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#### RIVISTA MICOLOGICA ROMANA BOLLETTINO dell'ASSOCIAZIONE MICOLOGICA ed ECOLOGICA ROMANA

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#### ALFREDO VIZZINI, LUIGI PERRONE, MATTEO GELARDI, MARCO CONTU, TAI-HUI LI, MING ZHANG, WEI-YE XIA

## A NEW COLLECTION OF CHLOROPHYLLUM HORTENSE (AGARICACEAE, AGARICALES) FROM SOUTH-EASTERN CHINA: MOLECULAR CONFIRMATION AND MORPHOLOGICAL NOTES

#### Abstract

The presence of Chlorophyllum hortense in China is confirmed on the basis of morphological and molecular data. A detailed description, line drawings of the main microscopic features and colour pictures are provided. Velar remnants on pileus surface are reported for the first time for the species.

#### Riassunto

La presenza di Chlorophyllum hortense in Cina è confermata sulla base di dati morfologici e molecolari. Sono forniti una descrizione dettagliata, disegni delle principali caratteristiche microscopiche e immagini a colori. Residui velari sulla superficie del cappello sono segnalati per la prima volta per la specie in esame.

Key words: Agaricomycetes, Leucoagaricus, Leucoagaricus carminescens, Macrolepiota, molecular analysis, taxonomy

#### Introduction

The genus *Chlorophyllum* Massee (typified by *C. esculentum* Massee), as traditionally circumscribed, was separated from *Macrolepiota* Singer [typified by *M. procera* (Scop.) Singer] mainly on account of its greenish mature lamellae and spore print and a few microscopic characters such as shortage of clamp connections and faintly metachromatic spores (HEINEMANN, 1968; SINGER, 1986; REID & EICKER, 1991; BON 1993; VELLINGA, 2001). However, the poisonous *Chlorophyllum molybdites* (G. Mey.) Massee (LEHMANN & KHAZAN, 1992) has recently been re-named as *Macrolepiota molybdites* (G. Mey.) G. Moreno, Bañares & Heykoop. These authors suggested that similarity in macroscopic and microscopic traits of *Chlorophyllum* and *Macrolepiota* supported their synonymy (MORENO *ET AL.*, 1995) and proposed the new section *Chlorophyllum* within the genus *Macrolepiota*.

The genus *Chlorolepiota* Sathe & S.D. Deshp. from India, typified by *C. mahabaleshwarensis* Sathe & S.D. Deshp., seems to occupy an intermediate position between *Chlorophyllum* and *Macrolepiota* due to the primrose yellow spore print, metachromatic spores which are provided with a germ pore but not truncate-and absence of clamp connections (SATHE & DESHPANDE, 1979).

JOHNSON & VILGALYS (1998) and JOHNSON (1999) were the first to unveil the heterogeneous phylogenetic status of Macrolepiota, but taxonomic conclusions were not drawn; VELLINGA ET AL. (2003), based on ITS and LSU analyses of a large set of Agaricaceae, showed that Chlorophyllum was paraphyletic and *Macrolepiota* was polyphyletic. They highlighted that some white-spored species formerly placed in Macrolepiota (i.e. M. rachodes), were much more closely related to the green-spored taxon C. molybdites than to M. procera (Scop.) Singer. As a matter of fact, their analysis showed that one clade (named lineage 2), placed in a sister relationship to Agaricus L., grouped together members of Macrolepiota sect. Laevistipedes (Pázmáni) Bon [viz. M. rachodes (Vittad.) Singer and allied species], M. globosa Mossebo, M. neomastoidea (Hongo) Hongo, Chlorophyllum molybdites, the secotioid Endoptychum agaricoides Czern. and Leucoagaricus hortensis (Murrill) Pegler; a second clade, sister to Leucoagaricus and Leucocoprinus, comprised M. procera, M. mastoidea (Fr.) Singer, M. clelandii Grgur. and related taxa [sect.Macrolepiota and sect. Macrosporae (Singer) Bon]. The two clades were regarded as indipendent genera for which the names Chlorophyllum s.s. and Macrolepiota s.s., respectively, were proposed (VELLINGA & DE KOK, 2002; VELLINGA ET AL., 2003). Species of Macrolepiota sect. Laevistipedes, L. hortensis and E. agaricoides were consequently recombined in Chlorophyllum (VELLINGA, 2002).

Focusing on the agaricoid members, the diagnostic characters of *Chlorophyllum* in its emended sense can be summarized as follow (VELLINGA, 2002, 2003a, 2003b; VELLINGA *ET AL.*, 2003): 1) hymenidermal pileipellis; 2) smooth stipe; 3) spores often truncate and with an un-covered germ pore, or with no germ pore (*C. hortense*). The genus *Macrolepiota* is restricted to species with a trichodermal pileipellis, a stipe covered by hymenial-trichodermal patches (stipe squamules arranged as a transversal zebra-like pattern in mature specimens) and spores with a rounded apex and a germ pore covered by a hyalinous cap (VELLINGA, 2003a, VELLINGA *ET AL.*, 2003, GE *ET AL.*, 2010). Subsequent additional molecular works supported these data (VELLINGA, 2004; VELLINGA *ET AL.*, 2011; LEBEL & SYME, 2012).

The aim of this paper is to provide an exhaustive description of *Chlorophyllum hortense* based on a recent collection from south-eastern China (Nan'ao Island, Guangdong Province) and supported by ITS and LSU rDNA sequences.

## Material and methods

## Morphology

Macroscopical description, macro-chemical reactions, habitat annotations and associated plant communities are based on detailed field notes of fresh basidiomes, colours being recorded under daylight and described in general terms only. Micromorphological features were observed on dried material; sections were hand made and revived either in ammonia (NH<sub>3</sub>) or in 5% Potassium hydroxide (KOH). The observation of the structures and measurement of the anatomical features were performed by mounting preparations in Ammoniacal Congo red, colour and amount of pigmentations were described after examination in NH<sub>3</sub>. Measurements were made at 1000× magnification with a calibrated ocular micrometer (Zeiss Universal R optical light microscopes with Leitz Wetzlar e PL Fluotar lens).

Spores were measured from the hymenophore of mature basidiomes (n = 23). Values are given as (minimum) average  $\pm$  standard deviation (maximum), Q = length/width ratio with minimum and maximum values and Qm = average quotient. Metachromatic, cyanophilic and iodine reactions were also tested by staining the spores in Brilliant Cresyl blue, Toluidin blue and Melzer's reagent, respectively. Line-drawings of microstructures were made from rehydrated material and based on microphotos. Specimens of the collection examined in this study were deposited in GDGM and in the MG's private herbarium. Herbarium acronyms follow THIERS (2014) except "MG" that refers to the personal herbarium of Matteo Gelardi. Author citations follow the Index Fungorum, Authors of Fungal Names (www.indexfungorum.org/authorsoffungalnames.htm).

## DNA extraction, PCR amplification, and DNA sequencing

Genomic DNA was isolated from 1 mg of a herbarium specimen (GDGM57301), by using the DNeasy Plant Mini Kit (Qiagen, Milan Italy) according to the manufacturer's instructions. Universal primers ITS1F/ITS4 were used for the ITS region amplification (WHITE *ET AL.*, 1990; GARDES & BRUNS, 1993) and primers LR0R/LR6 (VILGALYS & HESTER, 1990, VILGALYS lab, unpublished, http://www.botany.duke.edu/fungi/mycolab) for the LSU rDNA amplification. Amplification reactions were performed in a PE9700 thermal cycler (Perkin-Elmer, Applied Biosystems) in 25 ml reaction mixtures using the following final concentrations or total amounts: 5 ng DNA, 1 × PCR buffer (20 mM Tris/HCl pH 8.4, 50 mM KCl), 1mM of each primer, 2.5 mM MgCl2, 0.25 mM of each dNTP, 0.5 unit of Taq polymerase (Promega). The PCR program was as follows: 3 min at 95°C for 1 cycle; 30 s at 94°C, 45 s at 50°C, 2 min at 72°C for 35 cycles, 10 min at 72°C for 1 cycle. PCR products were resolved on a 1.0% agarose gel and visualized by staining with ethidium bromide. The PCR products were purified with the AMPure XP kit (Beckman) and sequenced by MACROGEN Inc. (Seoul, Republic of Korea). The sequences were submitted to the European Nucleotide Archive (ENA, http://www.ebi.ac.uk/ena/) and their accession numbers are reported in Figs. 3-4.



Fig. 1. Chlorophyllum hortense in habitat (MG515a-GDGM57301).

Photo by Matteo Gelardi



Fig. 2. Chlorophyllum hortense. Detail of the pilei showing remnants of the veil at disc (MG515a-GDGM57301). Photo by Matteo Gelardi





**Fig. 4**. Bayesian phylogram obtained from the LSU sequence alignment of *Chlorophyllum* species. *Agaricus bisporus* was used as outgroup taxon. BPP values above 0.70 and MLB values above 50% are given above branches.



C. hortense. Spores in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Metachromatic spores in Toluidine blue, 100× (MG515a-GDGM57301). Photo by Mariano Curti



C. hortense. Dextrinoid spores in Melzer, 25× (MG435a-GDGM57301). Photo by Mariano Curti



*C. hortense*. Cyanophilic spores in Cotton blue, 100× (MG515a-GDGM57301). Photo by Mariano Curti



C. hortense. Basidia in Congo red, 25× (MG515a-GDGM57301). Photo by Mariano Curti



C. hortense. Basidium in Congo red, 50× (MG515a-GDGM57301). Photo by Mariano Curti



C. hortense. Basidia in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Basidia in Cotton blue, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Cheilocystidia in Congo red, 25x (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Cheilocystidia in Congo red, 50x (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Cheilocystidia in Congo red, 25× (MG515a-GDGM57301. Photo by Luigi Perrone



C. hortense. Cheilocystidia in KOH 5%, 100× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Hymenophoral trama in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense Annulus trama in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Terminal hyphae of annulus trama in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Oleipherous hyphae in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone

#### Sequence alignment and phylogenetic analysis

The sequences obtained in this study were checked and assembled using Geneious v5.3 (DRUMMOND ET AL., 2010) and compared to those available in GenBank database by using the blastn algorithm. All sequences related to *Chlorophyllum hortense* were retrieved from GenBank and UNITE (http://unite.ut.ee/) databases according to the outcomes of recent phylogenetic studies on *Chlorophyllum* and allied taxa (VELLINGA, 2003a, 2004; VELLINGA ET AL., 2003, 2011; LEBEL & SYME, 2012). Alignments were generated for each single ITS and LSU dataset using MAFFT (KATOH ET AL., 2002) with default conditions for gap openings and gap extension penalties. The two alignments were then imported into MEGA 5.0 (TAMURA ET AL., 2011) for manual adjustment. The best-fit models were estimated by the Akaike Information Criterion (AIC) using jModelTest 0.1.1 (POSADA, 2008) to provide a substitution model for each single alignment. GTR+G and HKY+G models were chosen for ITS and LSU alignments, respectively.

Phylogenetic analyses were performed using the Bayesian Inference (BI) and Maximum likelihood (ML) approaches. *Agaricus bisporus* was chosen as outgroup in all the analyses (according to Vellinga, 2004, Vellinga *et al.*, 2003, 2011, Lebel & Syme, 2012, *Agaricus* is sister to *Chlorophyllum*).

BI and ML inferences were performed online using the CIPRES Science Gateway website (MILLER *ET AL.*, 2010) and both methods were implemented as single software usage. BI phylogeny using Monte Carlo Markov Chains (MCMC) was carried out with MrBayes 3.1.2 (HUELSENBECK & RONQUIST, 2001). Four incrementally heated simultaneous MCMC were run over 10 million generations. Trees were sampled every 1000 generations resulting in an overall sampling of 10001 trees. The first 2500 trees were discarded as "burn-in" (25%).

For the remaining trees, a majority rule consensus tree showing all compatible partitions was computed to obtain estimates for Bayesian Posterior Probabilities (BPP). Branch lengths were estimated as mean values over the sampled trees. ML estimation was performed through RA×ML v.7.0.4 (STAMATAKIS, 2006) with 1000 bootstrap replicates (FELSENSTEIN, 1985) using the GTRGAMMA algorithm to perform a tree inference and search for a good topology. Support values from bootstrapping runs (MLB) were mapped on the globally best tree using the "fa" option of RA×ML and "-x 12345" as a random seed to invoke the novel rapid bootstrapping algorithm. Only BPP values over 0.70 and MLB values over 50% are reported in the resulting trees (Fig. 3). Pairwise % identity (P%I) values of ITS sequences were calculated using MEGA 5.0 (TAMURA *et Al.*, 2011).

