median tubercle, a pair of low posterior tubercles, and short, blunt pronotal inferior spines. Mesonotum with a median rounded tubercle. Metapropodeal impression distinct. Propodeum in lateral view with basal face slightly convex; declivous face almost straight, armed with a pair of small blunt spines, occasionally these spines appearing as protuberances. Peduncle of petiole reduced, node of petiole as long as high, ending in two lateral lobes posteriorly. In dorsal view, posterior portion of postpetiole with a deep impression; posterior margin slightly convex, almost straight.

Gyne (Figs. 2 c, d, h, 6 c and 7 a)

Range of measurements (in mm) and indices of examined specimens (N = 13): IOD 0.66–0.72; HL 0.74–0.78; CI 87–92; SL 0.54–0.64; SI 79–94; ML 0.35–0.40; MI 47–52; WL 1.04–1.14; PL 0.20–0.24; PPL 0.26–0.30; GL 0.84–0.98; TL 3.45–3.90.

Color brownish to dark brown. Mandibles, antennae and legs yellowish, according to the age of individuals. Most characters as in conspecific workers. Compound eyes at maximum length with 15 ommatidia and at maximum width eleven ommatidia. In lateral view, scutum flattened, covering more than half of the pronotum. Pronotum with anterior lateral pronotal protuberances, a low median elevation, and distinct blunt inferior pronotal spines. Parapsidial lines indistinct, glabrous and parallel in relation to the main body axis. Notaulices shallowly impressed, scutum-scutellar sulcus distinctly impressed. Scutellum concave at anterior margin in dorsal view and twice the width of the area anteriorly than posteriorly. Posterior margin angled, concave in the middle. Katepisternum subtriangular, anepisternum subrectangular, both divided by a distinct suture. Propodeum declivous and basal face almost straight, with small blunt spines, directed back-and upwards.

Male (undescribed) (Figs. 2 e, f, i, 6 d and 7a)

Range of measurements (in mm) and indices of examined specimens (N = 10): IOD 0.44–0.52; HL 0.52–0.62; CI 79–87; SL 0.54–0.68; SI 117–113; ML 0.22–0.28; MI 38–48; WL 0.84–1.04; PL 0.18–0.22; PPL 0.18–0.24; GL 0.70–0.84; TL 2.69–3.15.

Color yellowish to brownish. Mandibles, antennae (base and funiculus) and legs yellowish, lighter in young individuals. Sculpture like in the conspecific workers, but for the gaster, which sculpture is fainter in males.

Head longer than wide, compound eyes occupying a fourth of its lateral margin, in full face view, with 18 ommatidia at maximum length and 16 ommatidia at maximum width. Anterior margin of clypeus almost straight, with one visible median seta twice as long as the mandible hairs. Middle portion of clypeus ending in a straight suture at the level of the antennal insertions, followed by the relatively large, impressed, frontal area. Mandibles with three apical teeth followed by a diastema and two to three smaller teeth; last tooth as a denticle. Frontal lobes covering half of the antennal insertions in full face view. Antennae 13-segmented. Antennal scapes slightly curved, flattened at base, rounded and thicker apically. Apical segment of funiculus as long as the two anterior segments together. Frontal carinae extending back up to the level of the median ocellus, disappearing near the vertexal margin. Lateral carinae following the internal margin of the compound eyes anteriorly, ending little after the level of the posterior margin of the compound eyes; both carinae converging but not touching posteriorly. Area between frontal and lateral carinae impressed and free of hairs. Vertex flattened, slightly and evenly concave, laterally marked by defined angles produced as blunt denticles.

In lateral view scutum covering half of the pronotum. Pronotum with small, acute, triangular, inferior spines and a pair of well developed, acute, lateral spines. Notaulices, in dorsal view, as wide impressed sutures with slightly transverse rugae at its posterior portion. Parapsidial lines very close to the lateral margins, gently rounded, diverging anteriorly. Prescutellum relatively wide. Scutum-scutellar sulcus deeply impressed with transversal rugae. Anterior margin of scutellum rounded; in dorsal view. Katepisternum and anepisternum divided by a suture with transverse rugae. Katepisternum subquadrate, antero-inferior margin rounded; anepisternum subtriangular, with anterior vertex rounded. Mesocoxa occupying only the posterior third of katepisternum inferior margin. Propodeum dorsal and declivous faces almost vertical, with short, backwards directed, spines.

Examined material: BRAZIL: Rio Grande do Sul: Morrete, Fazenda Oliveira, xii.1975 (V. P. Daniel) [# 12212], 1 w (MZSP); without data, (H. v. Ihering) [11419], 1 w (Syntype), (MZSP); Rio de Janeiro: Cabo Frio, viii.1926 (T. Borgmeier), 1 w (MZSP); Santa Catarina: Florianópolis, Praia da Joaquina, 3.v.1991 (A. Bonnet & B. C. Lopes) 2 w (MZSP), 8.iv.2003 (C. Klingenberg, R. R. Silva & B. C. Lopes) 29 w, 16 q, 9 m (MZSP); Pântano do Sul, 9.iv.2003 (C. Klingenberg, R. R. Silva & B. C. Lopes) 9 w, 2 q, 4 m (MZSP, SMNK); São Paulo: Itanhaém, vi.1914 (Luederwaldt), [18862, 18867], 3 w (MZSP); Itanhaém, 15–19.vii.1961 (A. Guedes & F. Grossmann), 3 w (MZSP); Mongaguá, Praia Grande, 18.vi.1960 (W. W.

Kempf), 1 w (MZSP); São Sebastião, 30.i.1955 (B. Fleddermann), 1 w [# 4]; São Vicente, Praia Grande, 18.xii.1955 (W. W. Kempf) [# 1496], 1 w (MZSP); Caraguatatuba, 22.v–1.vi.1962 (K. Lenko) 1 q (MZSP).

Comments. *Mycetophylax morschi* is the only species in the genus which bears a lateral depression on the head, similar to an antennal scrobe, a very common character of *Cyphomyrmex*. However, in *M. morschi*, the scrobe-like depression shelters only the anterior portion of the antennal scapes, by virtue of its laterally expanded frontal carina. In *Cyphomyrmex* the scrobe lodges all or most of the scape as the frontal carina is expanded over the whole scrobe. We consider that *M. morschi* and *Cyphomyrmex* acquired scrobe-like structures independently.

A further strong argument for transferring *C. morschi* to *Mycetophylax* is the nesting biology and habitat choice of these ants. As in *M. conformis* and *M. simplex*, the nests of *M. morschi* are exclusively found in the sandy soil of the South Atlantic beaches. The nest architecture and colony size are also similar in the three species (average of 120 workers per colony, Klingenberg *et al.*, 2007), while most *Cyphomyrmex* species have smaller colonies (see Mueller & Wcislo, 1998; Murakami *et al.* 2000, Schultz *et al.* 2002) and seldom occupy sandy dunes. In the results of Schultz & Brady's (2008) molecular phylogenetic study of the Attini, *C. morschi* and *M. conformis* grouped together in all topologies and methods of analysis, corroborating our findings based on our current morphological study.

