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*Perzia triseptata* (Photo: B. Perić)

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# PERZIA TRISEPTATA GEN. ET SP. NOV. (ASCOMYCOTA INCERTAE SEDIS) FROM XERIC CONIFEROUS BARK IN FRANCE AND MONTENEGRO

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## Abstract

A new genus and species is described for a non-lichenised discomycete collected on xeric bark of corticated branches and standing trunks of *Picea abies* in southern France and of *Pinus heldreichii* in Montenegro. The fungus has broadly sessile, roundish apothecia erumpent singly through the host's periderm by exposing a black margin and grey disc. The paraphyses are apically ramified, and the inamyloid asci are especially apically thick-walled in the dead state and contain eight rather large, 3-septate spores surrounded by a distinct, thick gel sheath. Sequences of rDNA extracted from apothecia surprisingly nested in the Lecanoromycetes though unresolved and distant to any group for which molecular data were available. The fungus shows morphological similarities with the genus *Exarmidium* (Xylariales), for which rDNA data were not available, or the Rhytismatales.

**Key words**: *Picea*, *Pinus*, xeric bark, Lecanoromycetes, *Exarmidium*, ascospore sheath

## Introduction

During an annual mycological session in the montagnes du Haut-Forez near Saint-Jean-la-Vêtre (Auvergne) in May 2010, devoted to ascomycetes, Piotr Perz (Poland) collected in a montane area within the Village de Vacances on a dead twig attached at the top of a low spruce hedge a discomycete with remarkable characteristics that could not be assigned to a known species or genus. Over five years later, one of us (B.P.) detected apparently the same fungus on living branches and trunks of pine in a subalpine forest on calcareous bedrock in the Southern Dinarian Alps of Montenegro. The hymenial traits showed some parallels to Rhytismatales, for instance, the genus *Triblidiopsis* features similar ascospores and spore sheaths, and apical branching of paraphyses. Yet, the hymenium of Rhytismatales is closed by a firm black roof until the asci mature, also the excipular structure is different and the asci are generally thin-walled throughout. In the failure to identify the fungus with a described taxon and to find an appropriate genus, we here describe it as a new species in a new genus.

## Materials and methods

For the methods applied in this study see Perić et al. (2016). Water agar 5% (Agar technical, Biolife, Italy) was used as culture medium. Type material was deposited in the herbarium of the Botanische Staatssammlung München (M, holotype) and the private herbaria of B. Perić and H.-O. Baral (B.P., H.B., paratypes from Montenegro) and P. Perz (P.P., paratype from France).

Sequences of the rDNA (ITS1-5.8S-ITS2 and 28S D1–D8, D10–D12) were gained by G. Marson and S. Hermant (Luxembourg) from dry apothecia a few months after collecting, and were deposited in GenBank (KY462793, KY462794). The ITS and 28S D1–D6 region were twice sequenced. Different phylogenetic analyses were carried out with MEGA 6.06, but the resulting trees did not provide enough evidence for a relationship, therefore, they are not reproduced here.

## Descriptions

### ***Perzia*** Baral & B. Perić gen. nov.

**Diagnosis**: Apothecia corticolous, erumpent, semi-immersed, disc greyish-white, margin black, smooth, even or toothed. Asci 8-spored, cylindric-clavate, thick-walled when dead, inamyloid. Ascospores ellipsoid-fusoid, hyaline, thin-walled, 3(–5)-septate, constricted at septa, multiguttulate, ensheathed in thick gel. Paraphyses filamentous, sometimes branched at slightly inflated apex, without refractive vacuolar contents, hyaline. Periphysoids abundant, forming a dense, hyaline or olive-brown *textura porrecta*. Ectal excipulum of small-celled, elongate or angular, dark olive-brown texture, gelatinized only when young, colour not changing in KOH.

**Type species:** *Perzia triseptata* Baral & B. Perić.

**Etymology**: named after the first collector of the species, Piotr Perz.

**MycoBank:** MB820807.

### ***Perzia triseptata*** Baral & B. Perić sp. nov.

**Etymology**: referring to the 3-septate ascospores.

**Holotype**: Montenegro, Massif Komovi, Bindža, on bark of living branch of *Pinus heldreichii,* 10.IX.2015, leg. B. Perić, M-0281052.

**MycoBank:** MB820808.

**Description** (symbols in {} mean: F= France, M= Montenegro, 2= observed at both sites):

**Apothecia** singly or subgregarious (2–10 in loose groups), erumpent from bark by lifting the outermost layer (periderm), sessile, immersed, rehydrated discoid, roundish to irregularly angular, (0.4–)0.6–1.2(–1.5) mm in diam., 0.35–0.55 mm thick, surrounded by raised lobes of periderm, opening the hymenium in the prohymenial phase; hymenium flat, smooth or sometimes

**Fig. 1.** *Perzia triseptata* from Montenegro, on bark of *Pinus heldreichii* (6, 8–10 = **coll. 1**; 2 = **coll. 2**; 3-5= **coll. 3** (holotype); 1 & 7 = **coll. 4**; all phot. B. Perić): 1. young apothecium that penetrates the substrate; 2. mature apothecium on the right, on the left more senescent apothecia; 3. senescent apothecium; 4. overmature apothecia; 5-10. mature apothecia (6, 9: with *Caloplaca* sp.). All in hydrated state (except for 5-6: dry state).

slightly grainy, shining, somewhat gelatinous, greyish-white or with bluish reflection, becoming slightly convex with age, creamy to rufous; margin black, smooth, rather thick (c. 100–200 µm), 0–150 µm protruding beyond hymenium, irregularly divided into ± broad, indistinct teeth or lobes; dry smoky gray, bluish gray to completely black, slightly sunken but remaining exposed.