#### Results

#### Molecular results

The ITS data matrix comprises a total of 33 sequences (including 30 from GenBank and 2 from UNITE). This dataset is 802 base pairs long and contains 309 (38.5%) variable sites. The LSU data matrix comprises a total of 11 sequences (including 10 from GenBank). This dataset is 912 base pairs long and contains 65 (7.1%) variable sites.

Topologies of the BI and ML trees are congruent. For this reason only the BI phylograms are shown with the support values for major clades of any analysis (Figs. 3-4). In the ITS analysis (Fig. 3) our *Chlorophyllum hortense* collection falls into a clade consisting of all the sequences of *C. hortense* retrieved from GenBank and UNITE. This well-supported clade (BP =1, MLB =100) is consisting of 9 sequences obtained from specimens collected in Usa (Hawaii, North Carolina), Colombia, Bolivia, Cameroon, China, Japan and Thailand (BPP = 1, MLB = 100%). All 9 sequences forming the clade show a P%I value of 98.7 and constitute the same species. *Chlorophyllum* sp. from Benin (two sequences, UDB016944, TU116023; UDB016960, TU116049) clearly represents an undescribed species close to *C. molybdites* and *C. globosum; Chlorophyllum* sp. from USA (one sequence HQ020416) represent two new distinct taxa.

In the LSU analysis (Fig. 4) our collection clusters together with a sample of *C. hortense* from Colombia.



Table 1. Chlorophyllum hortense (MG515a-GDGM57301). Microscopic features: a. Spores; b. Annulus trama;c. Basidia and cheilocystidia; d. Pileipellis; e. Remnants of the universal veil. Scale bar:  $a = 10 \ \mu m$ ;b,  $c = 20 \ \mu m$ ; d,  $e = 25 \ \mu m$ .Drawing by Matteo Gelardi

## TAXONOMY

## Chlorophyllum hortense (Murrill) Vellinga, Mycotaxon 83: 416 (2002)

= *Lepiota hortensis* Murrill, *N. Amer. Fl.* (New York) 10(1): 59 (1914)

- = Luucoagaricus hortensis (Murrill) Pegler, Kew Bull., Addit. Ser. 9: 414 (1983)
- = Lepiota humei Murrill, Lloydia 6: 220 (1943)
- = Lepiota mammillata Murrill, Lloydia 6: 220 (1943)
- = Lepiota subfulvidisca Murrill, Lloydia 6: 221 (1943)
- = Lepiota alborubescens Hongo, Mem. Fac. Educ. Shiga Univ., Nat. Sci. 12: 40 (1962)
- = Macrolepiota alborubescens (Hongo) Hongo, Trans. Mycol. Soc. Japan 27(1): 107 (1986)
- = Leucoagaricus bisporus Heinem., Bull. Jard. Bot. Nat. Belg. 43(1-2): 8 (1973)
- =? Leucoagaricus carminescens Heinem. Bull. Jard. Bot. Nat. Belg. 43(1-2): 8 (1973)

Misappl. names – *Lepiota americana* sensu Baker & Dale, CMI Mycol. Pap. 33: 88. (1951); *Leucoagaricus fimetarius* (Sacc.) Aberdeen sensu Aberdeen, Lepiotoid genera (*Agaricales*) in south-eastern Queensland: 8-9 (1992); *Lepiota fimetaria* Sacc. sensu Young, Common Australia Fungi: 88 (2000).

Synonyms are mainly according to Pegler (1983), Akers & Sundberg (1997), Vellinga 2003a.



C. hortense. Pileipellis at disc in Congo red. Remnants of the veil are visible at the top, 10× (MG515a-GDGM 57301). Photo by Luigi Perrone



C. hortense. Detail of the remnants of the veil in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Pileipellis in Congo red, 50× (MG515a-GDGM 57301). Photo by Luigi Perrone



*C. hortense.* Universal veil intermixed with the tricho-hymeniderm in Congo red, 25× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Pileipellis in Congo red, 100× (MG515a-GDGM 57301). Photo by Luigi Perrone



C. hortense. Pileipellis in Congo red, 50× (MG515a-GDGM 57301). Photo by Luigi Perrone



C. hortense. Pileipellis in Congo red. Negative image with sepia filter, 50× (MG515a-GDGM57301). Photo by Mariano Curti



C. hortense. Pileipellis in Congo red, 100× (MG515a-GDGM 57301). Photo by Luigi Perrone



C. hortense. Pileipellis at disc (inner layer) in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



C. hortense. Clamp connection with an incomplete morphology in Congo red, 50× (MG515a-GDGM57301). Photo by Mariano Curti



*C. hortense.* Pileipellis towards the margin of the pileus in Congo red, 50× (MG515a-GDGM57301). Photo by Luigi Perrone



*C. hortense.* Clamp connection with an incomplete morphology in Congo red. Negative image with red filter, 50× (MG515a-GDGM57301). Photo by Mariano Curti

## Macroscopic description

Basidiomes small-sized.

**Pileus** 3.3-4.4(5.6) cm diam., at first subcylindrical-ovid, then lastingly conical and finally flattened, regularly shaped, with a well pronounced obtuse umbo at maturity, scarcely fleshy, soft-textured and somewhat brittle in all developmental stages; margin initially slightly involute and coalescent with the partial veil but soon disrupting and almost completely expanded at maturity, regular to faintly waving, not exceeding beyond the lamellae, shortly striate at maturity; surface matt, dry, ornamented by adpressed and radially arranged scales which are more sparse outwards, with whitish remnants of the universal veil upon the discal zone, showily rimose-fibrillose at margin; scales yellow-ochreous to pale brownish on a whitish ground colour, ochraceous to brown in the centre; unchangeable on handling; subcuticular layer whitish.

**Hymenophore** lamellate, lamellae straight to slightly ventricose, crowded, thin, longer than pileus context thickness (up to 0.6 cm high), free to the stipe, intermixed by one lamellula, not furcate nor interveined, concolorous edges entire; pale cream, not changing in colour on bruising or pressure.

**Stipe**  $2.9-5.3 \times 0.4-0.8(1.3)$  cm, generally as long as the pileus diameter at maturity, central, hollow, firm, dry, straight to curved, cylindrical but always slightly enlarged downwards, often knobby and rounded at the very base, not rooting; young specimens exhibit a partial veil enclosing the fertile tissues which soon disrupts leaving the upper half of the stipe ornamented by a showy and long lasting, ascending, simple, membranaceous, cream-whitish to pale ochraceous ring; surface very finely fibrillose lenghtwise, whitish to brownish depending on the developmental stage but always with silvery streaks, brownish at the base, unchangeable on handling but strongly reddening on rubbering or when injured; basal mycelium whitish.

**Context** soft and brittle in the pileus (up to 0.4 cm thick in the central zone), tougher and more fibrous in the stipe, whitish in the pileus, whitish-gray in the stipe, turning vinaceous red on exposure, starting from the apical umbo and all along the stipe, more intensely downwards and towards the peripheral cortical layers, eventually fading brownish, nearly unchangeable to slightly staining pale pinkish-vinaceous in the pileus.

Smell negligible.

Taste mild.

Spore print not obtained.

#### Microscopic description

**Spores** (7)9.2 $\pm$ 1.3(13.1) × (5.2)6.4 $\pm$ 0.8(8.7) µm, Q = 1.2-1.7, Qm = 1.4, broadly ellipsoid to ovoid both in face and side view, rarely larmiform, smooth, thick-walled, with a well pronounced apiculus and no suprahilar depression, having a single large oil drop, without germ pore, hyaline in water, dextrinoid, cyanophilic and with metachromatic reaction.

**Basidia** rising from an irregularly-shaped subhymenium,  $30-42 \times 9-11 \mu$ m, clavate, moderately thick-walled, predominantly 2-spored but also 1-spored, bearing relatively long sterigmata (up to 8  $\mu$ m), usually containing a granular pigment.

**Cheilocystidia** 22-67 × 6-8  $\mu$ m, frequent, narrowly clavate to subcylindrical or more rarely subfusiform, smooth, moderately thick-walled, sometimes containing a pale yellowish granular pigment, without epiparietal encrustations.

Pleurocystidia not observed.

**Pileipellis** at disc consisting of two layers; an inner layer made up of parallel to moderately interwoven, septate, colourless, thick-walled, cylindrical hyphae,  $36.5-52.2 \times 3.5-6 \mu m$  and an upper layer consisting of clavate terminal elements arranged as a tricho-hymeniderm which are very variable in size,  $28-180 \times 5.2-20 \mu m$  with an apex rounded-obtuse; sometimes over the tricho-hymeniderm are present cylindrical, tigtly interwoven, hyaline, hyphae, remnants of the universal veil.

**Pileipellis** towards the margin of the pileus with the very same arrengement of the inner layer found at disc.

Stipitipellis a texture of parallel and longitudinally running hyphae, 5.2-7.8  $\mu$ m across; caulocystidia not observed.

**Annulus trama** consisting of interwoven, diverticulate, septate, more or less cylindrical hyphae with a brownish plasmatic pigment; terminal elements arranged as a palisade of parallel cells, cylindrical to clavate, more rarely slightly capitate, 29.6-78.3 × 4.3-10.4  $\mu$ m, moderately thick-walled.

**Hymenophoral trama** made up of interwoven, thick-walled, smooth, subcylindrical and sometimes diverticulate hyphae; terminal elements  $70-180 \times 4.3-11.3 \mu$ m broad, with rounded apex.

Oleipherous hyphae observed in the hymenium and pileipellis.

**Clamp connections** with an incomplete morphology (rudimentary clamps with incomplete junction) only detected in the stipe tissues.

**Habit**, **fenology**, **ecology** in tropical environment, growing gregarious to subcaespitose (up to two or three connate basidiomes) in a plane clearing managed as an orchard with several young unidentified fruit trees, at the base of a single plant on bare, clay and gravelly, presumably acidic soil; other species found in the same habitat: *Scleroderma* sp.

Material examined China, Guangdong province, Nan'ao Island, N 23° 25′ 46″, E 116° 59′ 21″, 100 m alt., 26 June 2013; several specimens in all developmental stages, legit. M. Zhang, Li P., Li T.-H. & M. Gelardi; exsicc. number GDGM57301 and MG515a (duplicate).

#### Discussion

Lepiota hortensis was originally described by MURRILL (1914) from sandy soil of a garden in Auburn, Alabama. Later it was transferred by PEGLER (1983) (who examined the type) in *Leucoagaricus* because of the metachromatic spores and lack of germ pore. AKERS & SUNDBERG (1997), in agreement with Pegler (1983), confirmed its placement in *Leucoagaricus* on account of the absence of the germ pore, even though they acknowledged that the presence of clamp collections suggested a close relationship with *Macrolepiota*. Finally VellingA (2002) placed it in *Chlorophyllum* based on molecular inference.

The position of the species is puzzling and has been the subject of recent debates (e.g. AKERS & SUNDBERG, 1997; JOHNSON, 1999). It appears to be a morphological intermediate between *Chlorophyllum, Macrolepiota* and *Leucoagaricus* as it shares with *Chlorophyllum* the partly hymenodermal pileipellis, with *Macrolepiota* the partly trichodermal pileipellis and the presence of distinct clamp connections (although in our case it comes to imperfect clamp connections) and with *Leucoagaricus* the lack of a prominent germ pore on spores.

It is a widely diffused species, being known from Hawaii and North America (as *Leucoagaricus hortensis* or *Lepiota humei*) (MURRILL, 1914; SMITH, 1966; AKERS & SUNDBERG, 1997; HEMMES & DESJARDIN, 2002), Central and South America (DENNIS, 1952; PEGLER, 1983, 1997; RODRIGUEZ GALLART, 1990; FRANCO, 1994; SOBESTIANSKY, 2005; GIMENES, 2007; NASCIMENTO & ALVES, 2014), Africa (as *Leucoagaricus bisporus*) (HEINEMANN, 1973a, b; VELLINGA, unpublished data), Japan (as *Lepiota alborubescens* or *Macrolepiota alborubescens*) (HONGO, 1962, 1986), China (GE & YANG, 2006), India (VRINDA *ET AL.*, 1999; FAROOK *ET AL.*, 2013), Thailand (VELLINGA *ET AL.*, 2011) and Australia (ABERDEEN, 1962, as *Lepiota naucina* (Fr.) P. Kumm.; ABERDEEN, 1992, as *Leucoagaricus fimetarius*; VELLINGA, 2003a). It occurs on dung, in cattle and horse pastures, sandy soils, meadows and garden loamy soil.

