

***Calocybe cyanea* - a rare and beautiful agaric is discovered in Puerto Rico**

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A rare find of *Calocybe cyanea* from Puerto Rico is described and illustrated. A discussion of all species of *Calocybe* found in the Caribbean is provided. Since nearly one-half of the described species of *Calocybe* can be found in the Neotropics (nine out of the 20 or so known taxa), a key to the species of *Calocybe* which are found in the Neotropics is included.

Keywords: *Calocybe cyanea*, Caribbean, identification key, Neotropics.

During one of our recent excursions to study Basidiomycetes of the Greater Antilles (a National Science Foundation supported project), we encountered numerous specimens of a very striking agaric, growing on a well decayed dicotyledonous log in the tropical rain forest near Sabana, Puerto Rico (Fig 1). *Calocybe cyanea* Singer ex Redhead & Singer has not been reported from Puerto Rico (Stevenson, 1975), nor has there been any other record of its occurrence for the greater Caribbean area and adjacent continents (Dennis, 1970; Pegler, 1983, 1987a & b). In fact only two other collections of *Calocybe cyanea* are known, the HOLOTYPE collection made by J. Rick in the Santa Catharina Province of southern Brazil (Singer, 1948), and a second collection made by Guevara in Mexico (Guevara, et al., 1985), but see the discussion below.

It is impossible to imagine even the casual collector ignoring such a brightly coloured and unusual find. Thus we must assume this species is rarely collected because it produces fruiting bodies so infrequently. *Calocybe cyanea* is a striking species with its bright violaceous pileus, yellow lamellae and stipe, and the delicate violaceous fibrils which can produce contrasting costae or a reticulum over the bright yellow apex

of the stipe. The very small, smooth spores, the siderophilous/cyanophilous granules in the basidia, and the hymeniform pileipellis are additional diagnostic features. One of us (RV) was able to confirm that this taxon is closely allied to other members of *Calocybe*, i.e. *C. carneae*, using sequences from the nlsuDNA region.

Of the 20 or so species of *Calocybe* described worldwide, at least nine occur in the Neotropics (Singer, 1977 and 1986; Pegler, 1983). For the Caribbean area, Pegler (1983) listed only two species of *Calocybe* from the Lesser Antilles. One of these is a completely white or ivory coloured agaric named *C. eborina* Pegler and was described as new in Pegler (1983). The other taxon, *C. cyanocephala* (Pat.) Pegler, has lilac or violaceous pigments in the pileus, stipe, and especially the lamellae. *C. cyanocephala* also has a pileipellis which is a cutis. Thus our report of *C. cyanea* for the Greater Antilles documents a third species known for the Caribbean area.

The following description of the macroscopic and microscopic features of *C. cyanea* adds new information to our understanding of this rarely collected and beautiful agaric. An identification key to species of *Calocybe* found in the Neotropics is provided below. Colour notations are from Kornerup & Wanscher (1978).

Calocybe cyanea Singer ex Redhead & Singer, *Mycotaxon* 6 : 501 (1978) Figs 1 - 4.

"*Calocybe cyanea* Singer", *Pap. Mich. Acad. Sci. Arts & Lett.* 32 : 124 (1948) (*nom. invalid.*)

Pileus mostly with bright violaceous hues; however when young, unexpanded, and moist, the colour is dark violet or deep purple at first (15 - 17 F 6 - 8); with expansion the colours become more vivid violaceous (15 - 17 C-E 6 - 8) and when these pilei become wet the colours turn sordid olivaceous or dark brownish and violaceous mottled, but upon drying the violaceous colours return: eventually with age the colour becomes paler greyish violaceous or greyish brown (11 - 12 E 3), some also with sordid yellow spots in the ground colour showing through the violaceous surface layer; 15 - 60 cm broad, convex becoming plano-convex and then plane, disc shallowly depressed at all stages, subsulcate-striate over margin, dry, finely granulate overall (under a lens), otherwise smooth. Context pale yellow. *Lamellae* pale yellow (2 - 3 A 3), subdecurrent, subdistant (L = 17- 19, 1 = 3 - 4), thick and readily splitting, broad, edges concolorous, even at first but soon lacerate. *Stipe* with a dark yellow or sordid yellow ground colour overall, near the apex with appressed violaceous fibrils forming slightly raised costae and/or a reticulum in some, with a distinct clear yellow band above this zone, equal with a slightly tapered base, terete, 3 - 6 mm broad at the apex, 15 - 60 mm long, yellow within. *Odour* fruity or none. *Taste* rancid farinaceous.