**Asci** 8-spored, cylindrical, club-shaped, *(/†)222–357 × 17.2–24.2 µm {M}, †?200–250 × 13.2–14.5 {F}, or †225 × (12–)14–17(–19) {M} µm, spores subbiseriate in */†asci, *pars sporifera* †95–123 µm long, apex (†) broadly hemispherical to slightly conical, inamyloid (in IKI {2}, even if KOH-pretreated), apical wall immature †6–9 µm thick, mature †2–6 µm {2} (c. *1 µm), forming an apical cushion being delimited from lateral wall by a constriction forming an apical cushion, opening by an apical split; lateral wall immature †1.5–4 µm thick, mature †0.6–2 µm {2}; lower half of ascus gradually strongly narrowed into a medium long stipe-like base, arising from croziers (pleurorhynque) {M}; ascoplasm in IKI (without KOH) partially coloured in yellow-orange, ascus wall surface stained (blue-)lilac towards apex in Bailinger or CRB. **Ascospores** mature *18–22 x (6.5–)7–7.7(–8.2) [†16–18 x 5.5–7] µm {F}, *(22.2–)24–28.5(–31) × (7.2–)8–9.3(–9.7) [†21–27 × 6.5–8(–9) µm] {M} (excluding gel sheath), ellipsoid-fusoid, occasionally broader in upper half, straight to slightly curved, 3- or exceptionally 4–5-septate {M, Fig. 6l-m}, rather strongly constricted at septa, both ends obtuse or sometimes rounded, cell wall smooth, 0.2–0.3 µm thick, cells densely filled with tiny granular oil drops (lipid content 5); entirely coated with a thick hyaline gel sheath, which is laterally 1–2 µm thick in the compressed state inside living asci (at the poles slightly thinner), smooth, IKI-, sheath stained pale to bright (blue-)lilac in Bailinger or CRB, swelling to 2–3.5 µm by imbibition after spore discharge or inside dead, turgorless asci, getting less refractive or entirely disappearing optically, but in some ejected spores remaining compressed and refractive (Fig. 6a), turning distinctly punctate-warted when adding KOH (Fig. 6f); germinating either inside dead asci or after ejection (in senescent apothecia or in hymenia put on agar), cells strongly swelling by getting globose and vacuolated, tending to disarticulate, forming germ tubes but no conidia (Fig. 7). **Paraphyses** filamentous *1.3–2.2 µm diam. {F & M}, †1.3–1.8 µm {M}, slightly enlarged to *2–3.3 µm at the top (†1.5–3 µm) {M}, apex rounded, sometimes branched like fingers, also branched in lower part and here mutually anastomosing, septate, terminal cells *8–14 µm long, lower cells *9.7–13.7 µm {M}, hyaline, not reacting with IKI, containing tiny oil droplets (0.4–0.6 µm diam.) that are not stained in IKI and do not disappear in KOH; without or with very sparse, minutely granular exudate between the paraphyses. **Periphysoids** densely growing out from the inner part of the marginal excipulum, filamentous, hyaline or agglutinated by (yellowish-) olive-brown exudate (in $H_2O$ or KOH), 80–150 µm long, 1–2.5 µm wide, bent upwards at their base to form a thick layer of *textura porrecta* oriented parallel to the paraphyses, not or only slightly enlarged to 1.8–2.5 µm at the rounded top. **Subhymenium** 30–50 µm thick, hyaline, of *textura angularis*, composed of irregularly polygonal cells 3.5–8 × 2.5–5.8 µm, the larger cells being the ascogenous hyphae. **Medullary excipulum** seemingly absent. **Ectal excipulum** c. 40 µm thick at base, 20–35 µm at lower flanks, of light to dark (olive-)brown (in $H_2O$ or KOH) *textura intricata-porrecta* oriented parallel to the outside, composed of ± densely interlaced hyphae, individual cells */†3.3–9.3 × 1–2 µm (in $H_2O$ or KOH), non-gelatinized, thin-walled (but hyaline inner parts gelatinized in young ascomata, Fig. 4e); at mid flanks and margin changing to a 40–50 µm thick, dense, dark (olive-)brown, small-celled