***Mycetophylax simplex* (Emery, 1888)**

(Figs. 3, 6 e, f, 7a)

Cyphomyrmex simplex Emery, 1888 ("1887"): 361; (worker) Syntype Brazil, Rio Grande do Sul, São Lourenço (type specimens not localized); Emery, 1922: 343; Kempf, 1972: 145–146: (combination in *Mycetophylax*, catalogue); Fowler, 1980: 184 (record in Paraguay), Brandão, 1991: 358 (catalogue); Bolton, 1995: 269 (catalogue), Albuquerque *et al.* 2005 (nest density).

Worker (Figs. 3 a, b, g and 7 a)

Range of measurements (in mm) and indices of examined specimens (N = 36): IOD 0.83–1.03; HL 0.85–1.01; CI 96–106; SL 0.49–0.82; SI 58–82; ML 0.34–0.48; MI 39–52; WL 1.05–1.30; PrW 0.52–0.69; PL 0.19–0.26; PPL 0.22–0.27; GL 0.70–0.92; FL 0.92–1.14; TL 3.30–4.05.

Color yellow to brownish, opaque, clypeus castaneous; masticatory border, median portion of clypeus, labrum, frontal area and coronal suture dark brown. Area between preocular and frontal carinae hairless. Surface of frons with small irregular pores; a single seta coming out from each of them (only visible with higher magnifications). Whole body, legs and antennae with short, sparse and appressed white hairs, brighter than integument, but the area between preocular carinae and frontal carinae, lateral faces of the mesosoma, dorsal discs of the coxae and petiole with even sparser pilosity. Masticatory border of mandibles with longer hairs. Sculpture reticulate. Mandibular dorsal disc with very fine longitudinal rugae. Integument of the frontal lobes with a rounded semitransparent spot on each side, above the antennal insertions, darker than the rest of the integument of the frontal lobes.

Head as long as wide (see CI), almost heart-shaped. Margin of vertexal in full face view concave, posterolateral corners rounded. Compound eyes with eleven ommatidia at maximum length and nine ommatidia at maximum width. Masticatory border of mandibles with seven to eight triangular teeth, the three most apical the same in size, the others somewhat smaller. Anterior margin of clypeus almost straight. Frontal lobes slender, covering the antennal insertions, but their maximum expansions attaining less than half the distance between the median line and external border of the head. External margin of frontal lobes gently rounded. Frontal and lateral carinae continuing posteriorly up to half the distance between the posterior margin of the eyes and vertexal margin. Antennal scapes slightly curved apically, only reaching the posterolateral corners of the head. Antennae ending in a two segmented club, the last antennal segment as long as the two before combined.

Pronotum convex with vestigial tumuli and pointed inferior pronotal spines. In lateral view mesonotum separated from pronotum by a distinct rounded suture, mesonotum projecting over the pronotum. Metapropodeal impression shallow. Basal face of propodeum slightly convex, a little longer than the straight declivous face meeting in an angle, but lacking spines or protuberances. Inferior margin of pronotum, katepisternum and metapleura bordered by a broad translucent carina. Propodeal spiracle small, with rounded opening 45° oblique in relation to the main body axis. Node of petiole as wide as high, in dorsal view, twice as wide as peduncle; ventral process as an acute denticle. Postpetiole wider than high.

Gyne (undescribed) (Figs. 3 c, d, h, 6 e and 7 a)

Range of measurements (in mm) and indices of examined specimens (N = 10): IOD 1.14–1.20; HL 1.00–1.12; CI 104–116; SL 0.82–0.9; SI 71–78; ML 0.48–0.56; MI 44–52; WL 1.64–1.68; PL 0.30–0.36; PPL 0.24–0.32; GL 1.32–1.40; TL 5.10–5.30.

Color yellow to brownish, depending on age, masticatory border of mandibles, middle portion of clypeus, frontal area, area in front and lateral to the ocelli, and parapsidial areas brownish. Most characters as in the conspecific workers. Compound eyes with 18 ommatidia at maximum length and 14 ommatidia at maximum width. Pronotum with blunt anterior inferior spines. In lateral view, flattened scutum covering almost two thirds of pronotum. Notaulices indistinct. Parapsidial lines shallowly impressed. Scutellum subquadrate, anterior margin slightly concave, wider anteriorly; posterior margin concave with vestigial spines. Anepisternum subtriangular and katepisternum subquadrate, separated from the metapleura by a distinct suture.

Male (undescribed) (Figs 3 e, f, i, 6 f and 7 a)

Range of measurements (in mm) and indices of examined specimens (N = 9): IOD 0.56–0.68; HL 0.56–0.68; CI 97–103; SL 0.58–0.76; SI 100–112; ML 0.24–0.30; MI 40–45; WL 1.30–1.70; PL 0.20–0.30; PPL 0.18–0.24; GL 0.94–1.34; TL 3.50–4.56.

Color dark brown, mandibles, antennae and legs yellowish. Integument reticulate with golden appressed shiny hairs. Hairs at external margin of mandible twice the length of the others. Mandibles with six to seven triangular teeth, decreasing in size from apical to basal, sometimes with varying distances between them. Clypeus anterior margin straight, with a distinct median impression on the anteclypeus. Median seta visible, with size similar to the mandible hairs. Median portion of clypeus bulging up to the level of half of the antennal insertions. Frontal carinae visible until the level of the posterior margin of compound eyes. Lateral carinae following the compound eyes, straight and directed backwards at posterior third. Compound eyes with 18 ommatidia at maximum length and 14 ommatidia at maximum width. Antennae 13-segmented. Antennal scapes straight, surpassing posterolateral corners of the head by half of their length. Antennal apical segment as long as the two preceding segments.

In dorsal view, anterior margin of scutum rounded, posterior margin convex. Parapsidial lines distinctly impressed, shiny, glabrous. Lateral margins of scutum as strong carinae. Prescutellum relatively wide, axillae subtriangular. Scutum-scutellar sulcus with transverse rugae. In lateral view anepisternum subtriangular and katepisternum subquadrate. Median coxa occupying only the posterior fourth of katepisternum inferior margin. Propodeal spiracle parallel in relation to the main body axis.

Petiole reduced and node strongly developed, rounded. Ventral process poorly developed. Anterior margin of node meeting the peduncle in a square angle, dorso-posterior portion concave, in side view. In dorsal view, petiole subrectangular and slightly wider anteriorly. Postpetiole in dorsal view subquadrate, wider than petiole, wider posteriorly. Spiracle of first gastral tergite visible.