ALBUQUERQUE (2006) described a *Chlorophyllum* aff. *hortense* from Brazil; on the basis of the pictures included in his thesis (Table 1a, b), the small-sized pileus (0.9-1.3 cm), thin stipe (2.7-3.2 × 0.1 cm), small spores (4.3-6.0 × 3.1-4.0  $\mu$ m) and heterogeneous pileipellis, it could likely be a *Leucocoprinus* sp.

Among the *Chlorophyllum* species, *C. hortense* is traditionally distinguished by mediumsized basidiomes (reminding a *Leucoagaricus*), pileus ornamented by ochre-yellow squamules, simple annulus, stipe context strongly reddening on handling or exposure, hymenidermal pileipellis, 2-spored basidia, spores without germ pore, cylindrical cheilocystidia and presence of clamp connections (Pegler, 1983; Akers & SUNDBERG, 1997; Vellinga, 2003a; Ge & YANG, 2006; NASCIMENTO & ALVES, 2014). Our collection is the third reported from China after those published by Bi & Li (1988, the collection GDGM9175 named *Chamaeota dextrinoidespora*, fide Ge & Yang 2006 and Yang 2007) and Ge & Yang (2006) on morphological basis only. It forms a monophyletic lineage with other sequences of *C. hortense* available in public databases (Fig. 3). Its morphological traits fit quite well with those emphasized in previous literature (ABERDEEN, 1992; Pegler, 1983; Akers & SUNDBERG, 1997; Vellinga, 2003a; Ge & YANG, 2006; NASCIMENTO & ALVES, 2014), with the exception of the presence of imperfect clamp-connections, monosporic basidia intermixed with bisporic ones, tricho-hymenidermal pileipellis and velar remnants on pileus surface.

Distinct clamp connections were reported by AKERS & SUNBERG (1997) and VELLINGA (2003a), but not observed by PEGLER (1983) and GE & YANG (2006). The Chinese mycologists pointed out the presence of several anastomosing structures on the hyphae of the stipitipellis which somehow may imitate true clamps when they are located near septa. Our analysis showed the presence of clamp connections with an imperfect morphology (rudimentary clamps with incomplete junction) detected in the stipe tissues only (see also the discussion on *L. carminescens* below).

Basidia are always described as bisporic (ABERDEEN, 1992; PEGLER, 1983; AKERS & SUNDBERG, 1997; VELLINGA, 2003a) or bisporic/tetrasporic (GE & YANG, 2006); our collection also displays monosporic basidia intermixed with bisporic ones.

All previous authors described the pileipellis arrangement as a true hymeniderm of broadly clavate terminal elements (Pegler, 1983; Akers & SUNDBERG, 1997; VELLINGA, 2003a). Indeed, the pileipellis structure of our specimens is rather unusual and is in between a hymeniderm (typical of *Chlorophyllum*) and a trichodermium (typical of *Macrolepiota*) (see Table 1d).

Finally, our morphological analysis on *C. hortense* highlighted for the first time the presence of whitish remnants of the universal veil on pileus surface (see Fig. 2, but see also the discussion on *L. carminescens* below). Such a feature represents the second report on the presence of a universail veil in *Chlorophyllum*; VIZZINI (1997) had already stressed the occurrence of obvious velar remnants on pileus surface from a collection of *C. brunneum* (Farl. & Burt) Vellinga [as *Macrolepiota olivieri* (Barla) Wasser]. As previously demonstrated by VIZZINI *ET AL.* (2011) for veil-bearing *Macrolepiota* (traditionally included in the artificial genus *Volvolepiota* Singer), independent origins of either partial veil achievement or loss have taken place during the evolutionary history of these fungi and accordingly this character is to be considered homoplasic and unsuitable for a natural classification of these fungi at the supraspecific rank. Consequently, the presence/absence of a veil is not a good attribute for either the generic or interspecific delimitation.

With regard to the morphologically closest taxa, it is necessary to cite *Leucoagaricus carminescens* Heinem. and some *Chlorolepiota* species. *L. carminescens* shares with *C. hortense* all of the morphological features (including the shortly striate pileus margin at maturity, the presence of a universal veil and imperfect clamp connections), differing only for the tetrasporic basidia (HEINEMANN, 1973a, b; see Fig. 5 and Planche VIII-1 in HEINEMANN, 1973b). It might just represent the tetrasporic status of *C. hortense*, as previously suggested by PEGLER (1983).

The genus *Chlorolepiota* was originally established for macrolepiotoid species with primerose spores, trichodermic pileipellis, metachromatic spores with a non-truncate germinative pore and absence of clamp-connections (SATHE & DESHPANDE, 1979). Later on, the concept of the genus was enlarged to include taxa with clamp-connections and aporate spores (KUMARI *ET AL.*, 2013; ATRI *ET AL.*, 2014). Based on a ITS sequence analysis, *Chlorolepiota* seems to be distinct from *Chlorophyllum* and not phylogenetically related to *Macrolepiota* (ATRI *ET AL.*, 2014). Of the three species currently ascribed to *Chlorolepiota*, *C. brunneotincta* N.S. Atri, B. Kumari & R.C. Upadhyay exhibits a close resemblance with *Chlorophyllum hortense* on account of the spores without a germ pore, reddening stipe when bruised, simple annulus and presence of clamp connections. However, it differs mainly in having greenish lamellae, 4-spored basidia and a trichodermic pileipellis.

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#### ENZO MUSUMECI, MARCO CONTU

## TEPHRODERMA (AGARICOMYCETIDAE, TRICHOLOMATOID CLADE) UN NUOVO GENERE DI BASIDIOMICETI LAMELLATI DALLA FRANCIA

#### Riassunto

Viene proposto il nuovo genere di Agaricales Tephroderma per includervi Tephroderma fuscopallens, una nuova specie rinvenuta nella Francia settentrionale. Sulla base dei dati molecolari Tephroderma appartiene a "Tricholomatoid clade" e si colloca in posizione vicina alle Entolomataceae e alle Lyophyllaceae, essendo ben distinto da ogni genere appartenente ai due cladi e differente dal Clitocybeae lineage. Tephroderma è caratterizzato da una combinazione di caratteri unica e, in particolare, dall'habitus clitociboide, il basidioma di consistenza tenace-elastica, le lamelle spesse e decorrenti, la sporata bianca, i basidi corti e privi di granulazioni siderofile, le spore lisce, acianofile, non amiloidi e non destrinoidi, la trama lamellare e la pileipellis gelatinizzate, l'assenza di cistidi e le ife a parete spessa, munite di giunti a fibbia. Il materiale raccolto viene dettagliatamente descritto e tassonomicamente discusso e sono presentate iconografie a colori di esemplari freschi in situ e schizzi dei porincipali caratteri micromorfologici. Il nuovo genere è conosciuto, fino ad ora, solo dalla Francia.

## Abstract

Tephroderma, a new genus of Agaricales, is described to accommodate the new species Tephroderma fuscopallens, collected in northern France. Based on a combined 28S nrLSU, rpb2, tef1 and 18S nrSSU Bayesian and Maximum Likelihood analyses, Tephroderma clearly belongs to the tricholomatoid clade and is closely related to the Entolomataceae and the Lyophyllaceae, and different from the Clitocybeae lineage. Tephroderma is distinguished from the other known genera by a unique combination of macroand micromorphological characters, including basidiomes with a clitocyboid habit, tenacious-leathery context, decurrent and thick lamellae, whitish spore print, short, not siderophilous basidia, smooth, acyanophilous and inamyloid basidiospores, gelatinous hymenophoral trama and pileipellis, the absence of both cystidia and clamped, thick-walled hyphae. Descriptions of the material collected, taxonomical notes and macroslides of fresh basidiomata and sketches of the main micromorphological features are provided. The new genus is thus far known only from France.

**Key words:** *Basidiomycota, Agaricales,* Tricholomatoid clade, *Tephroderma* gen. nov., *T. fuscopallens* sp. nov., taxonomy, molecular phylogeny.

#### Introduzione

Recenti indagini filogenetiche focalizzate sulle *Agaricales* (MATHENY & AL., 2006, BINDER & AL., 2010) hanno consentito di accertare l'esistenza di diversi cladi monofiletici. Fra questi quello denominato "Tricholomatoid clade", ben supportato, è risultato comprendere quattro famiglie, ossia le *Tricholomataceae* R. Heim ex Pouzar s.s., le *Lyophyllaceae* Jülich, le *Entolomataceae* Kotl. & Pouzar, le *Mycenaceae* Overeem e quello che è stato denominato *Catathelasma* clade (MATHENY & AL., 2006, AMMIRATI & AL., 2007), vicino ai lineages di *Infundibulicybe* Harmaja e *Pseudoclitocybe* (Singer) Singer (BINDER & AL., 2010).

In questa comunicazione viene proposto il nuovo genere *Tephroderma* per sistemare un fungo clitocyboide, più volte rinvenuto da E.M. in Francia, il quale, a seguito di indagini molecolari, non ha trovato collocazione in alcuno dei generi fino ad ora noti.



Fig. 1. *Tephroderma fuscopallens* in habitat.

Foto di Enzo Musumeci



Fig. 2. Tephroderma fuscopallens in habitat.

Foto di Enzo Musumeci



Fig. 3. Albero filogenetico a cura di Pablo Alvarado.

## Materiali e metodi

La specie in habitat è stata fotografata con un dispositivo digitale Nikon 7600 della serie Coolpix, mentre per le immagini di laboratorio e microscopia è stata utilizzata una Nikon Coolpix 4100.

Per le analisi di microscopia è stato utilizzato un microscopio binoculare Leica DME con obiettivi acromatici; per specifiche ispezioni di dettaglio è stato utilizzato un obiettivo ad immersione planapocromatico.

Il materiale fresco è stato osservato in soluzione acquosa o colorato con Rosso Congo, Verde di malachite o Blu cotone. Il reattivo di Melzer è stato utilizzato per saggiare eventuali reazioni di

amiloidia e/o di destrinoidia, il Blu cresile per verificare la reazione metacromatica nelle spore e nei tessuti imeniali, le soluzioni di Sulfobenzaldeide per individuare la presenza di ife idroflere o laticifere nei tessuti, mentre il Blu di toluidina è stato utilizzato per evidenziare la presenza di strati gelificati nel rivestimento pileico. I reperti di erbario, prima della colorazione, sono stati rigonfiati con KOH 3%.

Gli exsiccata sono depositati negli erbari specificamente indicati nel paragrafo "Materiale studiato" (l'abbreviazione "erb. pers. E.M." sta per erbario personale di Enzo Musumeci).

Il DNA è stato estratto da frammenti di campioni essiccati che inizialmente sono stati immersi in 600 µl di tampone CTAB (CTAB 2%, NaCl 1.4 M, EDTA pH 8.0 20 mM, Tris-HCl pH 8.0 100 mM), quindi incubati per 15 minuti a 65 °C. È stato aggiunto un identico volume di una soluzione di cloroformio e alcool isoamilico (nel rapporto 24:1), quindi il tutto è stato centrifugato per 10 minuti a 13.000 giri; il DNA contenuto nel surnatante è stato fatto precipitare grazie all'aggiunta di un identico volume di isopropanolo. Dopo ulteriore centrifugazione (15 minuti a 13.000 giri) il pellet è stato lavato con etanolo 70% freddo, nuovamente centrifugato per due minuti, quindi asciugato. Alla fine il DNA è stato risospeso in 200 µl di acqua distillata.

Per l'amplificazione mediante PCR sono stati utilizzati i primer ITS1F e ITS4 per la regione ITS (GARDES & BRUNS, 1993; WHITE & AL., 1990), LROR e LR5 per la regione 28S nLSU (VILGALYS & Hester, 1990), EF1-983 F e EF1-1567R per il gene *tef1*, translation elongation factor 1- $\alpha$  (Rehner & BUCKLEY, 2005) e NS19b e NS41 per la regione 18S nrSSU (http://www.clarku.edu/faculty/ dhibbett/Protocols\_Folder/Primers/Primers.htm). Il termociclatore è stato settato nel modo seguente: denaturazione iniziale a 95 °C per 5 minuti seguito da 35 cicli a 94 °C, 54 °C e 72 °C rispettivamente per 45, 30 e 45 secondi ed infine estensione finale a 72 °C per 10 minuti. I prodotti della PCR sono stati evidenziati e controllati grazie a elettroforesi in gel d'agarosio 1%. Sono stati controllati, infine, i cromatogrammi e sono stati corretti eventuali errori di lettura. Le sequenze sono state esaminate visivamente ricercando gli errori di lettura in MEGA 5 (TAMURA & AL., 2011). Le sequenze ottenute sono state allineate con quelle più prossime secondo i dati della letteratura (MATHENY & AL., 2006; BINDER & AL., 2010). Esse provengono principalmente da HOFSTETTER & AL., 2002. Si è provveduto, inoltre, ad allineare le sequenze con il software MEGA 5, usando la sua applicazione ClustalW. L'allineamento finale è stato realizzato manualmente ed inserito nel programma PAUP\* 4.0b10 (Swofford, 2001), con il quale sono stati esaminati i differenti risultati ottenuti mediante l'utilizzo dei singoli markers (28S nLSU, rpb2, tef1, 18S SSU). Per ottimizzare i migliori modelli evolutivi è stato utilizzato MrModeltest 2.3 (NYLANDER, 2004). I modelli così ottenuti sono stati immessi nel programma MrBayes 3.1 (Ronquist & Huelsenbeck, 2003) e ne è stata effettuata un'analisi bayesiana (ripartendo i dati, effettuando due corse simultanee, eseguendo il campionamento ogni 100 generazioni e fissando a 0.2 ° la temperatura) fino al raggiungimento dei parametri di convergenza dopo 1.060.000 generazioni. Il 25% dei primi alberi realizzati sono stati scartati in quanto "burn in" (essendo stato utilizzato un totale di 7.950). Successivamente è stata condotta un'analisi del "maximun likelihood in RAxML" (STAMAKIS, 2006) utilizzando l'algoritmo standard del programma (dati frazionati, 2000 ripetizioni bootstrap). Le soglie di significanza sono state al di sopra del 70% delle proporzioni di bootstrap (BP) e del 95% delle probabilità a posteriori (PP).