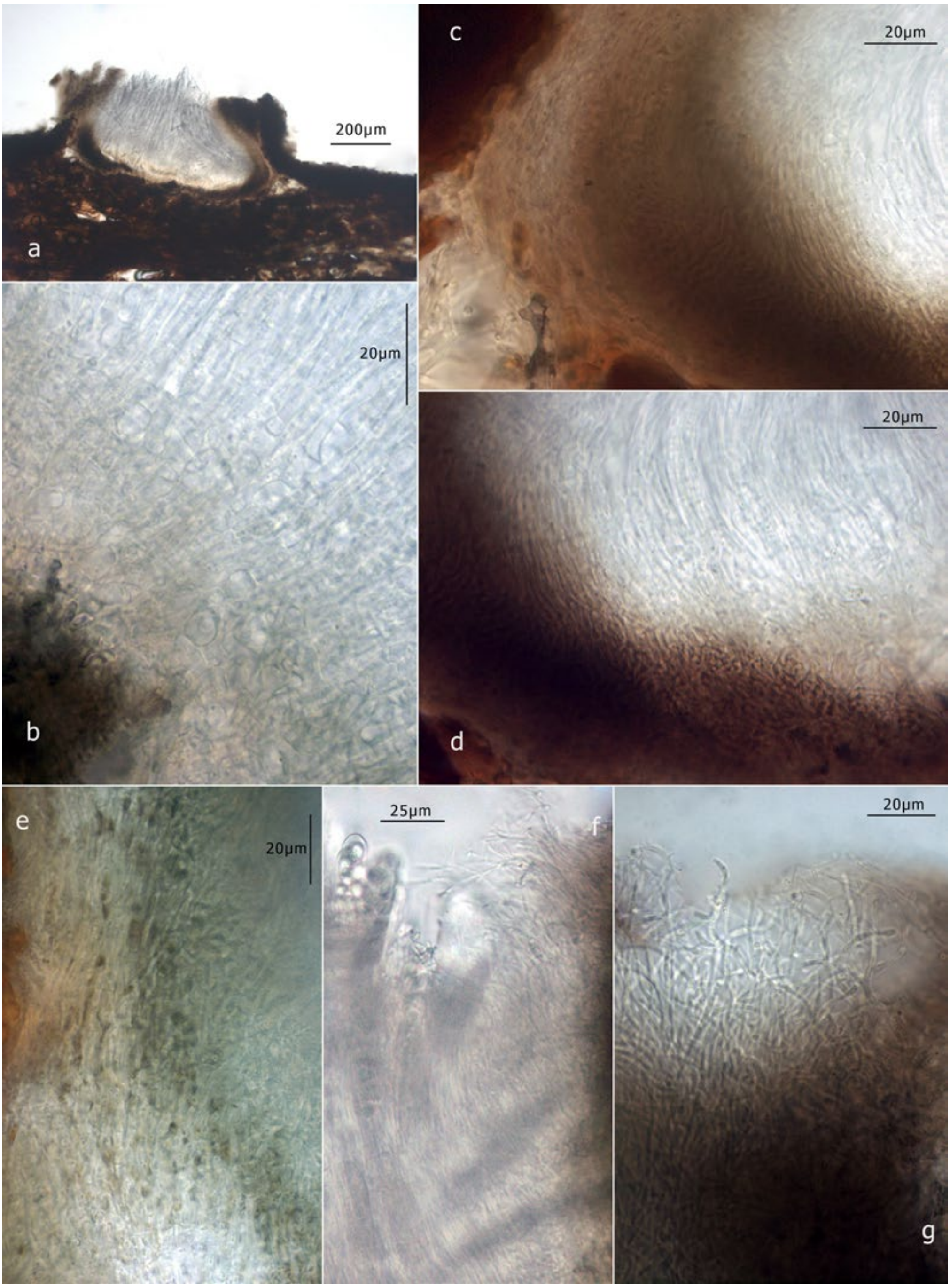

**Fig. 2.** *Perzia triseptata* from Montenegro, on bark of *Pinus heldreichii* (**coll. 4**; phot. B. Perić): a. median section of apothecium, in KOH 5%; b. subhymenium in $H_2O$; c. brown ectal excipulum, (brown, in $H_2O$; d. do., in KOH 5%; e. excipular cells at flanks, in $H_2O$; f, g. periphysoids at inner edge of margin, in $H_2O$.

*t. angularis*, cells 1.5–3 µm in diam., inner cells vertically elongated, giving rise to periphysoids, outer cells connected to the periderm. KOH: no colour reaction observed, no pigment dissolved. **Asexual state**: unknown.

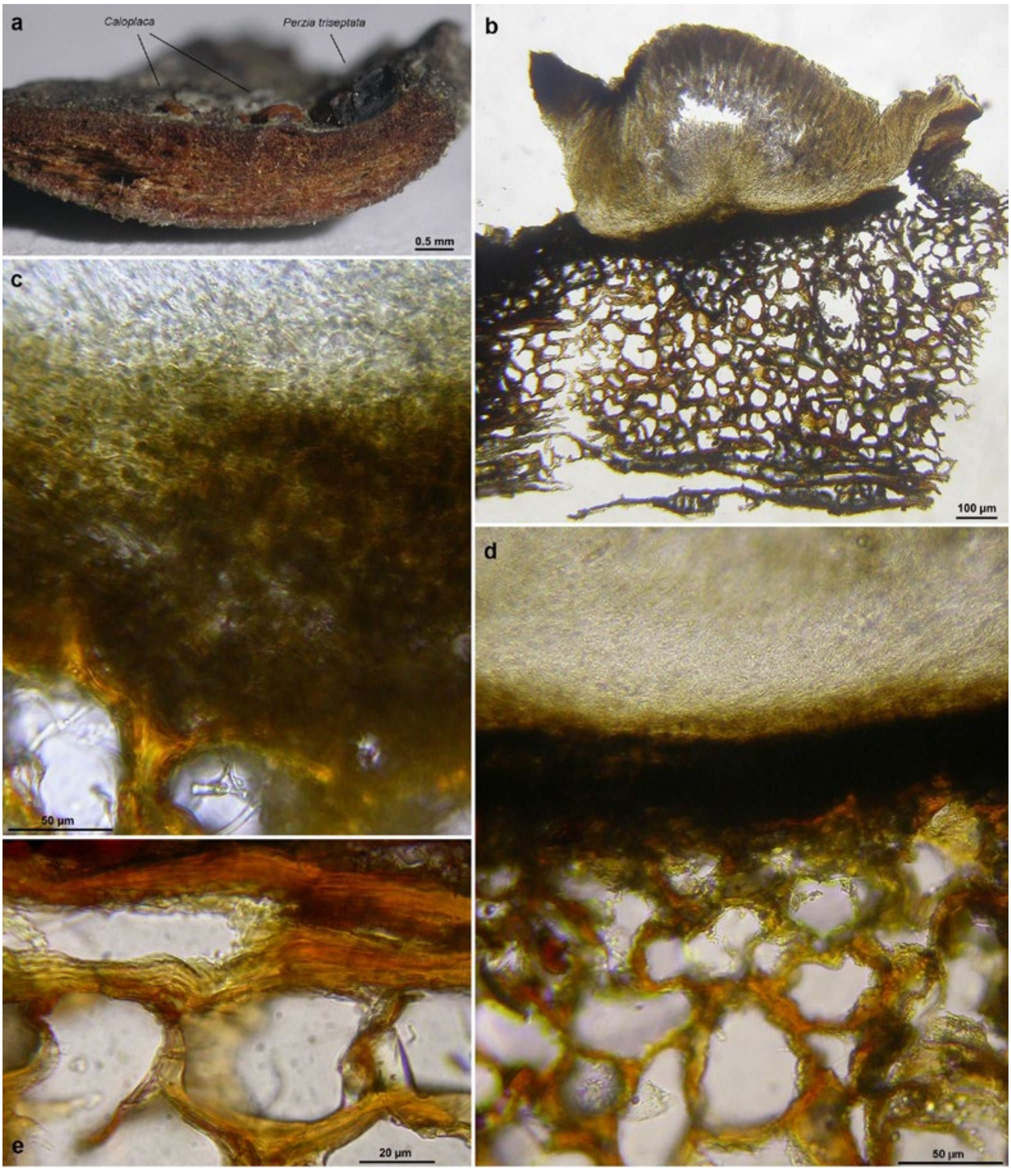

**Fig. 3.** *Perzia triseptata* from Montenegro, on bark of *Pinus heldreichii* (**coll. 1**; phot. H.-O. Baral): a. section of chip of bark with apothecia of *Caloplaca* and *Perzia* (dry); b. median section of apothecium of *Perzia triseptata* and bark beneath; c-d. ectal and medullary excipulum at base, showing sparse hyphae in bark cells; e. closeup of bark cells directly below apothecium. – b-c, e: in $H_2O$; d: in KOH.

