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ISSN 1340-3540 (print), 1618-2545 (online)

journal homepage: [www.elsevier.com/locate/myc](http://www.elsevier.com/locate/myc)**Short communication****Megacollybia rimosa (Agaricales), a new species from Brazil**Victor Rafael Matos Coimbra<sup>a,\*</sup>, Tatiana Baptista Gibertoni<sup>a</sup>, Felipe Wartchow<sup>b</sup><sup>a</sup> Universidade Federal de Pernambuco, Departamento de Micologia/CCB, Av. Prof. Nelson Chaves, s/n, Cidade Universitária, CEP: 50670-901, Recife, PE, Brazil<sup>b</sup> Universidade Federal da Paraíba, Departamento de Sistemática e Ecologia/CCEN, CEP: 58051-900, João Pessoa, PB, Brazil

## ARTICLE INFO

## Article history:

Received 21 June 2012

Received in revised form

24 July 2012

Accepted 5 September 2012

Available online 1 February 2013

## Keywords:

Agaricomycetes

Basidiomycota

Marasmiaceae

Neotropics

Taxonomy

## ABSTRACT

A new species of *Megacollybia* is here described, besides the collection being the first occurrence of this genus to Brazil. This taxon is mainly recognized by its rimose to cracked pileus, pruinose stipe surface, short-clavate, subclavate to lageniform pileocystidia and by the presence of clamp-connections. A full description, discussion, photographs and drawings of the microstructures are provided.

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*Megacollybia* Kotl. & Pouzar (Marasmiaceae Roze ex Kühner) was originally proposed by Kotlaba and Pouzar (1972) to accommodate *Collybia platyphylla* (Pers.) P. Kumm. Later, Cléménçon (1979) treated *Megacollybia* as a subgenus of *Oudemansiella* Speg., placing *O. platyphylla* (Pers.) M. M. Moser in the monospecific subgenus *Megacollybia* (Kotl. & Pouz.) M. M. Moser section *Megacollybia* Cléménçon, mainly by its non-gelatinized pileipellis, absence of annulus, stipe devoid of erect hairs and presence of smooth basidiospores.

Singer (1986) considered *Tricholomopsis platyphylla* (Pers.) Singer in a separated section (*Platyphyllae* Singer) in *Tricholomopsis* Singer. However, recent molecular data showed that *Megacollybia* is clustered with *Gerronema* Singer, *Hydropus* Kühner ex Singer and *Clitocybula* (Singer) Singer ex Métrod, but distant from *Tricholomopsis* (Moncalvo et al. 2002; Matheny et al. 2006). At the same time, based in ITS sequences, *Tricholomopsis*

*fallax* A.H. Sm. was shown to be closely related to *M. platyphylla*, not with *Tricholomopsis sensu stricto* (Matheny et al. 2006).

For many years, *Megacollybia* remained monospecific and basidiomata with diverse morphological features, collected in Europe, Asia, Central and North America, were named with the same epithet, until Hughes et al. (2007) analyzed several collections referred as *M. platyphylla* from whole world through integrative taxonomy, using morphological and molecular data. Through this innovative work, six new species were described, *T. fallax* was transferred to *Megacollybia* and *M. platyphylla* remained as type species of the genus, with geographical distribution delimited to Europe and Asia (Russian Federation). This work remains as the most complete study of *Megacollybia* available so far.

In this paper, we report *Megacollybia* for the first time to Brazil and describe, discuss and illustrate a new species of the genus.