#### Risultati molecolari

La comparazione, mediante BLAST, delle sequenze ottenute (Fig. 3) indica che si tratta di un fungo mostrante elevate percentuali di somiglianza con specie del "Tricholomatoid clade". Infatti il BLAST relativo alla regione ITS indica una percentuale di vicinanza al 90% a specie quali *Hypsizygus marmoreus* (Peck) H.E. Bigelow, *Clitocybe subditopoda* Peck e *Tricholoma scalpturatum* (Fr.) Quél., mentre il BLAST della regione 28S nLSU indica un 98% di prossimità con *C. subditopoda* e con una sequenza GenBank attribuita a *C. vibecina*. Il BLAST del gene TEF mostra una somiglianza pari all'81% con *Lyophyllum ambustum* (Fr.) Singer, *L. anthracophilum* (Lasch) M. Lange & Sivertsen e, infine, quello della regione 18S nSSU mostra valori di somiglianza pari al 99% con



Fig. 4. *Tephroderma fuscopallens* in habitat.

Foto di Enzo Musumeci



Fig. 5. T. fuscopallens. Igrofaneità. Foto di Enzo Musumeci



Fig. 6. T. fuscopallens. Igrofaneità. Foto di Enzo Musumeci



Fig. 7. T. fuscopallens in particolare. Foto di Enzo Musumeci



Fig. 8. T. fuscopallens in particolare. Foto di Enzo Musumeci

*Clitocybe candicans* (Pers.) P. Kumm., ancora *C. subditopoda* e *Asterophora parasitica* (Bull.) Singer. L'indagine filogenetica (**Fig.3**) dimostra chiaramente che le collezioni sequenziate non appartengono al *Clitocybe* lineage come definito da MATHENY & AL., 2006. Esse presentano, piuttosto, maggiore affinità con specie delle famiglie *Entolomataceae* e *Lyophyllaceae*, pur apparendo la specie strettamente imparentata con *Clitocybe candicans*, "*Clitocybe*" connata (Schumach.: Fr.) Gillet e *C. subditopoda*. Assieme a queste forma un clade monofiletico anche se il grado di differenziazione morfologica e molecolare rispetto ad esse suggerisce che si tratti di entità appartenti a generi separati.

Sample	ITS	28S nLSU	18S nSSU	tef1
LUG 18989	KJ701327	KJ701333	KJ701331	KJ701329
EM 4789-12	KJ701326	KJ701332	KJ701330	KJ701328

## TASSONOMIA

*Tephroderma* Contu & Musumeci, gen. nov. Mycobank number: MB 808569

Etymology: the epithet refers to the dark tinges of the fresh basidiomata.

Phylogenetically in the Agaricales, closely related to the families Entolomataceae and Lyophyllaceae. Basidiomata agaricoid (with distinct pileus, lamellae and stipe), tenacious-leathery, resembling those of members of Pseudoclitocybe, Clitocybe s.l. or Pseudolyophyllum, veil absent, basidiospores hyaline, without germ-pore, smooth, inamyloid, not dextrinoid, not metachromatic in Cresil Blue, hymenophoral trama regular, slightly gelatinized, basidia without siderophilous grana, cystidia and pseudocystidia absent, pileal surface a thin ixocutis of repent to interwoven, cylindrical hyphae, clamp-connections present, no sarcodimitic texture in any part of the basidioma; hyphal system mainly monomytic. Terrestrial, on the ground, never on wood. Type: Tephroderma fuscopallens Musumeci & Contu spec. nov.

## Tephroderma fuscopallens Musumeci & Contu, spec. nov.

Mycobank number: MB 808570

Etimology: da fuscus, -i (lat.) e pallens, -éntis (lat.): due to the fading colors of the cap.

**Original diagnosis:** Pileus 15-60 mm broad, semiglobose then subhemisphaerical-convex but soon applanate, the disc typically more or less deeply depressed and often subinfundibuliform, without umbo, undulate-lobate, very irregular, striate up to 1/3 of the diameter; surface smooth, without veil remnants, not pruinose, hygrophanous, dark-brown, hazel-brown, dark greyish-brown to dark chestnut-brown, fading pale whitish-cream on age. Lamellae moderately crowded, thick and tenacious-elastic, inaequal and with lamellulae, adnate to deeply decurrent, in young stages whitish-grey then whitish-cream to brown, not furcate towards the stem, the edge entire, not floccose, concolorous. Stipe 25-75 mm long, 4-8 mm thick, central, very solid and tenacious-leathery, fistulose to hollow, cylindric, not bulbose, at time compressed and sulcate, concolorous with the cap or slightly paler, smooth and polished but at times minutely pruinose, especially upwards, under the lamellae, the base covered with white hairy mycelium; veil absent. Context brown, typically tenacious-leathery; smell not noticeable, subherbaceous, taste mild. Probably not edible. Spore-print: whitish.

Spores 5.5-7 × 3.5-4.5  $\mu$ m, on average 5.6 × 3.8  $\mu$ m, Qm = 1.45, hyaline, inamyloid, not dextrinoid, not metachromatic in Cresil Blue, smooth, regularly ellipsoid, at times widely ellipsoid or subovoid to ellipsoidlacrymoid, thin-walled and easily collapsing, with a medium-sized apiculus. Basidia 20-30 × 4-6  $\mu$ m, mostly four-spored, at time intermixed with 2-spored basidia, clavate-subcylindrical, with basal clamps, without siderophilous grana; subhymenium made up of hyphoid, thick-walled, clamped elements, gelatinized. Hymenophoral trama regular to subregular, made up of cylindric, hyaline, often thick-walled hyphae, those of the central stratum 3-12  $\mu$ m wide, those of the hymenopodial stratum 2-8  $\mu$ m wide, sometimes slightly gelatinized. Marginal cells  $12-25 \times 3-5 \ \mu m$ , not very frequent, variable, subclaviform, subutriform or subfusiform, hyaline, thin-walled, not incrusted. Pileal surface made up of a cutis of repent to interwoven, cylindrical, long hyphae 2-15  $\mu m$  wide, with plasmatic or finely incrusting grey-brown pigment, suprapellis a thin ixocutis; subcutis not well differentiated, made up of slightly wider, 3-17  $\mu m$ , thick-walled hyphae. Covering of the stem made up by hyaline, parallel, thick-walled, at times nodulose hyphae, that are finely incrusted, those of the central stratum up to 14  $\mu m$  wide. Caulocystidia not seen. Oleiferous hyphae not seen. Clamps present at all septa. No parts of the basidiocarp amyloid, dextrinoid or metachromatic in Cresil Blue. Hyphal structure nearly entirely monomytic.

Habitat and distribution single or gregarious, not caespitose, in small groups in open places, on slightly sandy soil covered with mosses, 240 m o.l.s., on acid soil. Autumn. Thus far known only from Europe (France). Typus: France, Alsace, Rixheim, 30.9.2012, leg. E. Musumeci (herb. LUG 18989, holotypus, herb. pers. E.M. 4439-12, isotypus).

#### Descrizione

**Cappello** 15-60 mm, inizialmente subgloboso, poi brevemente subemisferico-convesso, ma ben presto aperto-disteso, non umbonato, al disco marcatamente depresso sin dai primordi, negli esemplari maturi la depressione appare profondamente accentuata, con aspetto quasi imbutiforme, margine striato fino a 1/3, a volte ondulato-lobato, piuttosto irregolare; cuticola liscia, marcatamente igrofana, con colore dipendente dal grado di umidità, bruno-castano, bruno-nocciola, bruno-alutaceo o grigio-bruno uniforme, tendente a divenire crema-biancastro; resti di velo e pruina assenti.

**Lamelle** mediamente fitte con presenza di lamellule, piuttosto tenaci alla manipolazione, spesse, da adnate a marcatamente decorrenti, dapprima grigio-biancastre, poi crema-biancastre fino a bruno-caffelatte, taglio concolore, regolare.

**Gambo** 25-75 × 4-8 mm, cilindrico-regolare, sovente compresso-solcato, fistoloso-cavo alla sezione, coriaceo alla manipolazione, molto consistente, con base rivestita da peluria biancastra; superficie liscia, a volte minutamente pruinosa, specialmente nel tratto apicale, concolore al cappello o leggermente più chiara.

**Carne** tipicamente tenace-coriacea, bruna, odore poco rilevante, suberbaceo; sapore mite. Probabilmente non commestibile.

Polvere sporale biancastra in massa.

**Spore** 5,5-7 × 3,5-4,5  $\mu$ m, in media 5,6 × 3,8  $\mu$ m, Qm = 1,45, lisce, ialine, inamiloidi, non destrinoidi, non metacromatiche in Blu di cresile, ellittiche, largamente ellittiche, subovali fino a sublarmiformi, con parete da mediamente spessa a sottile, molto facilmente collassanti sia quelle dell'imenio sia quelle della polvere sporale.

**Basidi** 20-30 × 4-6  $\mu$ m, tetrasporici, raramente misti con altri bisporici, da subclaviformi a subcilindrici. con unioni a fibbia basali; subimenio filamentoso, gelificato, composto da ife a parete spessa, frequentemente settate, con unioni a fibbia presenti quasi ad ogni setto così da far assumere alla struttura un aspetto subcoralloide, ife di raccordo con la trama imenopodiale anch'esse a parete spessa, sinuose e frequentemente fibbiate.

**Trama dell'imenoforo** regolare-subregolare, composta da ife clindriche in parte leggermente gelificate e/o a parete spessa, quelle imenopodiali larghe 2-8 µm, quelle dello strato centrale larghe 4-13 µm, a parete spessa.

**Cellule marginali** 12-25 × 3-5  $\mu$ m, variabili nella forma, subclaviformi, subutriformi, subfusiformi, ialine, a parete sottile, non incrostate.

**Rivestimento pileico** composto da una cutis di ife cilindriche da parallele a intrecciate per tratti, larghe 2-15  $\mu$ m, con pigmento leggero, in parte bruno-grigio-ocraceo di natura intracellulare, in altra parte finemente incrostate; suprapellis leggermente gelificata; subcutis non differenziata, formata da ife larghe 3-17  $\mu$ m, talvolta irregolarmente sinuose, con pigmentazione simile.



Fig. 9. T. fuscopallens. A. Spore; B. Struttura imeniale; C. Rivestimento pileico; D. Caulocute. Tavola di Enzo Musumeci

**Rivestimento caulinare** composto da una cutis di ife cilindriche parallele, larghe 2-7  $\mu$ m, a parete spessa, con pigmento leggero, a volte da finemente a mediamente incrostate per sottili placche aderenti, ife dello strato mediano larghe 3-14  $\mu$ m, a parete spessa, non fisaloidi.

Tutte le ife inamiloidi, non destrinoidi e non metacromatiche in Blu di cresile.

Ife oleifere assenti.

Unioni a fibbia presenti in abbondanza in ogni parte del basidioma.

Struttura ifale pressoché interamente monomitica.

Habitat solitaria o gregaria in bosco misto (*Carpinus betulus L., Quercus pubescens* Willd. e *Fagus sylvatica* L.) collinare e pianeggiante, entro una radura in tratti aperti e soleggiati, talvolta ruderalizzati, su terreno acido, sabbioso-sassoso alluvionale con substrato finemente sabbioso a tratti ricco di carbonati e con cotica muscoso-erbosa, in vicinanza di *Carpinus betulus*. Altre specie presenti nella stazione: *Tulostoma brumale* Pers., *Clitocybe variabilicolor* Musumeci & Contu, *Galerina vittiformis* (Fr.) Singer, *Entoloma incanum* (Fr.) Hesler, *Rickenella fibula* var. *pseudocantharellus* Bon e *Tricholoma argyraceum* (Bull.) Gillet. Autunno. Fino ad ora conosciuta con certezza solo dalla Francia.