Examined material: BRAZIL: Rio Grande do Sul: Praia do Cassino, 16km S, duna costa, 27.v.1992 (N. M. Giannuca), 20 w, 7 q (MZSP); Torres, Praia Grande, 18.ii.1998 (Ed. Diehl-Fleig), 29 w, 10 q, 3 m (MZSP); Santa Catarina: Florianópolis, Praia da Joaquina, 17.ix.2003 (C. Klingenberg & B. H. Dietz) 16 w, 1 q, 9 m (MZSP, SMNK).

Comments. *Mycetophylax simplex* can be easily distinguished from other *Mycetophylax* by its yellow-brownish color and the unarmed propodeum. Fowler (1980) recorded *M. simplex* in Paraguay, but as this species is currently known only along the Atlantic beaches, therefore this previous collection information

should be used with care; we have not examined this material. Until now the known geographic distribution of *M. simplex* included only the State of Rio Grande do Sul, Brazil, but we collected colonies of this species at the Isle of Florianópolis, Santa Catarina State, Brazil for the first time. In 2005, Albuquerque *et al.* published information on nest density of *M. simplex* at Rio Grande do Sul, Brazil coastal beaches. Diehl & Diehl-Fleig (2007) described *M. simplex* nest architecture and colony populations.

Bonnet & Lopes (1993) did not list *M. simplex* for the Praia da Joaquina beach in the Isle of Santa Catarina in their survey, but this species is quite common there (Klingenberg *et al.*, 2007).

***Kalathomyrmex* new genus**

(Figs. 4, 6 h, i, 7 b)

Myrmicocrypta (in part): Forel 1907: 144

Cyphomyrmex (*Mycetophylax*) (in part): Emery 1913: 251; key to species, Santschi, 1922: 357; raised to genus by Santschi 1923: 268

Myrmicocrypta (*Mycetophylax*) (in part): Santschi, 1916: 383, Gallardo, 1916: 320

Type species: *Kalathomyrmex emeryi* (Forel, 1907), by monotypy.

Etymology: from latinized Greek *kalathos* = basket, referring to the psammophore; *myrmekos* = ant.

Worker: Monomorphic Attini ants. Color yellowish to reddish-brown. Body densely sculptured and covered with short, appressed hairs. Head with long flexuous hairs (with the length of the first funicular segment), six fine and stiff setae with the same length as the apical funicular segment forming a psammophore set at the middle clypeal disc medially and at the posterior margin laterally, reaching or surpassing the anterior limit of the mandibles. Masticatory margin of mandible smooth, without any trace of sculpture. Head subquadrate. Compound eyes at anterior half of the head. Mandibles subtriangular. Clypeus triangular with latero-posterior margin strongly produced forward over the lateral wings of the clypeus, as rounded ridges, resulting in large circular areas where the antennal scapes articulate. Frontal lobes reduced, in frontal view forming an attenuated triangle. Antennae 11-segmented, scapes surpassing the posterolateral corners of the head. Mesosoma slender, pronotum without defined spines, dorsal margin in side view almost straight. Anterior mesonotal tubercles vestigial occasionally developed; postero-dorsal tubercles on mesosoma developed. Propodeum armed with a pair of small spines. Petiole without distinct node and postpetiole at posterior portion with a wide impression, dividing the postpetiole in two distinct lobes. Gaster smooth, without spines or protuberances.

Gyne: Color and pilosity as in the conspecific workers, as are the main morphological traits, with three equally developed ocelli. Mesosoma compact, scutum flat and in dorsal view rounded anteriorly and posteriorly. Juncture of scutum and scutellum without hairs medially. Parapsidial lines visible and impressed, prescutum reduced, axillae triangular. Propodeum with small blunt spines. Radial cell of forewing open.

Male: Color brown. Body covered by short appressed hairs. Head subquadrate. Compound eyes large, occupying the anterior half of the lateral margin of the head, in full face view. Mandibles slender and elongate. Anterior margin of clypeus straight with long setae, the median only visible in SEM images. Posterior margin bulging to half of antennal insertion level. Frontal lobes reduced, without antennal scrobes. Vertexal margin convex in full face view, posterolateral corners of the head rounded. Antennae 13-segmented; antennal scapes surpassing dorsal margin. In dorsal view, anterior margin of scutum rounded; scutum wider than prescutellum. Scutum with a glabrous median stripe. Scutellum subtriangular, with the major width at anterior portion. Postpetiole with median impression posteriorly, gaster smooth. Forewing with an open radial cell.

Comments: The here described monotypic genus *Kalathomyrmex*; with *K. emeryi* as the type species, presents the following exclusive set of characters: subquadrate head shape; reduced arched frontal lobes; subtriangular mandibles with five teeth; triangular clypeus with latero-posterior margins strongly produced forwards over the lateral wings of the clypeus as rounded ridges, resulting in two large circular areas where

the antennal scapes articulate, junction of antennal insertion area and clypeus with long setae, forming a psammophore (apparently non-homologous with the *Paramycetophylax* psammophore and a putative synapomorphy for *Kalathomyrmex*); lack of a median clypeal seta (otherwise universal in Attini); noticeably slender body; and median dorsal conical protuberance in the posterior area of the mesonotum. Also, in contrast to the species of *Mycetophylax* as accepted here, the species of *Paramycetophylax* and *Kalathomyrmex* females share a morphological character state of the postpetiole with a large posterior impression, almost dividing it into two lobes. Notwithstanding, in comparison with the morphological distinction accepted for Attini genera, we propose to separate these species in two different genera.

Mycetophylax emeryi (Forel, 1907) is formally excluded from *Mycetophylax* and here designated as the type species of a genus, *Kalathomyrmex*. We have already discussed that in comparison with other attines, the degree of morphological differentiation of this taxon led us to recognize it as a distinct genus, in particular the seemingly exclusive secondary loss of the median clypeal seta. *Kalathomyrmex* shares with *Myrmicocrypta* the character state of the antennal insertion area. It is a deep concavity with rounded anterior margin that projects forward, forming a conspicuous transverse and rounded ridge at the juncture with the posterior margin of the clypeus. The transverse ridge extends medially and is elevated anterior to the frontal lobes. However, other characters listed in the diagnosis exclude *Kalathomyrmex* from the genera traditionally recognized as Paleoattini. Hence the situation of the antennal insertions may represent a convergence with *Myrmicocrypta*.

Schultz & Brady (2008) studied *Kalathomyrmex emeryi* specimens from Guyana and Argentina, which consistently come together in their molecular phylogeny as the sister-group of the Neoattini, apparently splitting from the other neoattines 40–50 million years ago, being the oldest living lineage in the Neoattini. The species we are including in the monotypic *Kalathomyrmex* is widespread in cis-Andean South America, occurring in all its main ecosystems.