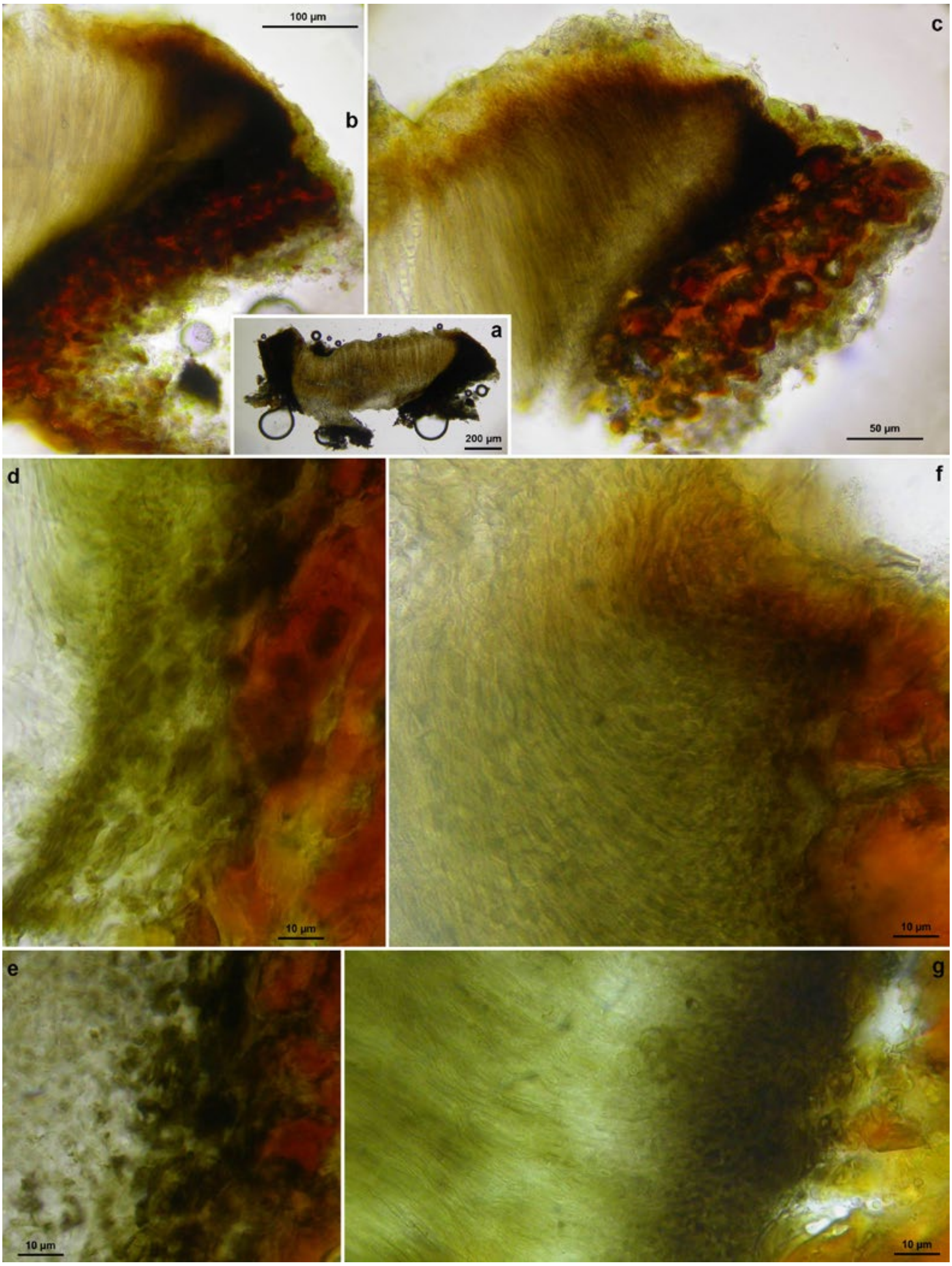

**Fig. 4.** *Perzia triseptata* from Montenegro, on bark of *Pinus heldreichii* (**coll. 3**, holotype; phot. H.-O. Baral): a. median section of apothecium; b-c. detail of a, showing erumpent growth from beneath the orange host periderm; d-e. ectal excipulum at flanks, with olive exudate (d: with marginal periphysoids; e: from immature, closed apothecium, with gelatinized hyphae); f-g. marginal ectal excipulum with thick layer of parallel periphysoids. – a, f: in $H_2O$; b-e, g: KOH.

**Fig. 5.** *Perzia triseptata* from Montenegro, on bark of *Pinus heldreichii* (2a-d, 2f, 2i, 3a-b = **coll. 1**; 2e = **coll. 2**; 2g, 4a-b = **coll. 3** (holotype); 1, 2h = **coll. 4**; phot. B. Perić): 1. apothecium in median section; 2a, 2d-e. upper part of †asci containing mature *ascospores, in $H_2O$; 2b-c. †ascus base with croziers (pleurorhynque); 2f. dead immature ascus, in $H_2O$; 2g. †asci, in IKI without KOH-pretreatment; 2h. †asci, in KOH; 2i. †ascus apex before and after discharge, in KOH; 3a. mature, recently ejected *ascospores coated by gel sheath, in $H_2O$; 3b. shortly later, gel sheath disappeared by swelling; 4a-b. *paraphysis apices, in $H_2O$.

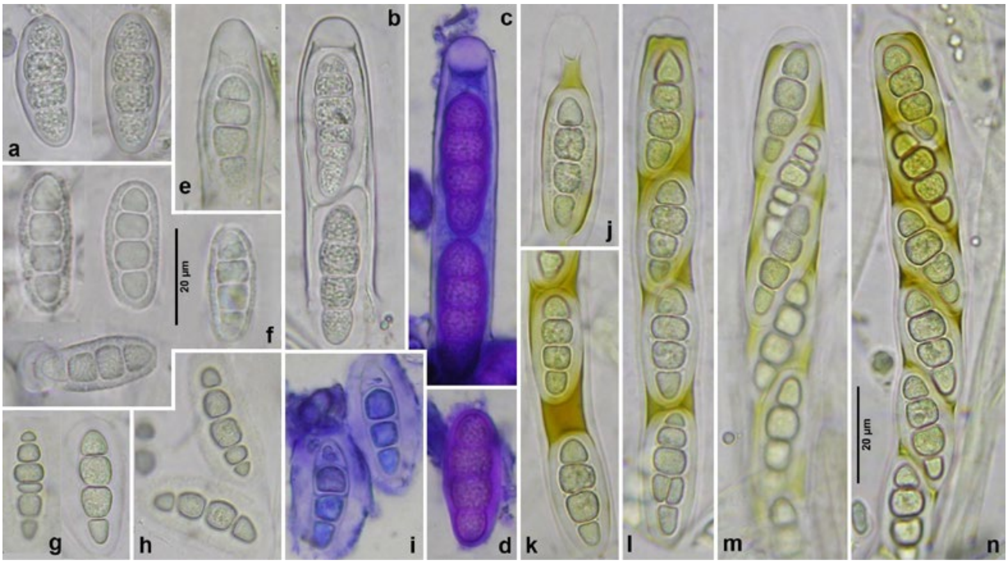

**Fig. 6.** *Perzia triseptata* from Montenegro, on bark of *Pinus heldreichii* (H.B. 9976, **coll. 3,** holotype; phot. H.-O. Baral): mature asci and ascospores in different states and reagents; a-d. *ascospores with compressed (a, c-d) or swollen sheath (b); e-n. †ascospores with compressed (e-f) or swollen sheath (g-n), note warted surface of sheath in f. – a-b: in $H_2O$; c-d, i: in CRB; e-h: in KOH; k-n: in KOH+MLZ. Scales are valid for all figures.