**Materiale studiato**: Francia, Dipartimento dell'Alto Reno, Alsazia, Rixheim, zona collinare pianeggiante a 240 m s.l.m., in una radura boschiva soleggiata all'interno di un bosco misto a *Quercus pubescens, Carpinus betulus* e *Fagus sylvatica*), su terreno acido, sabbioso-sassoso di natura alluvionale, con substrato finemente sabbioso, a tratti ricco di carbonati e cotica costituita da muschi bassi e graminacee; solitaria o in piccoli gruppi, con temperatura comprese fra 9 ° e 20 ° e umidità compresa fra 62% e 100%, 23.10.2010, leg. E. Musumeci (erb. pers. E.M. 7260-10); ditto, 13.10.2011, leg. E. Musumeci, (erb. pers. E.M. 1202-11); ditto, 30.9.2012, leg. E. Musumeci (erb. LUG 18989, *holotypus*, erb. pers. E.M. 4439-12, isotypus); ditto 30.9.2012, leg. E. Musumeci (erb. pers. E.M. 4789-12); ditto, 5.10.2012, leg. E. Musumeci (erb. pers. E.M. 4797-12).

#### Discussione

Sul terreno *Tephroderma fuscopallens*, che ha un aspetto tipicamente clitociboide, può evocare diverse entità appartenenti ad alcuni generi che annoverano taxa ad habitus simile e la determinazione può non risultare agevole, particolarmente con riguardo ad alcune di queste entità, soprattutto a causa della micromorfologia relativamente banale che connota questa specie. La consistenza elastico-cartilaginea dei basidiomi, l'habitus degli stessi ed il colore possono evocare *Myxomphalia maura* (Fr.) Hora, la quale, tuttavia, si separa agevolmente per il fatto di possedere spore amiloidi, di profilo subgloboso ed evidenti cistidi (v. per tutti ANTONIN & NOORDELOOS, 2004). Allo stesso modo le specie del genere *Pseudoclitocybe* (Sing.) Sing., spesso con un habitus ed una consistenza simili, si distinguono facilmente per le spore amiloidi e le ife prive di giunti a fibbia (SINGER, 1986).

*Tephrocybe osmophora* (E.J. Gilb.) Bon e *T. baeosperma* (Romagn.) M.M. Mos., che pure possono presentare basidiomi di consistenza elastica e colori paragonabili, sono agevolmente distinguibili per i basidi con granulazioni siderofile e le ife del basidioma a parete sottile, non gelificate nella trama lamellare (v. per tutti: CONSIGLIO & CONTU, 2005, sub *"Lyophyllum"*).

Più difficile può risultare, senza l'ausilio della genetica, distingure la nostra nuova specie da diverse specie attribuite a *Clitocybe* ss. lato, in particolare da *C. pseudo-obbata* (J. Lange) Kuyper e *C. umbilicata* (Schaeff.) P. Kumm. Quest'ultima si distingue agevolmente per la trama lamellare bidirezionale, le ife con pigmento unicamente intracellulare e per l'assenza di gelificazione nella trama lamellare (v., per tutti, CLEMENÇON, 1982). BoN (1997: 87, nota in calce a "Gerronema umbilicatum") ha sommariamente segnalato, senza convalidarne l'epiteto, una "*Clitocybe subumbilicata* ad. int.", detta differente da *C. umbilicata* per le ife del rivestimento pileico a pigmento misto anche incrostante e la trama lamellare regolare. Noi non abbiamo studiato il materiale del Maestro francese e quindi non siamo in grado di operare un raffronto più approfondito.



Fig. 10. T. fuscopallens. Spore.

Foto di Enzo Musumeci



Fig. 12. *T. fuscopallens.* Rivestimento pileico gelificato. Foto di Enzo Musumeci



Fig. 11. *T. fuscopallens*. Albero subimeniale con basidi e cellule marginali. Foto di Enzo Musumeci



Fig. 13. *T. fuscopallens*. Ife del gambo. Foto di Enzo Musumeci

Infine *C. pseudo-obbata*, probabilmente l'entità più facilmente confondibile con la nostra sul terreno, si separa, in assenza di dati genetici, per il basidioma generalmente più pallido, di consistenza fragile e non elastico-cartilagineo, le lamelle meno decorrenti, l'assenza di gelificazione nella trama lamellare, le ife del basidioma a parete sottile e le spore minori (CLEMENÇON, 1984; MOSEr, 2003; HORAK, 2005).

Fra le specie filogeneticamente più prossime *C. subditopoda* Peck, comune negli USA, possiede pure colorazioni brunastre, anche cariche, ma si separa per la carne con odore e sapore farinosi e per le spore ed i basidi di dimensioni decisamente minori (cfr. per tutti BIGELOW, 1985, il quale, peraltro, nella sua dettagliata ridescrizione della specie basata su 43 collezioni americane, quella tipica inclusa, non segnala la presenza nel basidioma delle tipiche ife a parete spessa riscontrate in *T. fuscopallens*).

Decisamente differenti, invece, "*Clitocybe*" connata (Schum.: Fr.) C. Gill., che possiede colorazioni bianche o comunque decisamente più pallide, crescita cespitosa, spore minori e ife del rivestimento pileico a pigmentazione non incrostante (v. per tutti Bon, 1999, come "*Lyophyllum connatum*") e *C. candicans* (Pers.: Fr.) P. Kumm., pure a colorazioni bianche o decisamente più pallide, che possiede cappello a superficie tipicamente glassata e spore minori e più strette, come anche le ife del rivestimento pileico tipicamente ramificate o subcoralloidi (CLEMENÇON, 1984; BON, 1999).

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## CLAUDIO ANGELINI, CRISTIANO LOSI

## ANNOTATED LIST OF POLYPORACEAE IN THE DOMINICAN REPUBLIC. THIRD PART

#### Abstract

Sixteen species of fungi belonging to the family Polyporaceae from the Dominican Republic, collected during the years 2003–2014, are commented and illustrated (Coriolopsis caperata, Earliella scabrosa, Favolus tenuiculus, Fomes fasciatus, Hexagonia hydnoides, Lenzites elegans, Polyporus amygdalinus, Polyporus arcularius, Polyporus dictyopus, Polyporus guianensis, Polyporus tricholoma, Pycnoporus sanguineus, Trametes ectypa, Trametes lactinea, Trametes maxima, Trametes membranacea).

#### Riassunto

Vengono commentate e illustrate le raccolte di sedici funghi appartenenti alla famiglia Polyporaceae effettuate nella Repubblica Dominicana, raccolti nel periodo 2003-2014 (Coriolopsis caperata, Earliella scabrosa, Favolus tenuiculus, Fomes fasciatus, Hexagonia hydnoides, Lenzites elegans, Polyporus amygdalinus, Polyporus arcularius, Polyporus dictyopus, Polyporus guianensis, Polyporus tricholoma, Pycnoporus sanguineus, Trametes ectypa, Trametes lactinea, Trametes maxima, Trametes membranacea).

Key words: Basidiomycota, Aphyllophorales, sub-tropical zone, Caribbeans.

#### Introduction

The areas of research and collection are characterized as follows:

1) coastal vegetation in areas heavily populated and immediately behind the beach of Sosua (Puerto Plata), consisting of trees such as Gri-grí (Bucida buceras L.), Guasuma (Guazuma tomentosa H.B.K.), Uva de playa [Coccoloba uvifera (L.) L.], Palma real [Roystonea hispaniolana (H.B.K.) O.F. Cook], Jabilla criolla (Hura crepitans L.), Caoba [Swietenia mahagoni (L.) Jacq.], Almendra (Terminalia catappa L.), Mara (Calophyllum calaba L.), Uvero (Coccoloba diversifolia Jacq.), Samán [Samanea saman (Jacq.) Merrill], Cigua blanca [Ocotea coriacea (Sw.) Britton], Almácigo [Bursera simaruba (L.) Sarg.], Ancillo (Celtis trinervia Lam.), Roble rosado [Tabebuia rosea (Bertol.) Bertedero ex A.DC.] and the inevitable Cocoteros (Cocos nucifera L.) and Cinola ("Passion fruit" - Passiflora edulis Sims) with undergrowth consists of Anamu (Petivera alliacea Mucura);

2) back coastal vegetation, with streams and small rivers, always present everywhere in Sosua (P.to Plata), consists primarily of trees as Guama (Inga vera Willd), Jabilla criolla (Hura crepitans L.), Roble [Catalpa longissima (Jacq.) Dum.Cours.], Jina americana [(Roxb.) Benth.], Aniceto (Piper amalago L.), Mango (Mangifera indica L.), Buen pan [Artocarpus altilis (Parkinson) Fosberg], Palo de burro [Dendropanax arboreus (L.) Decne. & Planch.], Guapalmo [Andira inermis (W. Wright) DC.], Yagrumo (Cecropia schreberiana Miq.), Almácigo [Bursera simaruba (L.) Sarg.] and the Cocoteros (Cocos nucifera L.), Cinola ("Passion fruit" - Passiflora edulis Sims) and Bejuco de costilla (Paullinia pinnata L.);

3) **riparian forests** growing along the river S. Juan, in the María Trinidad Sánchez province, where there are both the same species as above (with the exception of **Caoba**) and others, typical of that area, as for example **Anón de río** [*Lonchocarpus domingensis* (Turpin ex Pers.) DC.], **Drago** (*Pterocarpus officinalis* Jacq.), **Jobo de puerco** (*Spondia smombin* L.), **Higo cimarrón** 



Fig. 1. Coriolopsis caperata

Photo by Claudio Angelini



Fig. 2. Earliella scabrosa

Photo by Claudio Angelini



Fig. 3. Favolus tenuiculus

Photo by Claudio Angelini



Fig. 4. Hexagonia hydnoides

Photo by Claudio Angelini

(Ficus trigonata L.), Guasuma (Guazuma tomentosa H.B.K.), Cabirma [Guarea guidonia (L.) Sleumer], Guiro [Amphitecna latifolia (Mill.) A.H.], Jina criolla [Inga fagifolia (L.) Wildd.], Palo amargo (Trichilia pallida Swartz), Piñon cubano (Gliricidia sepium Jacq.);

4) hilly area of Peñón de Mundo Nuevo, protected area named "La Jíbara" (Tenares), in Hermanas Mirabal province, with meadows and woods with mostly deciduous trees as for example Cigua blanca [Ocotea coriacea (Sw.) Britton], Copey (Clusia rosea Jacq.), Caya amarilla (Syderoxylon foetidissimum Jacq.), Caya colorà [Syderoxylon salicifolium (L.) Lam.], Copeyito [Clusia clusioides (Griseb.) D'Arcy], Vibora [Oreopanax capitatus (Jacq.) Decne. & Planch.], Aguacatillo [Beilshmiedia pendula (Sw.) Hemsl.], Palo amargo (Trichilia pallida Swartz), Miracielo (Tabebuia ricardii M. Mejía), Puntilla (Podocarpus hispaniolensis de Laub.), Diablito [Chionanthus ligustrinus (Sw.) Pers.], Ramon de vaca [Dendropanax arboreus (L.) Decne. & Planch.] and typical of this area Palo de viento [Shefflera tremula (Krug & Urb.) Alain], Palo blanco (Drypetes alba Poit.), Hojancho (Coccoloba pubescens L.), Macao [Pseudolmedia spuria (Sw.) Griseb.] and Caracolì [Cojoba arborea (L.) Britton & Rose].

## Materials and methods

The basidiomata were photographed in fresh condition in habitat using a digital camera Nikon Coolpix 8400 and subsequently dried. The microscopic study was performed on dry material rehydrated in water and observed with an Olympus optical microscope (model BH-2). The material was also mounted with anionic Melzer to check the possible amyloid or dextrinoid reactions and colored with anionic Congo red to appreciate spore ornamentation. The macroscopic and microscopic descriptions in the text refer only to the material collected in the Dominican Republic.