***Kalathomyrmex emeryi* (Forel, 1907) new combination**

(Figs. 4, 6 h, i, 7 b)

Myrmicocrypta emeryi Forel, 1907:144 (worker) Syntypes, Colombia, Dibulla, Santo Antonio, Forel col. (MCSN, examined); Forel 1912: 189 (queen, male) Allotypes; Emery 1913: 251 combination in *Cyphomyrmex* (*Mycetophylax*); Santschi 1916: 383 combination in *Myrmicocrypta* (*Mycetophylax*); Kempf 1972: 145 (catalogue); Bolton 1995: 268 (catalogue).

Mycetophylax hummelincki Weber, 1948: 84 (worker) Syntypes, Venezuela, Stat. 121, Cabo Blanco, 19.viii.1936 (P. Wagenaar Hummelinck col.) (not examined); Weber 1958: 263 synonym of *Mycetophylax emeryi*; Kempf 1972: 145 (catalogue); Bolton 1995: 268 (catalogue).

Myrmicocrypta emeryi var. *arenicola* Forel, 1912: 189 (worker, queen) Syntypes, Argentina, Huasan, 1300 m (Bruch col.) (not examined); Emery 1922: 343 combination in *Cyphomyrmex* (*Mycetophylax*); Santschi 1922: 355 combination in *Myrmicocrypta* (*Mycetophylax*); Kempf 1962: 34 combination in *Mycetophylax*; Kempf 1972: 145 (catalogue); Bolton 1995: 268 (catalogue) Bestelmeyer & Wiens 1996: 1231 (ecology); **new synonym.**

Myrmicocrypta (*Mycetophylax*) *emeryi* var. *argentina* Santschi, 1916: 383 (worker) Syntypes, Argentina, Santiago del Estero, Rio Salado, (Wagner col.), Buenos Aires, (Bruch col.) (NHMB, examined); Emery 1922: 343 combination in *Cyphomyrmex* (*Mycetophylax*); Kempf 1972: 146 combination in *Mycetophylax*; Bolton 1995: 268 (catalogue); **new synonym.**

Myrmicocrypta emeryi var. *fortis* Forel, 1912: 189 (worker) Syntype, Argentina, Huasan, 1300 m (Bruch col.) (MNHB, examined); Santschi 1922: 355 combination in *Myrmicocrypta* (*Mycetophylax*); Bucher, 1974: 63; Kempf 1972: 146 in *Mycetophylax*, (catalogue); Bolton 1995: 268 (catalogue); **new synonym.**

Mycetophylax bolivari Weber, 1948: 84 (worker) Syntypes, Venezuela, Anzoategui: Llanos 17 km N of Soledad, 27.i.1935, across the Orinoco River from Ciudad Bolivar (Weber col.), (not examined); Weber 1958: 263 (*Mycetophylax emeryi* ssp. *bolivari*), Kempf 1972: 145 (catalogue); Bolton 1995: 268 (catalogue); **new synonym.**

Myrmicocrypta (*Mycetophylax*) *emeryi* st. *gallardoi* Santschi, 1922: 354 (worker) Syntypes, Argentina, Province de Buenos-Ayres, Sierra de la Ventana (Bruch, leg.) (NHMB, examined); Kempf 1972: 146 combination in *Mycetophylax* (catalogue); Brandão, 1991: 358 (catalogue); Bolton 1995: 268 (catalogue); **new synonym.**

Mycetophylax emeryi st. *hubrichi* Santschi, 1925: 163 (worker) Syntypes, Argentina, Santa Fé, Rosario, (Hubrich, col.) (NHMB, examined); Kempf 1972: 145 (catalogue); Bolton 1995: 268 (catalogue); **new synonym**.

Mycetophylax emeryi st. *weiseri* Santschi, 1929: 303 (worker) Syntypes, Argentina, Catamarca, Corral Quemado, (Weiser, col.) (NHMB, examined); Kempf 1972: 145 (catalogue); Bolton 1995: 268 (catalogue); **new synonym**.

Mycetophylax glaber Weber, 1948: 85 (worker) Holotype, Bolivia, Tumupasa, (W.M. Mann col.) (not examined); Kempf 1972: 145 (catalogue); Bolton 1995: 268 (catalogue); **new synonym**.

Worker (Figs. 4 a, b, g, 6 h and 7 b)

Range of measurements (in mm) and indices of examined specimens (N = 76): IOD 0.49–0.83; HL 0.54–0.83; CI 85–106; SL 0.48–0.8; SI 84–112; ML 0.23–0.48; MI 34–77; WL 0.70–1.26; PrW 0.26–0.60; PL 0.16–0.30; PPL 0.19–0.35; GL 0.57–0.92; FL 0.52–0.98; TL 2.42–4.03.

Color in general yellowish to reddish-brown, some specimens may be darker. Apex of funiculus, clypeus, and masticatory border of mandibles, head vertex, postpetiole, gaster and femora brownish. Mandibles and tarsi yellowish; rest of the body light reddish brown. Under optical scope, body sculpture densely punctuated with exception of lateral parts of pronotum, where the sculpture is more superficial. Mandible disc shiny with piliferous punctuations. Mesosoma covered by a fine layer of “dirt”, visible only in SEM images in a way that the sculpture of the integument is “reprinted” in the dirt-layer. Whole body covered by shiny whitish to golden appressed hairs. Long, flexuous hairs covering the mandibles and gular face.

Head shape quadrate (see CI). Mandibles with five teeth, apical tooth larger, followed by smaller second and third teeth. After the diastema a small fourth tooth followed by a small denticule. Anterior margin of clypeus gently concave. In lateral view, clypeus triangular. In frontal view latero-posterior margin of clypeus strongly produced forwards over the lateral wings of the clypeus, as rounded trenchant ridges, resulting in two large flat circular areas where the antennal scapes articulate. Median portion of clypeus attains posteriorly the posterior level of the antennal insertions in a generally straight sometimes rounded suture, followed by a small impressed triangular frontal area. A shallowly impressed median line running from the frontal area to the vertex. Frontal lobes reduced, barely covering the antennal insertions, their maximum expansion less than a fourth of a longitudinal median head axis and the lateral margins of head, ending posteriorly at the level of the posterior margin of compound eyes. Lateral carinae bordering the internal margins of the compound eyes, fading out a little after their posterior margins. Compound eyes set slightly before the middle of the head, at maximum width with ten ommatidia and at maximum length with 14 ommatidia. Vertexal margin straight, but occasionally with a median impression. Antennae with flattened scapes, surpassing the posterolateral corners of the head when laid back over the head capsule. First funicular segment as long as the second and the third together. Apical end of funiculus with a three segmented club, only a little wider than the other funicular segments. Ventral face of head flat.