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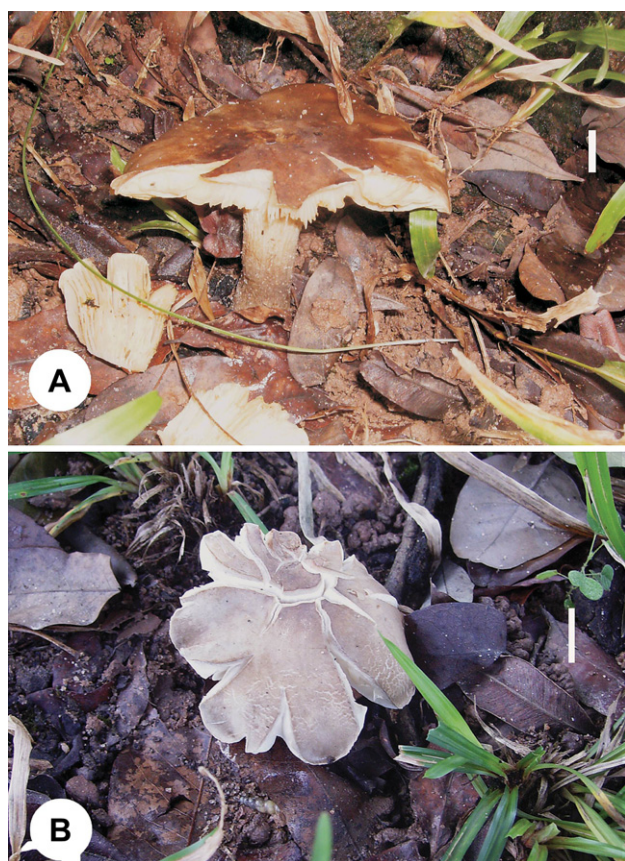
The basidiomata were collected during the rainy season in a grassland of the campus of the Universidade Federal de Pernambuco – UFPE (08°04'00"S 34°52'00"W) and they were analyzed following the usual methodology on studies in Agaricales (Singer 1986). Basidiospores were measured in KOH and statistics were based on 26 spores. Basidiospore data terminology followed Tulloss et al. (1992), slightly modified by Wartchow (2012) and Wartchow et al. (2012). Abbreviations include  $L(W)$  = basidiospore length (width) average,  $Q$  = the length: width ratio range as determined from all measured basidiospores, and  $Q$  = the  $Q$  value averaged from all basidiospores measured. All drawings of the microstructures were done with the aid of a camera lucida and the photographs of the fresh basidiomata were taken in the field. The exsiccates were deposited in Herbaria URM and JPB.

We also tried to extract DNA for phylogenetic analysis based in the methodology proposed by Góes-Neto et al. (2005), but all attempts failed as observed in the agarose gel electrophoresis. The failure of the process may have occurred due the condition of the genetic material, probably denatured by the high temperatures to which the basidiomata were exposed during drying.

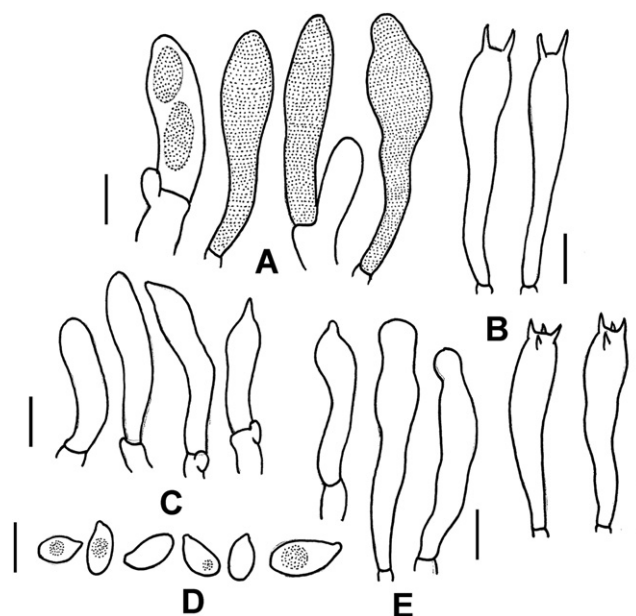
*Megocollybia rimosa* V. Coimbra & Wartchow, sp. nov. Figs. 1 and 2.

Mycobank no.: MB 564861.

This species presents as diagnostic features the clytocyboid basidiomata, rimose to cracked pileus, adnate to decurrent



**Fig. 1 – Basidiomata of *Megocollybia rimosa* (holotype).** A, Mature basidiome; B, Young basidiome. Scale bar = 10 mm. Photos by VRM Coimbra.



**Fig. 2 – *Megocollybia rimosa* (holotype).** A. Pileocystidia. B. Caulocystidia. C. Basidiospores. D. Cheilocystidia. E. Basidia. Scale bar = 10  $\mu$ m. Drawings by VRM Coimbra.

lamellae, pruinose stipe, presence of clamp-connections and short pileocystidia and cheilocystidia.

Type: Brazil, Pernambuco, Recife, Universidade Federal de Pernambuco, on soil of grassland close to *Clitoria fairchildiana* R. A. Howard, 9 July 2010, leg. Victor R. M. Coimbra s.n. (holotype URM 83564; isotype JPB 50426).

Etymology: 'rimosa', i.e. due to distinctly rimose pileus surface.

Habit clytocyboid, rather stout, solitary to gregarious. Pileus 40–100 mm, somewhat convex, plane-convex to plane, sometimes slightly depressed, light brown, grayish brown to sepia brown, surface rimose showing a white underline to radially cracking lacerate toward margin, fleshy consistency; context white and slightly gelatinous. Lamellae adnate to shallowly decurrent, subdistant with lamellulae of 2 lengths, edge smooth, not marginate, ivory white to pale cream colored. Stipe 35–50  $\times$  9–15 mm, clavate with a sub-bulbous base, central, sometimes slightly eccentric, terete, surface pruinose mainly at the center and downward, sometimes squamulose at base or slightly striate, grayish brown, somewhat hollow. Context white to cream, unchanging, fibrous and gelatinous in some basidiomata. Odor fungal. Taste not noted.