Basidiospores white in deposit, (3-) 3.6 - 5 x (2-) 2.4 - 3.6 μm (n = 23, $L^m = 4.09 \pm 0.33$, $W^m = 2.93 \pm 0.26$, $E = 1.24 - 1.78$, $Q = 1.41$; HOLOTYPE n = 10, 3.2 - 4.1 x 2.4 - 3.0 μm , $L^m = 3.5 \pm 0.3$, $W^m = 2.7 \pm 0.19$, $E = 1.16 - 1.45$, $Q = 1.32$), small, ellipsoid in profile and face view, round in polar view, smooth, slightly thick-walled, wall siderophilic and cyanophilic, inamyloid, not metachromatic. *Basidia* 14.6 - 23.5 x 4 - 6.4 μm , some 2- but mostly 4-sterigmate, narrowly clavate, thin walled, with obvious siderophilous and cyanophilous bodies. *Hymenial cystidia* lacking. *Lamella trama* of hyaline, parallel hyphae, with a distinct mediostratum composed of inflated cells 8 - 18 μm diam., a laterostratum composed of cylindrical cells 4 - 6 μm diam., and a

subhymenium of pseudoparenchymatous cells 1.6 - 3.2 μm diam. *Pileus context* composed of hyaline, interwoven, cylindrical or slightly inflated hyphae, 4 - 14 μm diam. *Pileipellis* an hymeniform layer of clavate, sphaeroid, pyriform and often mucronate end cells, thin-walled, mostly filled with bright violaceous, plasmatic pigments which dissolve in 3% KOH making the cells hyaline. *Stipitipellis* a repent layer of cylindrical hyphae, producing clustered or scattered cylindrical, contorted, erect caulocystidia. *Clamps* present.

Habit and Habitat: gregarious on fallen, well-rotted, dicotyledonous log in tropical forest. 9 June 1997.

Material studied: Brazil: Santa Catharina Province, Porto Novo, J. Rick 1928 (FH, HOLOTYPE - as "*Collybia violacea* Rick", consisting of at least 8 \pm whole, basidiomata in good condition). Puerto Rico: Sabana, Caribbean National Forest, near the USDA - Forest Service research facilities, N. W. Legon PR123 (K(M) 56506) and T. J. Baroni 8522 (CORT) [single collection was split].

Calocybe cyanea appears to be most closely related to the temperate boreal *Calocybe onychina* (Fr.) Donk, which is typically found under subalpine conifers in Europe and North America (Hanson & Knudsen, 1992; Bessette, *et al.*, 1995; Moser, 1983). Even though they are clearly different species, these two taxa share several similarities of macroscopic and microscopic features such as: the violaceous-purplish colours of the pileus, the yellow colours of the lamellae and flesh, spores of similar size and shape, and the hymeniform construction of the pileipellis. *C. onychina*, besides being found in sub-alpine coniferous forests, differs from *C. cyanea* by the more reddish-purplish, not truly violaceous pigments of the pileus, the pinkish-purplish not yellow colour of the stipe, the adnate not decurrent lamellae, and the hypha-like or clavate or lecythiform cells of the pileipellis (Bessette, *et al.*, 1995) which are clearly different from those of *C. cyanea* (Fig 4). Given these facts it is difficult not to consider the possibility of *C. cyanea* and *C. onychina* as sister or sibling taxa.

It is intriguing that *C. cyanea* has been found in Brazil and the Greater Antilles. but is at