Mesosoma. Pronotum without tubercles or distinct protuberances, lateral pronotal margins rounded, without spines or angles. Occasionally the pronotum bearing a blunt obliquely directed spine (specimens from Paraguay and Argentina). Dorsal face of mesonotum evenly rounded, in side view, followed by a small depression and a conical low protuberance. Anepisternum clearly divided from the mesonotum by a carina. In lateral view, basal face of propodeum slightly convex anteriorly, meeting the concave declivous face and about one half shorter than basal face. Propodeal spiracle opening in an angle of 45° in relation to the main body axis. Propodeum with a pair of divergent, short, blunt obtuse angles, directed obliquely upwards. In dorsal view, petiole straight, wider at three fourths of its length, with a vestigially developed ventral process. Postpetiole, in dorsal view, subtriangular, with a large impression at posterior margin, forming two distinct lobes, heart-shaped and dorsoventrally flattened.

Gaster smooth, without protuberances or carinae.

Gyne (Figs. 4 c, d, h and 7 b)

Range of measurements (in mm) and indices of examined specimens (N = 10): IOD 0.54–0.64; HL 0.56–0.63; CI 90–107; SL 0.5–0.56; SI 83–100; ML 0.26–0.34; MI 43–61; WL 0.94–1.02; PL 0.16–0.24; PPL 0.2–0.24; GL 0.84–0.98; TL 3.01–3.36.

Color, pilosity and main morphological traits of head, propodeal spiracle, petiole, postpetiole and gaster similar as in the conspecific workers. Mandible with five teeth, apical tooth bigger than all the others, followed by smaller second and third triangular teeth; fourth tooth triangular and smaller than the second and third, followed by a small denticle. Compound eyes with 15 ommatidia at maximum width and 17 ommatidia at maximum length. Posterior portion of head with three ocelli, the median superficially impressed at frons. The apical funicular segment as long as the three anterior together.

Mesosoma in lateral view with dorsally flattened scutum, in lateral view, dorsum of scutum starts at the anterior third of the pronotum. In dorsal view anterior margin and posterior margin round, the last ending in a carina. Parapsidal lines shallowly impressed. Prescutum reduced, represented only by triangular axillae; scutum-scutellar sulcus deeply impressed. Scutellum subquadrate, anterior third wider than posterior portion, posteriorly rounded. Metanotum reduced, appearing only as small, flattened disc in dorsal view. Katepisternum rectangular; anepisternum only half the size of the katepisternum, subquadrate, and both separated by a distinct groove, ending posteriorly in a carina. Propodeum with a small blunt obliquely upwards directed spine.

Male (Figs. 4 e, f, i, 6 i and 7 b)

Range of measurements (in mm) and indices of examined specimens (N = 10): IOD 0.21–0.34; HL 0.24–0.34; CI 88–100; SL 0.32–0.42; SI 110–152; ML 0.13–0.18; MI 38–53; WL 0.76–0.92; PL 0.10–0.18; PPL 0.12–0.20; GL 0.68–0.82; TL 2.31–2.58.

Color brownish to dark brown. Anterior half of mandibles, funiculus, labrum, legs and apex of gaster light yellow. Under optical scope, body densely punctuated, with exception of shiny gaster, where sculpture is more superficial. Whole body covered by golden, shiny, appressed hairs. Head shape quadrate (see CI). Mandibles with three multidenticulate teeth, apical tooth longer than the others, followed by a smaller second triangular tooth and a denticle, better visible with SEM images (Fig. 6 i). Anterior margin of clypeus straight. Clypeus with a psammophore composed by four setae arising from the meeting of the clypeus and the anteclypeus. Psammophore hairs fine and stiff as long as the length of the two apical segments of funiculus, reaching the apex of the mandibles. In frontal view, clypeus bulging, its posterior margin not forming a trenchant ridge. Frontal lobes reduced, covering only half of the antennal insertions, ending posteriorly at the level of the anterior margin of compound eyes. Lateral carinae marginate the compound eyes anteriorly. Compound eyes set at anterior part of head, at maximum width with 19 ommatidia and at maximum length with 23 ommatidia. Vertexal margin with a median longitudinal impression, resulting from the bulging of the lateral ocelli, posterolateral corners of head rounded. Antennae 13-segmented, scapes rounded, surpassing the posterolateral corners of the head by the length of the three apical segments of the funiculus. First funicular segment with the same length of the second. Funiculus with a three segmented club. The apical funicular segment as long as the two anterior together. Ventral face of head flat.

Mesosoma in dorsal view with rounded scutum, almost covering the whole pronotum. Major width of scutum at tegula. Parapsidal lines distinct and in parallel to the main body axis. Axillae subtriangular and scutum-scutellar sulcus deeply impressed. Scutellum subquadrate to subtriangular, wider anteriorly than posteriorly, posterior margin rounded. Katepisternum subquadrate with inferior margin rounded; anepisternum subtriangular. Apex of procoxa fail to attain the anterior margin of katepisternum level. Propodeum basal face occasionally slightly concave, meeting the declivous face in rounded angles. In lateral view, petiole triangular, node rounded dorsally, ventrally straight. In dorsal view, petiole with a shallowly and wide median impression. Postpetiole much wider posteriorly, heart-shaped; ventrally with a vestigial antero-median denticle. Gaster elongated.

Legs long and filamentous.

Examined material: ARGENTINA: Buenos Aires, Sierra de la Ventana, no coll. date (C. Bruch), 3 w (NHMB); Catamarca, no coll. date. (Coronel Weiser), 2 w (NHMB) (Types); Chaco, Chaco National Park, 26°48,522' S 59°36.395' W, 4–6.iv.2003, Scott Solomon col., 2 w, 2 q, 2 m (SMNK); Córdoba, no coll. data (C. Bruch), 2 w, 1 q (MZSP); Cruz Alta, 30.v.1965 (E. Bucher), 1 w (MZSP), Mendoza, Chileiro, no coll. date (Duzione), 3 w (NHMB)(Cotype), Santiago del Estero, no. coll. date (Merkle), 1 w (MZSP); Chaco de