## PRESENTATION OF THE SPECIES FOR FAMILIES AND GENERA

## Family Polyporaceae Fr. ex Corda 1839

The 10<sup>th</sup> edition of "*The Dictionary of The Fungi*" (KIRK *ET AL.*, 2008) includes 92 genera and 636 species. The family *Polyporaceae* Fr. ex Corda includes basidiomata either polyporoid with a central, eccentric or lateral stipe, or resupinate; annual or perennial; fleshy, leathery or strongly woody, with upper surface smooth, tomentose or scaly, sometimes zonate. Hyphal system monomitic, dimitic or trimitic with skeleton-ligative hyphae, clamp connections frequent, cystidia absent. Hymenium tubular or lamellate, without setae. Basidia small, clavate, usually with 4 sterigmata. Basidiospores cylindrical to allantoid, thin-walled, hyaline, usually smooth, not staining in iodine (CANNON & KIRK, 2007). In this work will be presented species belonging to the genera *Coriolopsis, Earliella, Favolus, Fomes, Exagonia, Lenzites, Polyporus, Pycnoporus* and *Trametes*.

## Genus Coriolopsis Murrill

**Basidiomata** annual, pileate, rarely resupinate, hirsute. **Sterile surface** brownish yellow, hirsute, zonate or not. **Pore surface** yellowish brown; **pores** round; **context** yellowish to amber. **Hyphal system** trimitic. **Basidiospores** cylindrical to ellipsoidal. **Clamp connections** present. Saprophytes of deciduous wood, rarely on conifers, white rot agents (BERNICCHIA, 2005).

## Genus Earliella Murrill

**Basidiomata** annual to perennial, often reviving, semiresupinate, thin and dry but rigid; **sterile surface**, when present, pelliculose, glabrous, zonate, first white to cream, then more or less

reddish-brown in colour spreading from the base. **Pore surface** white to cork-colored. **Context** white to wood-colored, coriaceus, zonate. **Pores** round to sinuose. **Basidiospores** cylindrical to oblong-ellipsoid. **Clamp connections** present. Saprophytes of deciduous wood, white rot agents (GILBERTSON & RYVARDEN, 1986; MURRILL, 1915). This genus is similar and related to *Trametes*, sharing the same type of hyphal system and spores (see below), but the basidiomata is deviating as it is frequently resupinate to effused-reflexed and develops a reddish cuticle on the pileus (GILBERTSON & RYVARDEN, 1986a). Monotypic tropical genus (GILBERTSON & RYVARDEN, 1986).

## Genus Favolus P. Beauv.

Same as Polyporus (see below), but with radially elongated pores.

## Genus Fomes (Fr.) Fr.

**Basidiomata** perennial, sessile, ungulate. **Sterile surface** glabrous, sulcate, crusty, zonate, gray to brown. **Pore surface** brown ochraceous; **pores** small and round; multilayered **tubules**; **context** brown, with a conspicuous mycelial core close to the substratum. **Hyphal system** trimitic. **Basidiospores** cylindrical-ellipsoidal. **Clamp connections** present. On deciduous wood, white rot agents, on living and/or dead trees (BERNICCHIA, 2005).

## Genus Hexagonia Fr.

**Basidiomata** annual or perennial, pileate, sessile, dimidiate, usually semicircular. **Sterile surface** glabrous, hirsute or tomentose. **Pores** angular, exagonal. **Context** brown-black with KOH. **Hyphal system** trimitic. **Basidiospores** cylindrical, always larger than 12 μm. **Clamp connections** present. Saprophytes of deciduous wood, white rot agents (BERNICCHIA, 2005).

## Genus Lenzites Fr.

**Basidiomata** annual, pileate; **sterile surface** glabrous or tomentose, strongly zonate, whitish to greyish. **Hymenophore** mazy to lamellate, white to yellowish. **Context** white-ochraceous. **Hyphal system** trimitic. **Basidiospores** cylindrical. **Clamp connections** present. On deciduous wood, white rot agents (BERNICCHIA, 2005).

## Genus Polyporus P. Micheli ex Adans.

**Basidiomata** annual or biannual, centrally or laterally stipitate. **Sterile surface** roundish to dimidiate, convex to infundibuliform, smooth to scaly, glabrous to tomentose, white to dark brown to blackish. **Poroid surface** whitish to creamy. **Pores** round, angular or polygonal, decurrent on stipe or not. **Context** white. **Stipe** glabrous or tomentose, white, brown or black. **Hyphal system** dimitic. **Basidiospores** cylindrical, straight or slightly curved. **Clamp connections** present. On deciduous wood, rarely in conifers, white rot agents (BERNICCHIA, 2005).

## Genus Pycnoporus P. Karst.

**Basidiomata** annual, sessile or with the top folded. **Sterile surface** glabrous, cinnabarine, often zonate and sulcate, with the same color as the pore surface; **pores** small and roundish. **Hyphal system** trimitic. **Basidiospores** cylindrical. **Clamp connections** present. On deciduous wood, rarely in conifers, white rot agents (BERNICCHIA, 2005).

## Genus Trametes Fr.

Basidiomata annual or perennial, fleshy or leathery, pileate, sessile, dimidiate or fan-shaped, single or imbricate. Sterile surface tomentose or glabrous, zonate or not, of a cream, brown



Fig. 5. Fomes fasciatus

Photo by Claudio Angelini



Fig. 6. Lenzites elegans

Photo by Claudio Angelini



Fig. 7. Polyporus amygdalinus

Photo by Claudio Angelini



Fig. 8. Polyporus dyctiopus

Photo by Claudio Angelini

or grayish colour. **Poroid surface** creamy-white or greyish; **pores** roundish to elongated. **Context** white, thin or thickened, sometimes with double structure, separate or not from the tomentum by a thin black line. **Hyphal system** trimitic. **Basidiospores** ellipsoid to allantoid to cylindrical. **Clamp connections** present. On deciduous wood, rarely in conifers, white rot agents (BERNICCHIA, 2005).

## MATERIAL STUDIED

## Coriolopsis caperata (Berk.) Murrill

**Basidiomata** sessile to dimidiate, 2-6 mm thick; **pileus surface** appressed tomentose to glabrous, distinctly zonate, light ochraceous to deep brown; **pore surface** light cinnamom to dark brown, **pores** 4-6 per mm. **Basidiospores** cylindrical 7.2-8 × 2.4-3 µm.

Common in tropical forest regions (Gilbertson & Ryvarden, 1986).

**Material studied**: specimens growing on dead hardwood trunk on the ground, collected on Aug. 05, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 122298 (**Fig. 1**); specimens growing on dead hardwood trunk on the ground, collected on Aug. 09, 2011 by C. Angelini at Cabarete (P.to Plata) – Loc. Perla Marina - Dominican Republic. *Exsiccatum*: JBSD 123814; specimens growing on dead hardwood trunk on the ground, collected on Dic. 28, 2012 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 1248720.

## Earliella scabrosa (Pers.) Gilb. & Ryvarden

**Basidiomata** sessile to effused-reflexed, imbricate; **pileus surface** whitish to cream, grey or brownish, zonate; soon a reddish cuticle covers more or less the whole surface starting from the base. **Pore surface** whitish to cream, **pores** 2-3 per mm. **Basidiospores** cylindrical to narrowly ellipsoid, 6.6-10 × 2.5-3 μm.

Very common in subtropical and tropical areas (GILBERTSON & RYVARDEN, 1986).

**Material studied**: specimens growing on a dead hardwood trunk on the ground, collected on Dic. 23, 2010 by C. Angelini at Rio S. Juan (María Trinidad Sánchez) – Dominican Republic. *Exsiccatum*: JBSD 121901 (**Fig. 2**); specimens growing on a dead hardwood trunk on the ground, collected on Nov. 22, 2013 by C. Angelini Sosua (P.toPlata) – Dominican Republic. *Exsiccatum*: in the first author's herbarium (ANGE147), pending its deposit in the herbarium of Santo Domingo (JBSD – Dominican Republic).

## *Favolus tenuiculus* P. Beauv.

**Basidiomata** laterally stipitate to dimidiate, white; **upper surface** smooth azonate and not striate with thin, minutely fringed or ciliate margin; **pores** radially elongated, up to 3 per mm. **Basidiospores** cylindrical, 8.8-12 × 3-3.8 µm

Very common throughout the tropics (Gilbertson & Ryvarden, 1987).

**Material studied**: specimens growing on a dead hardwood stump on the ground, collected on Aug. 01, 2010 by C. Angelini at Rio S. Juan (María Trinidad Sánchez) – Dominican Republic. *Exsiccatum*: JBSD 121944 (as *Polyporus t.*) (**Fig. 3**); specimens growing on a dead hardwood trunk on the ground, collected on Nov. 25, 2011 by C. Angelini at Sosua (P.to Plata) – Loc. Puerto Chiquito – Dominican Republic. *Exsiccatum*: JBSD 123803 (as *Polyporus t.*); specimens growing on a dead hardwood trunk on the ground, collected on Nov. 29, 2011 by C. Angelini at Sosua (P.to Plata) – Loc. Puerto Chiquito – Dominican Republic. *Exsiccatum*: JBSD 123803 (as *Polyporus t.*); specimens growing on a dead hardwood trunk on the ground, collected on Nov. 29, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 123808 (as *Polyporus t.*).

## Hexagonia hydnoides (Sw.) M. Fidalgo

**Basidiomata** sessile, dimidiate to flabelliform; **upper surface** dark, dull brown to blackish, covered with hairs up to 4 mm long; **pore surface** at first white then brown, **pores** 4-5 per mm. **Basidiospores** cylindrical 9.6-10.4 × 3.2-4 μm.

Common in all kinds of tropical vegetations (GUZMÁN & PIEPENBRING, 2011).

**Material studied**: specimens growing on a dead hardwood stump, collected on Jan. 15, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 121927; specimens growing on a dead hardwood stump, collected on Aug. 05, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 122293 (**Fig. 4**).

## *Fomes fasciatus* (Sw.) Cooke

**Basidiomata** sessile, applanate to somewhat ungulate; **upper surface** crustose, concentrically sulcate with whitish, grey, bluish or brown zones; **pore surface** white at first then brown with minute circular **pores**.

Several reports in the Caribbean area.

**Material studied**: specimens growing on a dead hardwood trunk on the ground, collected on Dec. 24, 2010 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 121904 (**Fig. 5**); specimens growing on a dead hardwood trunk on the ground, collected on Aug. 05, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 123810.

## Lenzites elegans (Spreng.) Pat.

**Basidiomata** sessile, dimidiate or substipitate; **upper surface** whitish, cream, brownish, slightly uneven and concentrically sulcate-zonate; **pore surface** whitish, irregularly sinuous-lamellate to poroid or daedaloid.

Common in the Caribbean area.

**Material studied**: specimens growing on a dead hardwood trunk on the ground, collected on Aug. 05, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 122291 (as *Tramtes e.*) (**Fig. 6**).

## Polyporus amygdalinus Berk. & Ravenel

**Basidiomata** laterally stipitate; **pileus** infundibuliform, yellowish-brown, radially striate; **pore surface** whitish, **pores** 2-3 per mm. **Stipe** brownish with black cuticle towards the base. **Basidiospores** cylindrical, 8-10.5 ×  $3.2-4 \mu m$ .

Pantropical to subtropical, but not very abundant (Núñez & Ryvarden, 1995).

**Material studied**: specimens growing on a dead hardwood trunk on the ground, collected on Dic. 24, 2010 by C. Angelini at Sosua (P.to Plata) – Loc. Puerto Chiquito – Dominican Republic. *Exsiccatum*: JBSD 121916 (as *P. virgatus*) (**Fig. 7**).

## **Polyporus arcularius** (Batsch) Fr.

Circumglobal species.

**Material studied**: specimens growing on a dead hardwood trunk on the ground, collected on Aug. 05, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 122309.

## *Polyporus dictyopus* Mont.

**Basidiomata** laterally stipitate; **pileus** flabelliform, azonate, purplish to yellowish-brown. **Pore surface** whitish, **pores** 6-8 per mm. **Stipe** with black cuticle.

Pantropical (Núñez & Ryvarden, 1995).



Fig. 9. Polyporus guaianensis

Photo by Claudio Angelini



Fig. 10. Polyporus tricholoma

Photo by Claudio Angelini



Fig. 11. Pycnoporus sanguineus

Photo by Claudio Angelini



Fig. 12. Trametes ectypa

Photo by Claudio Angelini

Material studied: specimens growing on a dead hardwood trunk on the ground, collected on Dic. 01, 2011 by C. Angelini at Jibara (Salcedo) – Dominican Republic. *Exsiccatum*: JBSD 123813 (Fig. 8).

## Polyporus guianensis Mont.

**Basidiomata** centrally stipitate; **pileus** circular, infundibuliform, brown. **Pore surface** white with angular or slightly elongate **pores**. **Stipe** brown above, brownish-black below. **Basidiospores** cylindrical-ellipsoid, 7.2-10 × 3-3.6 μm.

Not often reported in the Caribbean area.