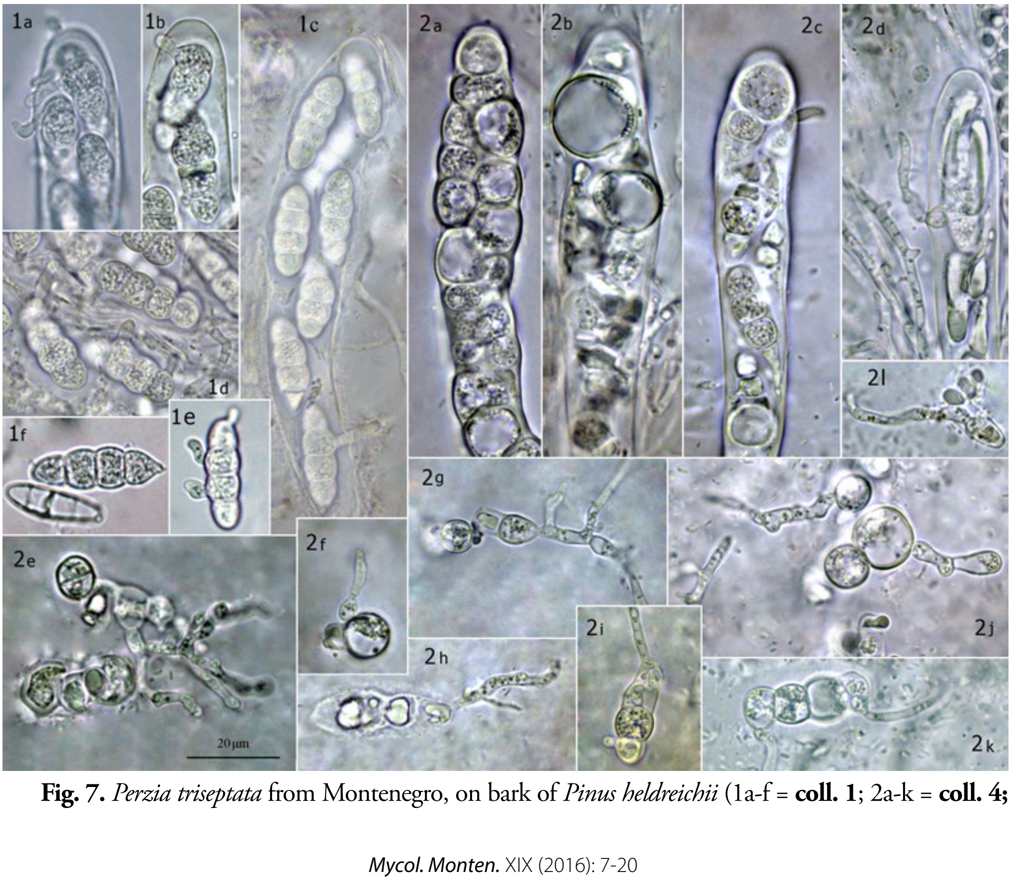

**Fig. 7.** *Perzia triseptata* from Montenegro, on bark of *Pinus heldreichii* (1a-f = **coll. 1**; 2a-k = **coll. 4;**

phot. B. Perić). Germination of free ascospores and those remained inside dead asci, mounted in $H_2O$; 1a-f. incubated in $H_2O$, 2a-l. incubated on agar. Note that individual cells of spores strongly inflate and vacuolate on agar during germination. – Living state, except for some or all cells of 2b, c, e, g-i, l. Scale is valid for all figures.

**Habitat** on slightly decayed bark of corticated, 9 mm thick, dead, attached branch of *Picea abies* {F} or 20–50 cm thick living branches and trunks of *Pinus heldreichii* {M}, 0.8–1.5 m above ground. **Assoc.**: *Caloplaca* sp. {M}, *Orbilia aristata* and *O. euonymi* {F}, *Lachnellula pseudofarinacea* and *L. suecica* {M}. **Desiccation tolerance**: excipular cells, paraphyses, and immature asci still alive after 2 weeks {M}, ascospores after 2.5 months {F}: June–Nov.

**Specimens studied**: **France** – Rhône-Alpes, dépt. Loire, Auvergne, le montagnes du Haut-Forez, 16 km WNW of Boën, 1.5 km S of St.-Jean-la-Vêtre, Ventuel, low hedge within Village de Vacances, 880 m, 45°46'35"N, 3°48'25"E, branch of *Picea abies*, on bark,