Santiago del Estero, Rio Salado, no coll data, 1 w (NHMB) (Holotype of *M. emeryi argentina*); Rosário, no coll. date (Hubrich), 1 w (MZSP), 3 w (NHMB); La Soledad (Canete), Tucumán: no coll. date. (Weiser), 1 w; 5.xii.1956 (NK 10018) [Nicolas Kusnezov], 3 q (MZSP); Siete de Abil, Dpto. Burruyacu, 8.vi.1965 (E. Bucher) 2 w (MZSP); BRAZIL: Amazonas: Manaus, Praia de Tupé (Rio Negro), 3.iii.2002 (C. Rabeling), 32 w (MZSP), 20.iv.2002 (C. Klingenberg), 14 w (MZSP); Praia Paricatuba (Rio Negro), 20.iv.2002 (C. Klingenberg) 4 w (MZSP); Bahia: Juazeiro, x-8.xii.1948 (C. R. Gonçalves), 5 w, 1 q (MZSP); Mato Grosso: Porto Murtinho, vii.1960 (B. Kelber), [4680, 3803], 3 w (MZSP); Rondonópolis, 6.iii.1971 (W. Kempf), [6263], 7 w (MZSP); Tocantins: Goiatins, 9.xi.1999 (C. R. F. Brandão & C. I. Yamamoto), 1 w (MZSP); Pará: Altér do Chão, 2°30'S 54°57'W, 15.vii.1998 (M. F. Leite), 2 w (Heraldo Vasconcelos); Paraíba: Juazeirinho, Soledade, 28.i.1956 (C. R. Gonçalves), 4 w (MZSP); Pernambuco: Araripina, 2-4.i.1973 (R. Montenegro), [8424, 8426, 8434, 8445], 8 w, 2 q (MZSP); Piauí: Canto do Buriti, 18-22.xi.1991 (C. R. F. Brandão) 23 q, 17 m; 20 km S Floriano, Buriti Sol, 5-12.xi.1991 (C. R. F. Brandão & P. Moutinho), 10 km N Corrente, Faz. Maracuja, 23-27.xi.1991 (C. R. F. Brandão) 1q, 1m (MZSP); Rio Uruçui-Preto, 20.ii.1976 (R. Negrett), [12857], 3 w (MZSP); São Paulo: São Manoel, 10.ii, 6.xi, 8.xii.1988, (E. S. Zanetti), 2 q, 1 w (MZSP); Agudos, ix, 10.x.1958 (R. Mueller), [2752, 2661], 4 w (MZSP), Agudos, 26.xi.1955 (W. Kempf), 2 w, 1 q (MZSP); Itirapina, 18.iii.1966 (W. Kempf), [4422], 1 w (MZSP); GUYANA: Pirara, nest in soil, 4.iv.1996 (Ted Schultz & U. G. Mueller), 4 w [#00303800] (USNM). PARAGUAY: Boquerón: Parque Nacional Tte. Enciso, Zona Administrativa, 21°13'S 61°40'W, 6-7.viii.1994 (B. Garcete), 1 w (MZSP); PERU: Huánuco ("Panguana"), Rio Yuyapidris, 16.xii.1984 (M. Verhaagh), 3 w (SMNK), VENEZUELA: Lara, Barquisimeto to Carora km 19, 29.vi.1971 (W. L. Brown), 15 w (MZSP).

Comments. Authors often based their descriptions of subspecies and varieties of *Kalathomyrmex emeryi* on morphological character differences regarded today as minor local variations. It is well known that characters like color and pilosity in general vary within the same ant species and colony. Examples of this usage can be seen in Forel (1912) in his descriptions of *Myrmicocrypta emeryi* var. *arenicola* and *M. emeryi* var. *fortis*. The two variations differ only by their color, but were collected at the same locality. This may suggest that these taxa are composed of sibling species, but the present criteria do not afford recognition. Another example is given by Santschi (1922), when he states that *M. emeryi* var. *fortis* seems to be a transitional form between *arenicola* and *argentina*. These examples indicate that the validity of the majority of the described subspecies and variations of *K. emeryi* is doubtful. The examination of all listed specimens, including the available types, shows that there are variations in color and pilosity, but mostly gradual and sometimes aleatory, and thus we found no ground for a reliable recognition of species or subspecies among them. Although we were not able to locate and examine the type of *M. glaber*, the description of the species given by Weber (1948) led us to conclude that *M. glaber* is also identical to *K. emeryi*.

Information on the biology of this species is scant. As mentioned above, Bucher (1974) described the nest architecture of *Paramyrmecophylax bruchi* and *K. emeryi*; both species inhabit sandy soil and prefer places devoid of vegetation. We confirmed this observation for *K. emeryi*, as we found this species nesting at the beaches of the Rio Negro (AM), Brazil. The nests are quite common at the sandy beaches of the river and can be easily located. In the Amazonian rainy season, the nests become covered by water for months. This observation has been confirmed by Dr. M. Verhaagh in Peru (pers. comm.), who found a *K. emeryi* nest nearby a river bank covered by high water for several days; when the river returned to its normal water level, the ants reopened the entrance and came out of the nest. According to Bucher (1974), the fungus chambers are located from 60 to 100 cm deep, but can be found deeper due to temperature changes during the year. For the fungus substrate, the species forages for feces of other insects, mainly of Lepidoptera. The ants showed their highest activity during the night. However, we observed *K. emeryi* in frantic activity during the day in several instances, even with relatively high temperatures and under full sun exposure.

Kalathomyrmex emeryi is distributed all over cis-Andean South American. A map of the known records is presented in Fig. 7 b.

***Paramycetophylax* Kusnezov, 1956 revised status**

(Figs. 5, 7 c)

Myrmicocrypta (in part) Wheeler, 1907: 728; Forel 1907: 144

Cyphomyrmex (*Mycetophylax*) Emery 1913: 251; key to species, Santschi, 1922: 357; raised to genus by Santschi 1923: 268

Myrmicocrypta (*Mycetophylax*) Santschi, 1916: 383, Gallardo, 1916: 320

Sericomyrmex (in part) Santschi, 1916: 383

Paramycetophylax Kusnezov, 1956: 23; synonym of *Mycetophylax* by Weber, 1958: 263 (**removed from synonymy**)

Type species: *Sericomyrmex bruchi*, Santschi, 1916 (original designation) (junior subjective synonym of *Paramycetophylax bruchi*)

Worker: Monomorphic. Integument reticulate, the mandibles longitudinally striate, the head, gaster and legs (particularly over the frontal face of the coxae) with appressed fine short whitish hairs. Long setae at the anterior margin of clypeus, forming a psammophore, mandibles glabrous.

Head quadrate, compound eyes at the middle of head. Mandibles subtriangular, with irregularly developed teeth. Anterior margin of clypeus straight, almost concave, posterior portion attaining the antennal insertions level in a rounded suture. Triangular frontal lobes developed. Vertexal margin strongly concave.

Pronotum with a pair of lateral low tubercles; lateral pronotal margin with an attenuated obtuse angle, mesonotum with a very low antero-median protuberance. Metapropodeal impression distinct and flat; propodeum basal face convex in side view, meeting of faces armed with a pair of small sharp triangular spines; declivous face straight. Petiole without distinct node, half the width of the postpetiole, which bears a large impression posteriorly, dividing the postpetiole posterior area in two lobes.

Gaster smooth, without carinae, spines or protuberances.

Gyne: Color, pilosity and sculpture like conspecific workers. Head as in the workers, but with three equally developed ocelli in the posterior fourth of head. Mesosoma with a well developed scutum, scutum-scutellar sulcus and scutellum. Prescutellum straight at middle portion anterior, posterior margin not attached, and axilla well developed. In dorsal view, scutum rounded anteriorly and with its widest part at the tegulae. Parapsides almost indistinct, mostly observable due darker surrounding color, set between parapsidial lines and latero-posterior margin of the scutum, limited by a darker carina. Scutum-scutellar sulcus concave anteriorly. Anepisternum and katepisternum divided by a suture. Anterior border of katepisternum sinuous. Petiole, postpetiole and gaster like those of the workers; gaster with the same width as the head.