**Material studied**: specimens growing on a dead hardwood branches on the ground, collected on Aug. 01, 2010 by C. Angelini at Rio S. Juan (María Trinidad Sánchez) – Dominican Republic. *Exsiccatum*: JBSD 121930; specimens growing on a dead hardwood branches on the ground, collected on Nov. 11, 2013 by C. Angelini Sosua (P.to Plata) – Loc. P.to Chiquito – Dominican Republic. *Exsiccatum*: in the first author's herbarium (ANGE301), pending its deposit in the herbarium of Santo Domingo (JBSD – Dominican Republic) (**Fig. 9**).

## Polyporus tricholoma Mont.

**Basidiomata** centrally stipitate; **pileus** circular and centrally depressed; **upper surface** smooth, often radially wrinkled, pale ocher to brown, even whitish in age; margin white ciliate. **Pore surface** whitish to pale brown with minute **pores. Basidiospores** cylindrical, 5.6-7.6 × 2.4-3  $\mu$ m.

Widespread in the neotropics (Núñez & Ryvarden, 1995).

**Material studied**: specimens growing on dead hardwood branches, collected on Jan. 11, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 121907 (**Fig. 10**); specimens growing on a dead hardwood trunk on the ground, collected on Nov. 16, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 123802.

## Pycnoporus sanguineus (L.) Murrill

Common throughout the subtropical and tropical regions of the world (Gilbertson & Ryvarden, 1987).

**Material studied**: specimens growing on a dead hardwood trunk on the ground, collected on Jan. 17, 2011 by C. Angelini at Sosua (P.to Plata) – Loc. P.to Chiquito – Dominican Republic. *Exsiccatum*: JBSD 121917; specimens growing on a dead hardwood trunk on the ground, collected on Aug. 09, 2011 by C. Angelini at Cabarete (P.to Plata) – Loc. Perla Marina – Dominican Republic. *Exsiccatum*: JBSD 122306 (**Fig. 11**); specimens growing on a dead hardwood stump, collected on Nov. 25, 2013 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: in the first author's herbarium (ANGE314), pending its deposit in the herbarium of Santo Domingo (JBSD – Dominican Republic).

## Trametes ectypa (Berk. & M.A.Curtis) Gilb. & Ryvarden

**Badidiomata** sessile or with a short contracted base, rigid; **pileus** surface finely velutinate or glabrous, multizonate, avellaneus to umbrinus, becoming dark greyish brown from the base. **Pores** and **tubes** concolorous, white when fresh and ochraceous when dry; **context** whitish.

Not frequently reported in the Caribbean area.

Material studied: specimens growing on a dead hardwood trunk on the ground, collected on Dic. 10, 2006 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 123786 (Fig. 12); specimens growing on dead a hardwood trunk on the ground, collected on Jan. 17, 2011 by

C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 123785; specimens growing on a dead hardwood trunk on the ground, collected on Nov. 22, 2013 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: in the first author's herbarium (ANGE164), pending its deposit in the herbarium of Santo Domingo (JBSD – Dominican Republic).

## Trametes lactinea (Berk.) Sacc.

**Basidiomata** sessile to effused-reflexed, rather thick and tough; **pileus** sometimes imbricate and laterally fused; **upper surface** whitish to clay pink or vinaceous buff, faintly zonate to azonate, velvety to touch. **Pores** white to cream, 4-5 per mm. **Basidiospores** cylindrical to cylindrical-ellipsoid, 4.8-7 × 2.5-3  $\mu$ m.

Several reports in the Caribbean area. It seems widely distributed in the eastern USA and often misdetermined as *T. elegans* or *T. menziesii* (VLASÁK & JIRI, 2011).

Material studied: specimens growing on a dead deciduous trunk on the ground, collected on Aug. 04, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 123784 (Fig. 13); specimens growing on piles of hardwood wood used for fences, collected on Nov. 30, 2012 by C. Angelini at Rio S. Juan (María Trinidad Sánchez) – Dominican Republic. *Exsiccatum*: JBSD 124860.

## Trametes maxima (Mont.) A.David & Rajchenb.

**Upper surface** tomentose to hirsute, zonate, often greenish due to algae, margin at first typically lemon-yellow then white. **Basidiospores** cylindrical to narrowly ellipsoid,  $4.4-5.8 \times 2.2-2.8 \ \mu m$ .

Widespread throughout the Caribbean area.

Material studied: specimens growing on a dead hardwood trunk on the ground, collected on Dic. 23, 2010 by C. Angelini at Rio S. Juan (María Trinidad Sánchez) – Dominican Republic. *Exsiccatum*: JBSD 121905; specimens growing on a dead hardwood trunk on the ground, collected on Aug. 05, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 122292; specimens growing on a dead hardwood stump, collected on Nov. 20, 2012 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 124865 (Fig. 14).

## Trametes membranacea (Sw.) Kreisel

**Basidiomata** sessile, flabelliform, pliant, 1-2 mm thick, white to light cream. **Basidiospores** cylindrical-ellipsoid 4.8-5.6 × 2.4-3  $\mu$ m.

Widespread throughout the Caribbean area.

**Material studied**: specimens growing on a dead hardwood trunk on the ground, collected on Aug. 05, 2011 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 123809; specimens growing on a dead hardwood tree, collected on Dic. 26, 2012 by C. Angelini at Sosua (P.to Plata) – Dominican Republic. *Exsiccatum*: JBSD 124851 (**Photo 15**).

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Fig. 13. Trametes lactinea

Photo by Claudio Angelini



Fig.14. Trametes maxima

Photo by Claudio Angelini



Fig.15. Trametes membranacea

Photo by Claudio Angelini

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#### ELISEO BATTISTIN, UBALDO MARULLI

## AN UNCOMMON MEDITERRANEAN ENTOLOMA FROM ITALY: E. OLIVACEOHEBES

#### Abstract

The macro- and microscopical features of Entoloma olivaceohebes, a recently described taxon on the basis of few collections from southern Italy, are reported after examining some specimens picked up in Tuscany (Central Italy). A comparison with allied entities is carried out and colour photographs of basidiomata and some microscopic elements are provided. A detailed statistical analysis on the spore size and Q distribution is carried out.

## Riassunto

Vengono riportate le caratteristiche macro- e microscopiche di Entoloma olivaceohebes, specie recentemente descritta dal sud Italia e poco nota, sulla base di una raccolta effettuata nella Toscana meridionale in ambiente di macchia mediterranea. Viene effettuato un raffronto con specie simili e vengono presentate immagini dei basidiomi e di alcuni elementi microscopici. Viene altresì proposta un'analisi statistica dettagliata delle dimensioni sporali e della distribuzione del quoziente sporale Q.

**Key words:** *Entoloma, hebes, malenconii, olivaceohebes, palmense,* Mediterranean scrub, rare species, statistics, taxonomy.

#### Introduction

Hereby the authors intend to contribute to improving the knowledge of a recently described taxon found in very few italian localities.

## Materials and methods

The photographs of the basidiomata were taken in situ (**Fig. 1-2**) using a Nikon Coolpix P310 and a Canon Eos 600D digital cameras. The macromorphological characters were observed in fresh specimens, while the microscopic analyses were carried out from sections of fresh or revived tissues that were mounted in distilled water, in a saturated, aqueous solution of NaCl or in 5% KOH (Titolchimica, Rovigo, Italy). Congo red (Titolchimica, Rovigo, Italy) was also used to stain hyaline structures.

Spores were first displayed on a 22" Samsung led monitor by a DCM 510 camera (La Nuova Didattica, Milan, Italy) inserted into the top end of the eyepiece tube of a Nikon Eclipse E-200 light microscope and the ScopePhoto software (La Nuova Didattica, Milan, Italy) and then measured (n = 50) through the Mycomètre program (FANNECHÈRE, 2005). For each parameter, i.e. length, width and Q, the mean value ± standard deviation and the extreme values (in brackets) were calculated by the GraphPad Prism 5.0 program (GraphPad Inc., San Francisco, U.S.A). Other descriptive and inferential statistics parameters, the D'Agostino & Pearson omnibus normality test along with the percentage of iso-, subiso- and heterodiametrical spores were specified in **Tab. 1**.

Technical terms used for describing the morphological characters refer to NOORDELOOS (1992, 2004) and VELLINGA (1998). The Q distribution was reported according to BATTISTIN & RIGHETTO (2008).

Authors of fungal names were cited according to the Index Fungorum website (http://www.indexfungorum.org/Names/AuthorsOfFungalNames.asp). Voucher specimens were deposited in the authors' herbaria. Noordeloos' systematic arrangement (1992, 2004) was followed.



Tab. 1. Bar graph of the Q distribution in Entoloma olivaceohebes.

## TAXONOMY

Entoloma olivaceohebes Noordel. & Hauskn., Boll. Gr. Micol. Bres. (Trento) 43(3): 23 (2000)

**Pileus** 10-34 mm broad, conical to convex with or without a low obtuse umbo, grey-brown, brown with evident olivaceous hues, hygrophanous, translucently striate, glabrous.

Lamellae moderately distant, ventricose, emarginated-adnexed, whitish, then pink; edge concolorous, eroded.

**Stipe** 39-70 × 1-5 mm, cylindrical to strongly compressed, also sulcate, straight to slightly curved, finely fibrillose, a bit striate, pruinose-flocculose at apex.

Context scanty with very weak farinaceous-rancid smell; taste not recorded.

**Spores** (7.8-)9.3  $\pm$ 0.6(-10.5) × (6.2-)7.3  $\pm$ 0.4(-8.1) µm (*n* = 50), Q = (1.12-)1.29  $\pm$ 0.1(-1.68). They are mainly heterodiametrical (**Tab. 1**), 6-7 angled in side view.

**Basidia** 30.7-39 × 10.1-12.5 μm, claviform, 4-spored.

**Cheilocystidia** 29.4-46.2 × 5.4-8.4  $\mu$ m, (sub)cylindrical, sublageniform, sometimes weakly subcapitate, hyaline, scattered among basidia.

**Caulocystidia** 28.4-83.5 × 6.7-11(13.4)  $\mu$ m, scattered, cylindrical, equal or tapering at apex, septate (0-2).

**Pileipellis** cutis of cylindrical hyphae 2.1-6.7 (11.7)  $\mu$ m thick, provided with an epiparietal encrusting pigment. Subcutis composed of larger, subfusiform hyphae, 5.5-13.5  $\mu$ m wide on average.

Clamp-connections present in the pileipellis and hymenium.

**Ecology** among mosses in the Mediterrranean scrub (*Cistus monspelliensis* L., *Cistus salvifolius* L., *Quercus suber* L., *Erica arborea* L. and *Pinus pinea* L.).



Fig. 1. Entoloma olivaceohebes in habitat.



Fig. 2. Entoloma olivaceohebes in habitat.

at. Photo by Ubaldo Marulli

Photo by Eliseo Battistin

#### Phenology november.

**Collections studied** Italy, Tuscany, Province of Grosseto, Municipality of Orbetello, locality Patanella on November the 6<sup>th</sup> 2013, leg. U. Marulli, det. E. Battistin & U. Marulli.

## Discussion

*Entoloma olivaceohebes* Hauskn. & Noordel. was described in 2000 by Hausknecht & Noordelos after collecting it in Puglia, southern Italy.

In the field it is easily recognizable on account of its overall brownolivaceous colours, the mycenoid habit, the very weak, but distinct, farinaceous-rancid smell perceived by us, but not reported in the original diagnosis ("odor saporque nulli") and

the growth in the Mediterranean scrub on sandy soil. Microscopically it is worth reporting the presence of scattered cheilocystidia, caulocystidia, clamps and subisodiametrical to heterodiametrical spores. Misidentifications with a lot of brown *Nolanea* (Fr.: Fr.) Noordel. can be avoided when considering its olivaceous tinges and its Mediterranean



E. olivaceohebes. Spore. Photo by Eliseo Battistin

habitat, which so far seems peculiar, but nobody can exclude that in the future it will be picked up also in different environments of course. Its double is surely *E. malenconii* Vila & Llimona found for the first time in 1999 in north-eastern Catalonia (Spain) near *Cistus monspeliensis* and *Cistus salvifolius*: its smaller size and the lack of olivaceous colorations permit to distinguish it from *E. olivaceohebes*.

*E. palmense* Wolfel, Noordel. & Dahncke so far only known from the island of La Palma, Canarian archipelago (Spain), is very similar to both the aforementioned species but it can be separated because of the lack of clamp-connections and the

different spore shape. *E. hebes* (Romagn.) Trimbach is close to *E. olivaceohebes*, however it is deprived of olivaceous colours. A recent survey (VILA *ET AL.*, 2013) pointed out that *E. olivaceohebes* and *E. malenconii* are different molecularly: their collocations in the phylogenetic tree (ITS sequences) are rather distant and their genetic distance is equal to 12.5%. With regard to the protologue we would like to highlight that we have observed caulocystidia in our specimens, have perceived a weak farinaceous-rancid smell and the spores were subisodiametrical to heterodiametrical lacking the isodiametrical ones reported instead by the authors of *E. olivaceohebes*.