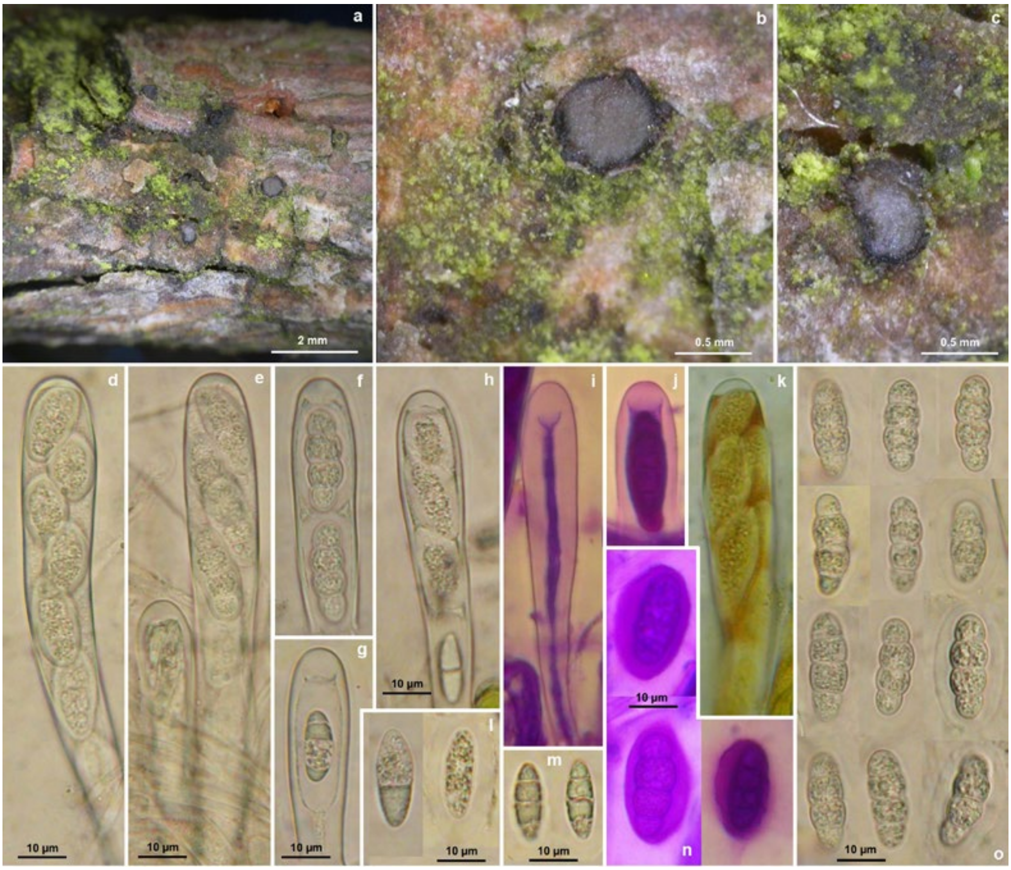

**Fig. 8.** *Perzia triseptata* from France, on bark of *Picea abies* (H.B. 9288a; phot. H.-O. Baral) – a-c. rehydrated apothecia; d-e. medium turgescent mature *asci, apical wall and ascospore gel sheath compressed; f-k. do., †asci, apical wall and ascospore gel sheath swollen (asci in i-j immature, here also lateral wall swollen); l-o. ascospores (l: immature, 0–1-septate; m-o: mature, 3-septate), partly with swollen gel sheath. – Living state, except for asci in f-k, ascospores in m, some spore cells in g & l. In $H_2O$ (except for i-j, n: in CRB, k: in IKI).

6.V.2010, leg. P. Perz (P.P. 20100506-1B; H.B. 9288a [unpreserved]). – **Montenegro** – 36 km NE of Podgorica, Massif Komovi, Paljevi, 0.7 km SE of Vujadinovića katun, Bindža, 42°37'41–43"N, 19°37'45–48"E, 1705–1720 m, SW-exposed slope with small open *Pinus heldreichii* forest between treeless pasture land above and *Fagus moesiaca* forest below, 10 apothecia on corticated, living, ca. 20–50 cm thick, standing trunks of *P. heldreichii*, 0.8–1.5 m above ground. 17.VIII.2015, leg. B. Perić (B.P. Dgf/C7D-17-08-15, H.B. 10047, **coll. 1**, sq.: KY462793 [ITS, 28S D1–D6]). – *Ibidem*, 10 apothecia from the same trunk, 20.VIII.2015, leg. B. Perić (B.P. Dgf/C7D-20-08-15, **coll. 2**, sq.: KY462794 [28S D6–D8, D10–D12]). – *Ibidem*, 20 apothecia on ~15 cm thick living branch (the lowermost of the tree) and on 40 cm thick trunk in armpit of that branch, after two rainy days, 10.IX.2015, leg. B. Perić (M-0281052, **holotype**; H.B. 9976, **isotype**; **coll. 3**). – *Ibidem*, 10 apothecia on living trunk of *P. heldreichii*, 50 cm diam., after two rainy and hazy days, 28.IX.2015, leg. B. Perić (B.P. Dgf/C7D-28-09-15, H.B. 10042, **coll. 4**). – *Ibidem*, 50 apothecia on living trunk of *P. heldreichii*, 30–50 cm diam., 7.VI.2016, leg. B. Perić (B.P. Dgf/C7D-07-06-16, H.B. 10012, **coll. 5**).

## DISCUSSION

Remarkable differences between the samples from France and Montenegro were only observed in regard to the size of asci and ascospore, which were distinctly smaller in the French sample. For the time being we consider these differences as variation within a single species.

A remarkable similarity of our fungus with the genus *Exarmidium* P. Karst. (Xylariales, ?*Hyponectriaceae*) is observed. In unpublished studies of *E. inclusum* (Pers.) Aptroot (≡ *Odontotrema inclusum* (Pers.) P. Karst.) by one of us (H.B.), very small, often semi-immersed perithecia were observed that partly change to apothecioid ascomata. *Exarmidium inclusum* seems to be a plurivorous species, as it was observed on various angiosperms and rarely also from gymnosperms (pine trunk, Sherwood-Pike & Boise 1986). Contrary to *P. triseptata*, *E. inclusum* consistently grows on decorticated wood. Its hymenial elements are quite similar to *P. triseptata*: the paraphyses are apically branched, the asci have an apical and lateral wall thickening and contain 3-septate, multiguttulate spores with more distinctly inflated second cell. However, a gel sheath was consistently absent.The occurrence of *Exarmidium* on decorticated xeric wood was also stressed by Sherwood-Pike & Boise (1986), who treated this taxon under the name *Xylopezia* Höhn. A preference for xeric decorticated wood is also observed in *Mycowinteria* Sherw. and *Odontotrema* Nyl., which deviate from *Xylopezia* by an amyloid apical ring or a mostly amyloid hymenial gel, respectively (see Sherwood-Pike & Boise l.c.). Species of *Odontotrema* resemble *P. triseptata* to some extent, but have ascospores without gel sheath and usually unbranched paraphyses (Sherwood 1987).

Rehm (1900) described *Triblidiopsis novae-fundlandiae* Rehm (as *Tryblidiopsis*) on *Pinus* bark in Newfoundland (Canada) with similar spores covered by a thin mucus, but with finally 7 septa. Magnes (1997) transferred this species to *Huangshania* O.E. Erikss. (Triblidiales) and described it with seemingly superficial apothecia, an excipulum of globular cells with a carbonaceous cortex, paraphysoids that do not form a palisade on the inner side of the marginal lobes, and spores with up to 1.5 µm thick walls without a sheath. All this appears to exclude a closer relationship with the present fungus, although the gel sheath in *Perzia triseptata* may simulate a thick spore wall when studied in the dead state.