Male: Color brown. Head quadrate, big compound eyes occupying anterior half of lateral margin of head, in full face view. Mandibles elongated. Anterior margin of clypeus straight with long setae. Frontal lobes reduced, covering only half of antennal insertions. Vertexal margin straight. Antennae 13-segmented; antennal scapes surpassing vertexal margin. In lateral view, scutum covering entire pronotum. Scutellum strongly bulging in side view. Postpetiole posterior margin with a median impression, gaster smooth.

Comment: *Mycetophylax bruchi* was described by Santschi in 1916 as a *Sericomyrmex*. Kusnezov, while describing *Paramycetophylax* in 1956, designated *S. bruchi* as the type species. We already pointed out above why we believe that this species does not belong to *Mycetophylax*, in special for the psamphore, which in *S. bruchi* departs from the anterior margin of the clypeus and not in the posterior margin as in *Kalathomyrmex*. Other putative synapomorphy is the shape of the frontal lobes, which are triangular and ill-developed, different from the frontal lobes of *Mycetophylax* species (in the present sense). The name *Paramycetophylax* is available and is hence hereby revalidated to accommodate *Sericomyrmex bruchi*.

The only species we assign to the genus *Paramycetophylax* (*P. bruchi*) is defined by the following set of characters, the wide triangular frontal lobes; long setae at the mandibles and at the anterior margin of clypeus, forming a psammophore, and distinct pronotal spines. *Paramycetophylax* seems to occur only in southern South America, with *P. bruchi* known only in Argentina thus far.

***Paramycetophylax bruchi* (Santschi, 1916) new combination**

(Figs. 5, 7 c)

Sericomyrmex bruchi Santschi, 1916: 383, (worker) Holotype, Argentina: Puerto Madryn (Biraben) (NHMB, examined); Santschi 1922: 355 combination in *Myrmicocrypta* (*Mycetophylax*); Santschi 1923: 268 combination in *Mycetophylax*; Kusnezov 1956: 24 combination in *Paramycetophylax*; Weber 1958: 262 combination in *Mycetophylax*; Kempf, 1972: 145 (catalogue); Bolton 1995: 268 (catalogue) **new combination**.

Mycetophylax bruchi var. *pauper* Santschi, 1923: 268 replacement name, junior secondary homonym of *Mycetophylax bruchi* var. *simplex* Santschi, 1922: 355 (worker) Type, Argentina: Neuquén, (Dr. Carette col.) (MZSP, NHMB examined); Kempf 1972: 145 (catalogue); Bolton 1995: 269 (catalogue); **new synonym**.

Myrmicocrypta (*Mycetophylax*) *cristulata* Santschi 1922: 356 (worker, queen, male) Syntypes, Argentina: Tucumán, El Bañado, Valle Santa Maria, Ing. Weiser col. (NHMB, examined); Santschi 1929: 304 combination in *Mycetophylax*; Bucher, 1974: 63, Kempf 1972: 145 (catalogue), Bolton 1995: 268 (catalogue); **new synonym**.

Mycetophylax cristulatus var. *emmae* Santschi 1929: 304 (worker) Syntypes, Argentina, Catamarca, Nacimientos, (Weiser col.) (NHMB, MZSP examined); Kempf 1972: 145 (catalogue), Bolton 1995: 268 (catalogue), Klingenberg & Brandão, 2005: 45 (syntype worker in MZSP); **new synonym**.

Worker (Figs. 5 a, b, g, 7 c)

Range of measurements (in mm) and indices of examined specimens (N = 13): IOD 0.88–1.18; HL 0.82–1.10; CI 101–113; SL 0.67–0.87; SI 57–80; ML 0.47–0.58; MI 47–58; WL 1.25–1.73; PrW 0.53–0.70; PL 0.25–0.37; PPL 0.23–0.37; GL 0.90–1.18; FL 0.93–1.39; TL 3.93–5.82.

Measurements (in mm) and indices of Holotype (worker without gaster): IOD 1.00, HL 0.91, CI 110, SL 0.76, SI 76, ML 0.53, M 58, WL 1.48, PrW 0.62, PL 0.30, FL 0.93.

Color yellow to reddish-brown. Masticatory and external borders of mandible, margins of clypeus and carinae brownish. Under optical microscope, body sculpture densely reticulate with exception of dorsal discs of mandibles, where sculpture is finely striate. Whole body sparsely covered by golden shiny appressed hairs. Anterior margin of clypeus with five to nine fine, stiff, and long setae, reaching half the length of the mandibles; three median setae longer than lateral ones.

Head wider than long (see CI). Compound eyes set close to the middle of the head, with eleven ommatidia at maximum width and eight ommatidia at maximum length. Mandibles with eight to ten teeth, the two most apical teeth bigger than the others, followed by five to seven smaller triangular teeth and a last denticle. Anterior margin of clypeus slightly concave, almost straight, which bears a 6–8 long setae psamphore. In frontal view, clypeus attaining posteriorly the level of half the frontal lobes, in a rounded suture, followed by a weakly impressed triangular frontal area. Triangular shaped frontal lobes fully covering the antennal insertions. Glabrous area between antennal insertions and lateral carinae ending posteriorly at the level of posterior margin of the compound eyes. Sharp lateral carinae, almost vertical, marginate the anterior border of compound eyes. Vertexal margin concave, with a median impression and forming two lobes. Antennal scapes flattened, slightly curved; depending on degree of curving, reaching or slightly surpassing the posterolateral corners of the head. Apical end of funiculus with a three segmented club, wider than preceeding segments. The apical segment of funiculus as long as previous two segments together. Ventral face of head conspicuously flat.

Mesosoma. Pronotum with a pair of anterior blunt and low spines, and a pair of inferior spines, square in lateral view. Dorsal face of mesonotum with a small blunt low median protuberance anteriorly. Inferior margin of mesosoma bordered by a sharp translucent carina. In side view, dorsal face of mesonotum slightly concave in the middle, metapropodeal suture straight; propodeum with a pair of triangular anterior protuberances at the basal face, a pair of divergent, short, blunt narrow triangular spines at the meeting of basal and declivous faces, and declivous face almost vertical. Petiole compact; in lateral view peduncle very short, and dorsal margin of node gently sloping until two posterior low triangular corner-like protuberances, with a weakly developed ventral process. Postpetiole in dorsal view subquadrate, with rounded margins. In lateral view, sternite of postpetiole well defined, covering 2/3 of tergite surface.

Gyne (Figs. 5 c, d, h, 7 c)

Measurements (in mm) and indices of examined specimen (N = 1): IOD 1.50; HL 1.36; CI 110; SL 1.01; SI 67; ML 0.57; MI 42; WL 2.05; PL 0.52; PPL 0.49; GL 2.10; TL 7.09.