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## SPAZIO RUBRICA

## IL GENERE *LACTARIUS* NEL LAZIO A cura di Giovanni Segneri

Continuando nella descrizione delle specie appartenenti al genere *Lactarius* è opportuno soffermare la nostra attenzione sul latice e parlare in modo più completo dei caratteri che esso possiede. Fino ad ora per il riconoscimento di un piccolo gruppo di *Lactarius* e poi di ogni singola specie abbiamo utilizzato prioritariamente alcuni caratteri morfologici, ritenuti differenziali, osservabili sulla superficie del cappello, sulle lamelle e sul gambo. È stato e continuerà ad essere tenuto in grande considerazione l'ambiente di crescita.

I caratteri del latice, quale colore, quantità prodotta e viraggio sulle lamelle sono stati utilizzati finora quasi in modo complementare agli altri. Da questo numero in avanti daremo loro maggiore importanza per il valore differenziale che assumono. Per questa ragione esporremo qui di seguito quali sono i caratteri principali che vanno presi in considerazione nell'osservazione del latice:

- quantità;
- fluidità;
- colore;
- viraggio.

Riguardo alla **quantità** è importante quella che viene prodotta incidendo trasversalmente le lamelle. Essa può essere:

- abbondante (si formano voluminose gocce, qualcuna sovente cade a terra);
- poco abbondante (non si formano grosse gocce ma il liquido è molto evidente);
- scarso (il liquido è appena osservabile);
- molto scarso (liquido difficilmente osservabile).

È bene ricordare che l'emissione del latice può essere influenzata negativamente dalle basse temperature o dalla eccessiva maturazione del soggetto preso in esame.

Riguardo alla fluidità essa può essere:

- densa o cremosa;

- acquosa.

Riguardo al colore esso può essere:

- bianco (da intendere bianco latte);
- colorato (ad esempio subito giallo carota o rosso vinoso);

- trasparente (di solito con il termine acquoso si intende un liquido fluido e trasparente).

Riguardo al viraggio, se presente, esso può avvenire:

- a contatto delle lamelle (o sulla carne);

- isolato dalle lamelle, trasferito su carta assorbente bianca e pulita.

Tali tipi di viraggio possono essere sia presenti contemporaneamente che singolarmente. Sarà comunque messo maggiormente in evidenza quel tipo di viraggio che costituisce per ogni singola specie carattere differenziale. I tempi con cui il viraggio si manifesta sono diversi (da quasi istantanei, lenti, a molto lenti) ed in alcuni casi, come vedremo, sono indicativi della singola specie. Ovviamente il sapore e l'odore dovranno essere sempre monitorati. In questo numero parlerò di cinque specie di Lactarius accomunate dai seguenti caratteri:

- taglia medio piccola (solitamente il diametro del cappello non supera la misura di 6-8 cm);
- robustezza e carnosità in misura meno appariscente che nelle specie fin qui trattate;
- latice bianco che vira al giallo più o meno lentamente. Nel caso del Lactarius decipiens Quél. e del Lactarius lacunarum Romag. ex Hora, il viraggio deve essere osservato su carta, in quanto tale fenomeno non si manifesta a contatto delle lamelle.

## Lactarius chrysorrheus Fr.

**Cappello** fino a 9 cm di diametro, inizialmente piano convesso, poi con piccola depressione centrale e solo tardivamente un po' imbutiforme; cuticola asciutta, liscia, colore da crema arancio a fulvo arancio, ornato soprattutto nella parte periferica da zonature o guttule più scure.

Lamelle fitte, appena decorrenti, inizialmente crema pallido poi rosa arancio.

**Gambo** cilindrico, liscio o rugoloso, nella parte superiore ricoperto da una pruina biancastra, prima pieno poi tardivamente cavo, concolore al cappello con l'età o dove manipolato.

**Carne** soda, biancastra, al taglio rapidamente gialla. Odore leggermente fruttato, sapore molto acre.

Latice bianco, fluido, vira rapidamente al giallo a contatto con l'aria, sapore acre.

Commestibilità non commestibile.

Habitat gregario nei boschi di latifoglia o misti.

Fra i raccoglitori dilettanti è conosciuto con il nome generico di "Lattario" e per il suo sapore molto acre non desta molto interesse. È una specie molto comune, a crescita gregaria, quasi sempre in colonie di numerosi individui. Presente sia nei boschi collinari che di pianura e costieri. Inizia ad apparire nel mese di ottobre e la sua crescita si protrae fino ai primi geli invernali. Si riconosce per il cappello dal colore vivace e dai toni rosati, per le zonature, sovente poco visibili in tarda età ed il latice *bianco, abbondante, virante velocemente al giallo citrino*.

Nelle leccete costiere, in ambiente mediterraneo, è possibile incontrare anche il *L. mediterraneensis* Llistosella & Bellù, anch'esso con latice bianco virante al giallo. Separarli con i soli caratteri macroscopici può risultare difficoltoso. Quest'ultima specie si caratterizza per colore del cappello giallo con tonalità ocracee, per vistosi scrobicoli, l'assenza di vere zonature, latice meno abbondante e virante al giallo più lentamente che nel *L. chrysorrheus* Fr.

## Lactarius decipiens Quél.

**Cappello** fino a 6 cm di diametro, convesso, poi appianato, sovente con papilla piccola ed aguzza, margine generalmente regolare; cuticola liscia, asciutta, con aspetto un po' granuloso, colore ocra rossastro.

Lamelle abbastanza fitte, crema rosato.

**Gambo** cilindrico, slanciato, spesso attenuato verso la base, asciutto, dello stesso colore del cappello, bruno rossastro alla base.



Lactarius chrysorrheus

Foto di Giovanni Segneri



Lactarius decipiens

Foto di Giovanni Segneri



Lactarius hepaticus

Foto di Giovanni Segneri



Lactarius lacunarum

Foto di Giovanni Segneri

**Carne** compatta, biancastra con toni rosato carnicini, più scura nel gambo. Odore *tipico di pelargonio*. Sapore acre e leggermente amaro.

Latice bianco, poco abbondante, ingiallisce rapidamente se isolato su carta. Sapore acre ed amaro.

Commestibilità non commestibile.

Habitat nei boschi di latifoglia con preferenza per quelli di quercia e castagno.

È una specie presente su tutto il territorio regionale, preferendo i boschi di media collina, di pianura e costieri. In montagna è meno comune se non proprio raro. Il periodo di maggior crescita è il mese di novembre.

Si può riconoscere facilmente per il tipico odore di foglie di geranio stropicciate e per il latice bianco che ingiallisce rapidamente se isolato su carta (è sufficiente separarlo su un pezzo di carta bianca qualsiasi purché assorbente).

## *Lactarius hepaticus* Plowr.

**Cappello** fino a 7 cm di diametro, convesso, poi piano depresso, sovente con piccolo umbone aguzzo; cuticola liscia con aspetto untuoso, colore *bruno rossastro vinoso*.

Lamelle fitte, crema carnicino, col tempo macchiate di bruno rossastro.

Gambo cilindrico, slanciato, pruinoso in alto, concolore al cappello ma su toni più pallidi.

**Carne** poco consistente, crema carnicino, al taglio vira lentamente al giallino. Odore simile a quello di *Lactarius quietus*. Sapore acre ed amaro.

**Latice** bianco, abbondante, *vira abbastanza rapidamente al giallo crema a contatto delle lamelle*. Sapore acre, amaro dopo un po' di tempo.

Commestibilità non commestibile.

Habitat sotto pino.

È una specie dalle dimensioni piccole con crescita sotto pino in periodo tardo autunnale. Nel Lazio non è molto comune benché in letteratura sia riportato genericamente come molto frequente.

Esistono almeno altre due entità di *Lactarius* con colore simile a questa specie ma con habitat di crescita diverso, *L. sphagneti* (Fr.) Neuhoff e *L. badiosanguineus* Kühner & Romagn., che crescono in ambiente montano sotto abete rosso e/o abete bianco. *Comunque è riconoscibile per il suo colore* bruno rossastro simile al colore del fegato, il latice bianco che si rapprende sulle lamelle, assumendo lentamente una colorazione giallo crema, la crescita sotto pino.

## Lactarius lacunarum Romagn. ex Hora

**Cappello** fino a 6 cm di diametro, convesso, poi piano depresso, sovente con piccola papilla, margine da regolare a ondulato lobato; cuticola asciutta, con aspetto un po' granuloso, colore da fulvo-rossastro a fulvo-ocraceo chiaro.

Lamelle fitte, sottili, fragili, da crema-giallognole a ocra-aranciato con tonalità rosate.

**Gambo** cilindrico, spesso attenuato verso la base, asciutto, dello stesso colore del cappello o talvolta più scuro.

Carne poco spessa, crema ocracea. Odore di L. quietus. Sapore mite poi leggermente acre.

Latice bianco, abbondante, *ingiallisce, anche lentamente, se isolato su carta*. Sapore mite poi leggermente acre.

Commestibilità non commestibile.

Habitat nei boschi di latifoglia, di abete rosso e abete bianco, particolarmente in luoghi umidi, canali di scolo che in estate si asciugano, zone che saltuariamente subiscono allagamenti.

La specie con la quale può essere confuso è il *L. decipiens*, con il quale condivide lo stesso colore e lo stesso ingiallimento del latice se separato su carta. Occorre osservare con attenzione il tempo di questo viraggio poiché nella specie in oggetto è visibilmente più lento che in *L. decipiens*. L'elemento fondamentale per una separazione con i soli caratteri organolettici è *l'odore*, che in *L. decipiens* è *di pelargonio*, mentre in *L. lacunarum* è simile a quello di *L. quietus*.

È una specie che non ho mai trovato in montagna, sembra prediligere boschi di bassa collina e di pianura.

Gli ambienti di crescita sono piuttosto particolari, preferendo zone che saltuariamente si inondano, letti e margini di canali di scolo che in estate asciugano.

## Lactarius quietus (Fr.) Fr.

**Cappello** fino a 9 cm di diametro, da convesso a leggermente piano depresso, margine talvolta ondulato, lobato; cuticola asciutta, opaca, da bruno rossastro a bruno vinoso scuro, sovente sono presenti numerose guttule, soprattutto nella zona periferica.

Lamelle fitte, da crema a crema rossastre, si macchiano di bruno ruggine alla rottura.

**Gambo** cilindrico, spesso attenuato alla base, rugoloso, concolore al cappello ma verso la base più scuro, quasi bruno vinoso.

**Carne** soda, da biancastra a crema rabarbaro. Odore molto particolare come di cimice. Sapore mite o appena astringente.

**Latice** abbondante, bianco, ingiallisce molto lentamente su toni crema asciugandosi sulle lamelle, sapore da mite, dolce, ad appena amarognolo.

Commestibilità non commestibile.

Habitat nei boschi di quercia.

Identificato col nome generico di "Lattario", non desta particolare interesse fra i raccoglitori dilettanti; forse per il suo aspetto opaco poco invitante o per il tardo periodo di crescita, quando i boschi sono meno frequentati. Cresce abitualmente sia nei boschi di quercia caducifoglia che sempreverde, in particolare sotto leccio; non disdegna neppure i parchi cittadini con presenza di leccio.

Nel Lazio il periodo di crescita preferito è il mese di novembre. Molto comune ma non rinvenibile ovunque, preferendo i boschi di pianura e costieri.

Si caratterizza per il suo particolare odore che molti definiscono "cimicino", ma in realtà di difficile definizione. Questo odore, così particolare, viene quasi sempre preso come odore



Lactarius quietus

Foto di Giovanni Segneri

di riferimento per definire quello di altre specie fungine, in particolar modo di altri *Lactarius*. In questi casi (vedi *L. hepaticus* e *L. lacunarum*) troveremo specificatamente scritto: "odore di quietus". Si riconosce oltre che per il suo particolare odore, per il cappello più o meno zonato, il colore da bruno rossastro a bruno vinoso privo di tonalità fulve, la cuticola asciutta, il latice abbondante, bianco, mite, che vira lentamente al crema a contatto delle lamelle.

## ERRATA CORRIGE

**N. 90** - Luigi Minciarelli – "Poronia punctata (*L.*) *Fr.* (Ascomycota, Xylariales), *nei pascoli del Parco Regionale del Monte Cucco (Pg-Italia)*", pag. 47, "**Peridio**", terza riga: perifisi non parafisi.