## Molecular analysis

The two assembled sequence data from coll. 1 comprise a short part of the 18S region, the entire ITS region, and 28S D1–D6. They were fully identical atlantic influence and conifer, therefore, uploaded as one sequence (KY462793). From coll. 2 a sequence was gained that includes 28S D6–D8 and D10–D12 (KY462793). The two sequences overlap by 12 nucleotides in the D6 region. A BLAST similarity search for gene regions available in GenBank yielded the following result. In the ITS region only the conservative 5.8S region aligned, which matches by 100% taxa of some Botryosphaeriales (*Diplodia*, *Phyllosticta*), Capnodiales (*Hortaea*), Rhytismatales (*Lophodermium*), Helotiales (*Cenangium*, *Phaeopyxis*, *Claussenomyces*) etc. The S1506 intron at the 3'-end of the 18S region is absent. Parts of the 28S region yielded merely different orders of Lecanoromycetes as the closest hits: D1–D2 *Umbilicaria* spp. 93–95%; D3–D4 *Miltidea*, *Cameronia*, *Xylographa*, *Cryomyces* 95%; D5–D6 *Umbilicaria* spp., *Xylographa* spp. 92%; D7–D8 *Umbilicaria* spp. 93%. A provisional phylogenetic analysis of the 28S region (D1–D4) placed *P. triseptata* unresolved among the included Lecanoromycetes. The distance in the D1–D2 region to non-lichenized taxa was to Ostropales 8–13% and to members of *Rhytismataceae* and *Marthamycetaceae* 13–15%. Further extracts from a future collection are planned in order to confirm the validity of the present sequences.

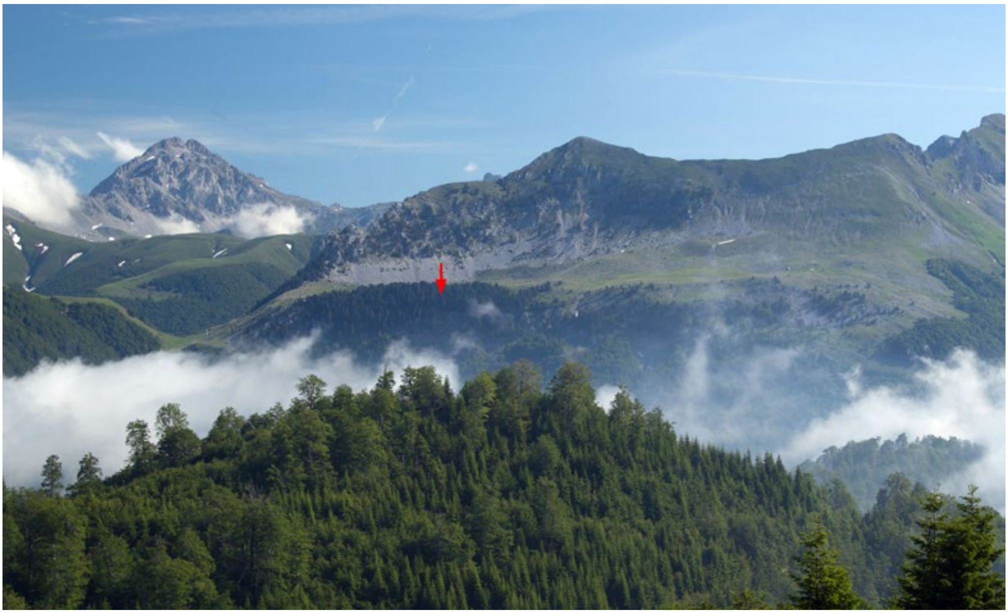

**Fig. 9.** Collection site in Montenegro (tip of red arrow), subalpine *Pinus heldreichii* forest (phot. B. Perić).

**Ecology**: The site in Auvergne (France) is a montane area with atlantic influence and conifer forests on volcanic bedrock. The sparse collection consisted of two apothecia and was made inside the vacation village in a regularly cut, 1.5 m tall hedge of *Picea abies*, at top of hedge near the cut end of a thin, dead, attached branch. The site in Massiff Komovi (Montenegro) is a small subalpine (altimediterranean) forest on calcareous bedrock in the Southern Dinarian Alps, composed of a pure stand of large, very old trees of *Pinus heldreichii*. Here the fungus was repeatedly collected on the bark of living branches and trunks in about 0.8–1.5 m above ground.

The apothecia are undoubtedly drought-tolerant for at least a few weeks, and are expected

**Fig. 10-11.** Living trunks of *Pinus heldreichii*, from which **coll. 5** was harvested (phot. B. Perić).

to be long-lived over many months until they get senescent. However, we rarely observed living asci. They are here shown only for the paratype from France (Fig. 8d-e), which was studied at the day when it was collected.

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Guy Marson and Sylvie Hermant (Musée National d´Histoire Naturelle de Luxembourg) is greatly thanked for gaining rDNA sequences of *Perzia triseptata,* and Piotr Perz (Poland) for giving his collection for study. Paul Diederich (Luxembourg) and Walter Jaklitsch (Wien) is thanked for critical comments on morphological and molecular details.

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# CYSTOLEPIOTA OLIVEIRAE SP. NOV., RÉCOLTÉE AU PORTUGAL SUR TRONC DE FOUGÈRE ARBORESCENTE MORTE

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## Résumé

Une nouvelle espèce de *Cystolepiota* est proposée après des études macroscopiques, microscopiques et phylogénétique d'une récolte portugaise. Ces résultats sont illustrés. La taxonomie, la distribution de ce taxon sont aussi commentées.

## Abstract

A new species of *Cystolepiota* is proposed after macroscopic, microscopic and phylogenetic studies of a Portuguese collection. These results are illustrated. The taxonomy, the distribution of *Cystolepiota oliveirae* are also commented.

## INTRODUCTION

Le genre *Cystolepiota* Singer se caractérise par des basidiomes à faciès lépiotoïde avec un revêtement constitué de cellules généralement sphériques et pulvérulentes (SINGER & DIGILIO, 1952 : 281). Les spores ne sont jamais amyloïdes mais peuvent être dextrinoïdes et les boucles aux cloisons sont présentes pour la plupart des espèces. KNUDSEN (1978) amenda le genre en y introduisant la section *Echinatae* du genre *Lepiota*, puis il retira cette section (KNUDSEN, 1980). La dernière modification de ce genre fut l'œuvre de VELLINGA (1992) qui y inclut *Lepiota pulverulenta* Huijsman qui ne possède aucune boucle et un revêtement très pulvérulent de cellules non sphériques, en pièces de puzzle. Selon les dernières études de VELLINGA (2009) le genre *Cystolepiota* comporte plus de 30 taxons. Ce genre a une répartition mondiale : Afrique (MALENÇON & BERTAULT, 1970), Amérique (SINGER & DIGILIO, 1952 ; VELLINGA, 2007), Asie (KUMAR & MANIMOHAN, 2009 ; PEGLER, 1986 ; XU et al., 2016) ; Europe (CANDUSSO & LANZONI, 1990) et Océanie (HUBREGTSE, 2016 ; MICHAEL, 2016).