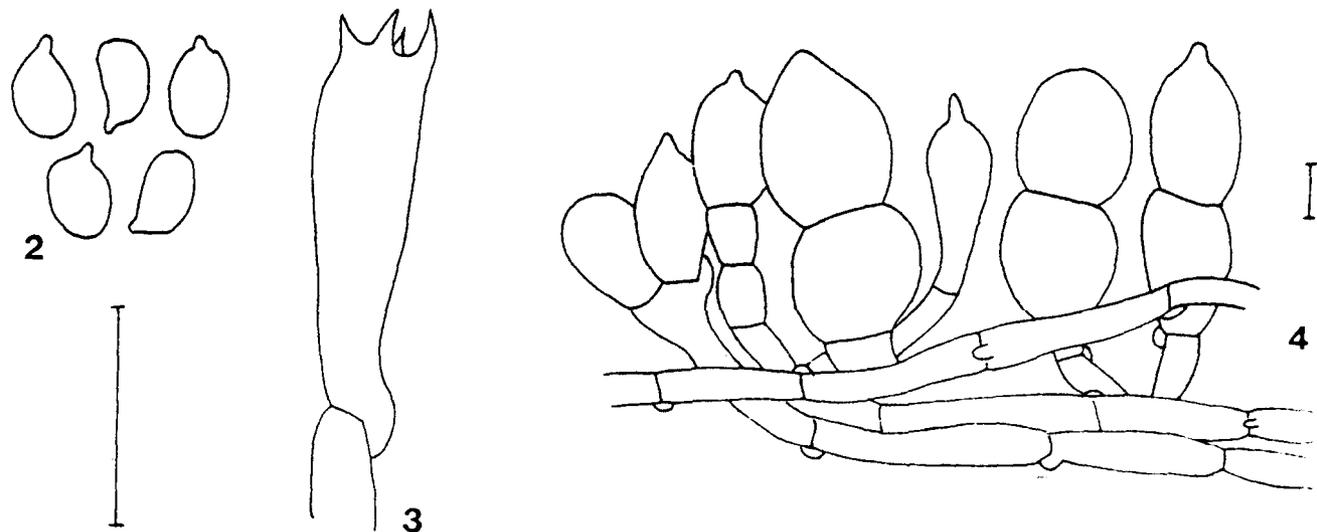
present not reported from Venezuela (Dennis, 1970) and the Lesser Antilles (Pegler, 1983). It appears that *C. cyanea* is rare and one is truly lucky to happen upon this jewel; *C. cyanea* will most likely be found throughout the tropical areas of the Caribbean and adjacent regions in the future. A piece of evidence which seems to support this conjecture is a report on *C. cyanea* from a xerophytic habitat in Mexico (Guevara, *et al.* 1985). In this particular paper, the description indicated a taxon with several slightly different characters from those found in our collection, and from those known for the holotype, e.g. colour of lamellae and shape of basidiospores. Guevara's collection appears to be a morphological variant of *C. cyanea*. We will simply have to wait for future collections of *C. cyanea* and related taxa to turn up, in order to learn what the actual distribution is for *C. cyanea* in North and South America, Central America, and the Caribbean Islands. An understanding of the biogeography of this species may help explain its apparent relationship to *C. onychina*.

Key to *Calocybe* species of the Neotropics
Complete descriptions can be found in the literature cited in the key couplets.

1. Basidiomata uniformly white or ivory, spores globose, 5 - 6.5 µm diam. (Pegler, 1983) *C. eborina* Pegler
1. Basidiomata with red, violet, lilac, yellow, or bluish grey colours, if pallid then disc of pileus greyish brown2
2. Basidiomata uniformly purplish red with disc of pileus darker, lamellae dark reddish-fuscous when dried, crowded, spores short ellipsoid, 3 - 5 x 2 - 4 µm, cheilocystidia hyaline, cylindrical, septate (Singer, 1948)*C. rubra* Rick in Singer ex Redhead & Singer
2. Basidiomata not with reddish colours.....3
3. Pileus with brown, reddish brown, or yellowish brown colours, lamellae ochraceous or yellow.....4
3. Pileus deep violaceous, lilac, bluish grey, or pale cream with a greyish brown disc, lamellae may or may not be yellowish..... 5
4. Pileus convex-papillate, dark reddish brown glabrous or slightly punctate, approx. 7 mm broad; lamellae ochraceous, adnexed, narrow, crowded; stipe ochraceous: cheilocystidia cylindrical or fusoid (Singer, 1977) *C. bipigmentata* Singer
4. Pileus convex-depressed, light fulvous with a pale greyish brown disc, approx. 10 mm broad; lamellae yellow, rather broad, close; stipe fuscous or fuscous yellow; cheilocystidia absent (Singer, 1977)*C. alneti* Singer



Fig 1 *Calocybe cyanea* young and mature basidiomata near Sabana, Puerto Rico. Photo © N.W. Legon.



Figs 2-4 *Calocybe cyanea* microscopic structures. 2 basidiospores. 3 basidium. 4 pileipellis. Scale bars = 10 µm.

- 5. Pileus pale cream with a greyish brown disc, convex-papillate; lamellae white, adnexed; stipe pale sordid (Singer, 1977).....*C. coniceps* Singer
- 5. Pileus violaceous, lilac or bluish grey.....6
- 6. Pileus bluish grey with a fuliginous disc, convex with prominent papilla, 13 - 18 mm broad; lamellae white, subdecurrent; stipe fuliginous (Singer, 1977) *C. atropapillata* Singer
- 6. Pileus violaceous or lilac, greater than 20 mm broad...7
- 7. Lamellae with violaceous or lilac hues (Pegler, 1983)..... *C. cyanocephala* (Pat.) Pegler
- 7. Lamellae yellow or white.....8
- 8. Lamellae white, stipe bluish; pileipellis a cutis (Singer, 1948).....*C. cyanello* Singer ex Redhead & Singer
- 8. Lamellae yellow, stipe yellow with violet fibrils; pileipellis hymeniform.....*C. cyanea*

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