Color, pilosity and main morphological character traits of head, propodeal spiracle, petiole, postpetiole and gaster conspecific with the workers. Mandibles with nine teeth; apical tooth bigger than all others, followed by a smaller second apical tooth, six equally developed triangular teeth and a small basal denticule. Compound eyes with 16 ommatidia at maximum width and 21 ommatidia at maximum length. Posterior fourth of head with three equally developed ocelli. Most apical funicular segment slightly shorter than the two anterior together.

Mesosoma. In lateral view anterior margin of pronotum and anterior face of scutum almost vertical, dorsal face of scutum flat almost concealing the pronotum in dorsal view, anterior margin of scutum rounded. In dorsal view, posterior margin almost straight, slightly rounded. Parapsidal lines visible due to the darker color of the parapsidal region and median portion of scutum. Notaulices obsolete. Prescutum narrow, at middle portion anterior and posterior margin not touching, axillae subtriangular. Scutum-scutellar sulcus impressed, convex and rounded. Scutellum trapezoid, anterior margin double the width of the slightly convex posterior margin. Metanotum reduced, appearing only as small, flattened disc in dorsal view. Katepisternum subquadrate to subtriangular; anepisternum two thirds of size of katepisternum, subquadrate, both divided by a distinct groove and ending posteriorly in a carina. Propodeum basal face straight in lateral view, oblique, with a sharp and produced triangular spine. Petiole, postpetiole and gaster as in the workers. Spiracle of first gastral segment indistinct.

Male (Figs. 5 e, f, i, 7 c)

Range of measurements (in mm) and indices of examined specimens (N = 3, in two specimens it was not possible to measure the mandible length, therefore range for mandible length, mandibular index and total length are not given): IOD 0.7–0.71; HL 0.68–0.74; CI 101; SL 0.77–0.86; SI 108–123; ML 0.31; MI 42; WL 1.6–1.77; PL 0.37–0.43; PPL 0.26–0.29; GL 1.59–1.73; TL 5.05.

Color dark brown. Funiculus, mandibles, pretarsi and tarsi brownish to yellowish. Integument and pilosity like in the conspecific workers. Integument of gaster shiny, with an almost vestigial reticulation. Head slightly wider than long (see CI), with the postero-lateral angles almost straight. Compound eyes with 21 ommatidia at maximum length and 20 ommatidia at maximum width. Mandibles slender and elongated with only two apical teeth, followed by a straight margin. Anterior margin of clypeus straight with three long setae. Clypeus posterior area attaining the level of half the antennal insertions, ending in a distinct triangular suture, followed by a narrow, impressed triangular area. Frontal lobes reduced, covering only half the antennal insertions. Lateral carinae barely surpassing the level of the posterior margin of compound eyes. Vertexal margin almost straight, posterolateral corners of the head almost rectangular. Antennal scapes straight, with half the length of all other antennal segments together. First funicular segment as long as the two next segments together. Ventral portion of head convex behind the buccal cavity, ending postero-ventrally in a sharp angle.

Mesosoma. In lateral view scutum fully covering the pronotum. Scutum dorsal margin rounded in lateral view; in dorsal view with a middle shallow impression. Anterior margin of scutum rounded in dorsal view. Posterior margin convex. Parapsidal lines parallel to the median body axis. Median portion of prescutum narrow but anterior and posterior margin not touching, axillae subtriangular. Scutum-scutellar sulcus distinct. Scutellum bulging, strongly rounded in lateral view; scutellum anterior margin slightly convex, posterior margin rounded. Anepisternum and katepisternum divided by a sinous groove, development varies among the specimens. Anepisternum subtriangular with four to five transversal rugae dorsally. Katepisternum subquadrate and antero-ventral margin sinuous. Propodeum basal face slightly convex in lateral view, with a pair of small blunt spines; declivous face slightly concave. Petiolar dorsal margin rounded in side view, without spines, only two lobes in dorsal view. Ventral process vestigial. Postpetiole almost twice as wide as petiole in dorsal view, wider posteriorly; posterior margin of postpetiole with a median depression.

Examined material: ARGENTINA: Neuquén, no coll. data 2 w (NHMB), v.1925 (Dr. Carette), [#1425], 1 w (MZSP); Nacimientos, 2.xii.1922 (Weiser), 3 w (NHMB) 1 w (MZSP) (Cotype); Puerto Madryn (Biraben), 1 w (NHMB); El Bañado, Valle Sta. Maria (Weiser), 3 w, 3 m, 1 g (NHMB); Tucumán, Siete de Abril, Depto. Burruyacú, 2.vi.1965 (E. Bucher), 2 w (MZSP).

Comments. The shape of the workers antennal scapes varies among individuals; it was not possible to determine a typical shape for the species: some specimens have straight scapes, surpassing the posterolateral corners of the head while others have curved scapes, only reaching the posterolateral corners. Santschi (1922) commented on the variation in *P. simplex* (= *Mycetophylax bruchi* var. *pauper* Santschi, 1923) with some individuals with slightly longer antennal scapes and without greyish powder covering (“pruinósité”). We suspect that he actually observed the symbiotic bacteria *Streptomyces* covering the Attini ants in some individuals, which can cause such an appearance. Currie *et al.* (1999) described this phenomenon in *Acromyrmex* ants.

In his description of *Myrmicocrypta* (*Mycetophylax*) *cristulatus*, Santschi (1922) mentioned larger dimensions in comparison with *M. bruchi*. But he was not able to define any clear morphological difference between the species, except for the shape of the postpetiole. In 1929 Santschi published the description of *Mycetophylax cristulatus* var. *emmae*. Again he justified the description of the variety because of its different dimensions and color.

In his key, published in 1922, Santschi recognized similarities between *M. bruchi* and *M. cristulatus*, as well as differences and based his arguments for distinguishing them on the dimensions of the postpetiole. In *M. cristulatus* Santschi argued that the postpetiole seems to be wider than long, whereas in *M. bruchi* the postpetiole seems to be as long as wide. From our measurements of all available specimens we find that this character is not efficient for species separation. The same is true for the separation of *M. bruchi* from its variety *M. bruchi* var. *simplex* (latter renamed as *pauper*).

However, Santschi was never able to show distinct morphological differences between the species *bruchi* and *cristulatus* and among their variations. Our observations show that the examined individuals present variations in body dimensions and color, especially in the length and shape of the antennal scape. These variations are gradual, so that the recognition of distinct forms is not possible. We propose then the synonymy of *M. cristulatus* and all varieties under *P. bruchi*.

In two of the three examined males, the inferior vein of the radial cell does not touch the costa of the forewing. So the apicalmost part of the radial cell appears as not fully closed.

There is no recent information published about the natural history of the species. Only Bucher (1974) briefly commented on the nest architecture of *P. bruchi* and *K. emeryi*; both species nesting in sandy soil, in places clear of vegetation.

The species *P. bruchi* is known only from continental Argentina. A detailed map of distribution records is given in Fig. 7 c.

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