Basidiospores 6–9 (–13)  $\times$  (4–) 5–6.5 (–9)  $\mu$ m [ $L$  = 7.9  $\mu$ m;  $W$  = 5.7  $\mu$ m;  $Q$  = 1.16–1.60 (–2.50);  $Q$  = 1.39], ellipsoid, subglobose to ovoid, thin-walled, with distinct hilar appendix, inamyloid, hyaline, guttulate or not, smooth. Basidia 38–48 (–52)  $\times$  7–9  $\mu$ m, clavate, thin-walled, presenting refringent guttules, sometimes with a clamp-connection at the base, 2–4 sterigmata. Cheilocystidia 20–35  $\times$  4–6  $\mu$ m, inconspicuous, capitulate, non-septate, not projecting above the level of basidioles, hyaline, thin-walled. Pleurocystidia absent. Pileipellis a made of interwoven cylindrical hyphae of 3–8  $\mu$ m, thin-walled, with a pale brown cellular content, with upper layer made of scattered pileocystidia 30–75  $\times$  7–11  $\mu$ m, clavate, subclavate to lageniform with a subacute to rounded apex,

thin-walled, presenting a weak yellowish intracellular pigment. *Caulocystidia* 16–37 (–42) × 4–8 µm, clavate to rostrate, sometimes presenting acute apex, hyaline, thin-walled. *Lamellar trama* regular, made of cylindrical hyphae of 4–9 µm diam., thin-walled; gloeoporous hyphae of 2–8 µm diam., hyaline, thin-walled. *Hyphae* clamped.

Distribution and ecology: Known only to Pernambuco State (Northeast Brazil) occurring on soil of grassland close to *C. fairchildiana* trees.

Notes: It is extremely difficult to find distinguishing anatomical characters among taxa of *Megacollybia* because the basidiospores and other microstructures present little variation in shape and size in the genus, but the macroscopic features are very useful (Hughes et al. 2007). This species is macroscopically characterized mainly by the rimose to cracked pileus, adnate to shallowly decurrent lamellae and pruinose stipe surface (at the center and downward). Microscopically, *M. rimosa* has as remarkable features the short and clavate, subclavate to lageniform pileocystidia, short cheilocystidia and the presence of clamp-connections. The basidiomata were found growing solitary to gregarious, sometimes cespitose on lawn soil always near to several *C. fairchildiana*.

In the Neotropics, two species of *Megacollybia* were reported until now, but one of them is insufficiently known and not fully described, belonging to the “clade costaricensis” (Hughes et al. 2007). This immature specimen was depicted in Halling and Mueller (2005) and referred as *M. platyphylla*, but until now any convincing holotype was proposed.

The other Neotropical species, *M. fusca* J. L. Mata, Aime, & T. W. Henkel is also the only known occurring in South America. This species was found in the Colombian *Quercus humboldtii* Bonpl. forests, a tree species common in montane regions with altitude range between 1500 and 3300 m (Fernández-M. and Sork 2007), and in the Guiana Shield with domination of leguminous plants, mainly the ectomycorrhizal tree *Dicymbe corymbosa* Sprucei ex. Benth. (Henkel 2003). Despite considering the differences in the ITS sequences observed in collections regarded as *M. fusca* (from Guyana and Colombia) enough to represent two divergent taxa (Hughes et al. 2007), the authors maintained those fungi with the same epithet. This species is remarkably different from *M. rimosa* by the: 1) collybioid habit with obviously non-decurrent lamellae; 2) pileus that can become deeply depressed to everted in maturity and that presents fibrils mainly over disc; 3) larger basidiomata, presenting a wider pileus (110–150 mm) and slender stipe (60–170 × 10–18 mm); 4) pileipellis, a 2-layered parallellocutis divided in suprapellis and subpellis; 5) shorter basidia [25–30(–41) × 6–11 µm], as seen in *M. texensis*; and 6) more numerous and easily found cheilocystidia (Hughes et al. 2007) in *M. fusca*, inconspicuous in *M. rimosa*.

*Megacollybia fallax* (A. H. Sm.) R. H. Petersen & J. L. Mata is the most phenetically similar taxon, presenting the same stout basidioma but differing in the following features: 1) lamellae: although Hughes et al. (2007) reported as adnate, our interpretation of the Fig. 15 in p. 33 is that they are adnexed, or more probably sinuate, typical for the tricholomatoid habit (Largent et al. 1977) as the authors referred in the beginning of the description; 2) color: according to description, *M. fallax* has white to whitish yellow stipe, while in the Brazilian taxon it is

brownish, mostly downward; 3) cheilocystidia: in the North American mushroom they are clavate to broadly clavate, firm walled and occasionally secondary septate; 4) caulocystidia: conspicuously longer, ranging to 88 µm long.

The Japanese species *M. clitocyboidea* R.H. Petersen, Takehashi & Nagas. can be separated from *M. rimosa* by the: 1) pileus disc slightly scabrous to furfuraceous, dark brown to blackish; and the 2) presence of larger caulocystidia (30–158 × 10–15 µm), although also thin-walled as observed in *M. rimosa* (Hughes et al. 2007).

Another Asian taxon, *M. marginata* R. H. Petersen, O. V. Morozova & J. L. Mata differs mainly by: 1) the lamellae edges, referred as delicately marginate; 2) the olivaceous lamellae when young, becoming off white to ochraceous buff at maturity, contrasting with the lamellae of the Brazilian species, that remains ivory white to pale cream in all stages of development; 3) the biogeographic distribution, restricted to far eastern Russia; 4) and the pigmentation (pale pinkish to pale tan) and dimensions (31–65 × 7–15 µm) of cheilocystidia, noticeable larger than *M. rimosa* (Hughes et al. 2007).

Recently described by Manimohan et al. (2010), the Indian taxon *M. virosa* Manim. & Vrinda causes severe gastrointestinal upset when eaten. This species can be separated from *M. rimosa* by: 1) the strong and unpleasant odor; 2) non-bulbous stipe base, but presenting a dilated apex; 3) the presence of glutinous exudates covering most of the cheilocystidia apex; and 4) grayish brown plasmatic pigments present in pileocystidia.

The type species of the genus, *M. platyphylla*, presents: 1) pileus ornamentation that ranges from scabrous, fibrillose, furfuraceous, rivulose, minutely squamulose to densely radially streaked, differently from the Brazilian taxon, that presents a rimose surface; 2) non-decurrent lamellae, one of the characteristics of the collybioid habit (Largent 1986); 3) non-capitulate shaped and larger cheilocystidia [(20–)30–75(–86) × 6–22(–28) µm]; and 4) firm-walled and slender caulocystidia, sometimes longer [(16–)32–147 × 6–12(–16) µm] than the Brazilian species (Hughes et al. 2007).

The North-American species, *M. texensis* R. H. Petersen & D. P. Lewis, with known distribution restricted to Texas (USA), has: 1) an arachnoid pileipellis, considered by Hughes et al. (2007) too thin to be considered as a true layer; 2) a distinct collybioid to xeruloid habit, different from the clitocyboid habit of *M. rimosa*; 3) broadly clavate, firm to thick-walled and larger cheilocystidia [25–67 × (11–)19–22 µm]; 4) larger caulocystidia, reaching up 150 µm length and 7–20 µm wide; and 5) shorter basidia (26–36 × 7–10 µm), maybe one of the smallest ones in this genus (Hughes et al. 2007).

*Megacollybia rodmanii* R. H. Petersen, K. W. Hughes & Lickey, known to North America and with two forms (*f. murina* and *f. rodmanii*), differs from *M. rimosa* by the: 1) shorter basidia (25–38 × 7–10 µm); 2) firm to thick-walled, abundant cheilocystidia; 3) significantly larger (25–72 × 5–18 µm) and firm to thick-walled caulocystidia; and 4) a tricholomatoid to russuloid habit in *M. rodmanii f. murina* and a collybioid habit in *M. rodmanii f. rodmanii* (Hughes et al. 2007).

Another North American taxon, *M. subfurfuracea* R. H. Petersen, is a collybioid fungus which differs from *M. rimosa* mainly by its: 1) unusual size of the pileocystidia



(40–113 × 9–47 μm), the largest in *Megacollybia*, often mammaliform and firm to thick-walled; 2) non-decurrent lamellae; 3) larger cheilocystidia (28–65 × 7–18 μm), found protruding beyond basidia.

## Acknowledgments

The authors thank the CNPq – Conselho Nacional de Desenvolvimento Científico for the scholarship provided to VRMC (BIC – 136229/2010-7) and FACEPE – Fundação de Amparo à Ciência e Tecnologia do Estado de Pernambuco (APQ 0444-2.03/08) for financing this research. MSc. Nelson Lima-Junior is also thanked by the help in molecular biology procedures.

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