Lors des Journées Mycologiques de la Confédération Européenne de Mycologie Méditerranéenne à Fornos de Algodres au Portugal, nous avons eu la possibilité de découvrir les champignons du parc de la Fundação Mata do Buçaco à Luso qui comprend une vallée de fougères arborescentes. Nous y avons découvert sur un tronc mort de ces fougères un champignon lépiotoïde qui s'est révélé être, après études, une nouvelle espèce de *Cystolepiota* proche de *C. petasiformis* (Murrill) Vellinga.

## Matériels et Méthodes

Les descriptions et observations ont été effectuées à partir de basidiomes frais, d'exsiccata et sur sporées. Les observations microscopiques ont été faites avec l'aide d'un microscope trinoculaire (Realux, Smart) équipé d'objectifs 4, 10, 40 et 100X surmonté de la caméra Motic 2000. Les dessins des éléments microscopiques ont été obtenus par décalque de photographies. Pour les différentes préparations microscopiques, les réactifs suivants ont été utilisés : eau, rouge congo, rouge congo SDS (1% p/v en solution aqueuse pour le réactif et le détergent), Melzer et Bleu coton lactique. Les dimensions des éléments microscopiques ont été mesurées à l'aide du logiciel de mesure Motic 2000. Les échantillons sont conservés dans les herbiers des auteurs. L'identification de la séquence des bases nucléotidiques de l'ADN a été effectuée par analyse de la région ITS selon les procédures décrites par De Hoog et al. (2000). L'analyse phylogénétique de cette séquence a été effectuée selon la méthode du maximum de vraisemblance sur le site internet www. Phylogeny. fr (Anisimova & Gascuel, 2006 ; Castresana, 2000 ; Dereeper et al., 2008) selon les paramètres par défaut proposés par le site. La séquence ITS de notre récolte a été déposée dans la base GenBank sous le numéro d'accès KY472789 ; pour les autres références GenBank utilisées pour notre étude voir le **Tab. I.**

## Descriptions

### *Cystolepiota oliveirae* P. Roux, Paraíso, Maurice, Normand, Fouchier

**Éthymologie** : dédiée à Sofia Oliveira, biologiste qui fut notre guide dans la Fundação Mata do Buçaco

**MycoBank** : MB 819989

**Diagnosis :** *Pileus usque ad 1,6 × 1,0 cm latus, convexus, sine umbone. Pilei velum ex squamis conicis fulvis et leviter detergibilibus constitutum. Lamellae albae vel cremeae, liberae, angustissimae (1-1,5 mm) et distantissimae. Stipes albus vel cremeus, centralis, cylindricus (6-32 × 1,5-3 mm), velo albo pulverulento obtectus, annulo destitutus. Odor nullus. Sporae rugosae, ellipsoideae vel subcylindricae (5,0-6,4 × 2,9-4,0 µm), lentissime dextrinoideae. Cystidia absentia. Veli cellulae similes illis Cystolepiotae petasiformis. Lamellarum trama dextrinoidea. Fibulae absentes. Habitatio supra truncum Dicksoniae antarcticae mortuae. Holotypus in loco Fundação Mata do Buçaco, Luso (Portugal) dicto, 11/XI/2015 lectus, leg. M. Paraíso, in herbario P. Roux sub n° 95-11-5408 conservatus; isotypus in herbario F. Fouchier sub n° FF15102 conservatus.*

**Fig. 1.** *Cystolepiota oliveirae* (photo P. Roux)

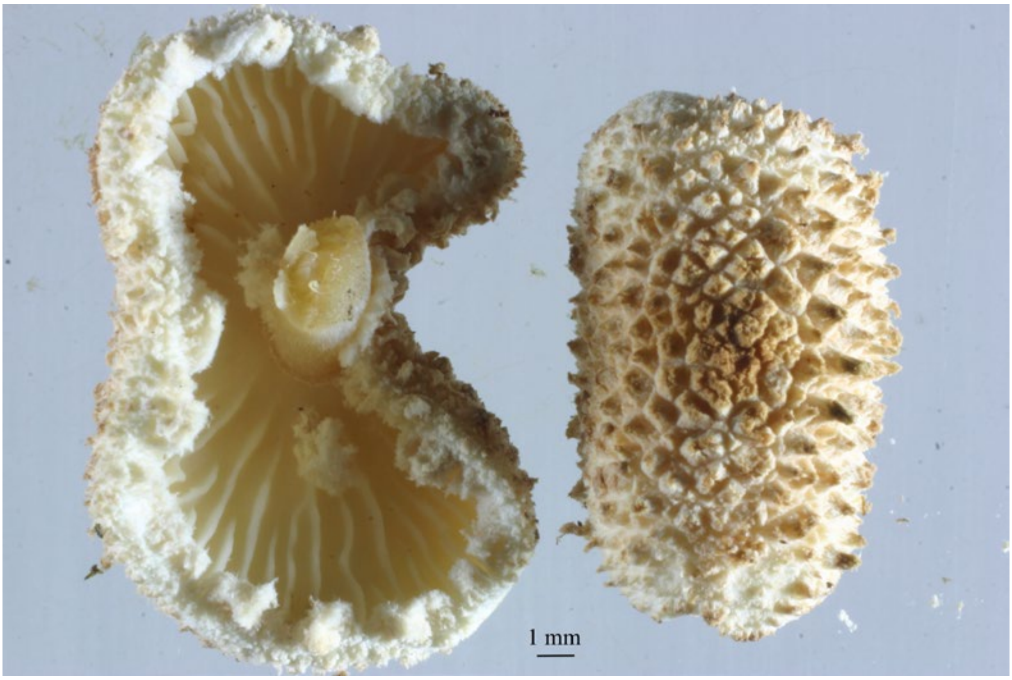

**Fig. 2**. Lames et revêtement de *Cystolepiota oliveirae* (photo F. Fouchier)

### Macroscopie (**Fig. 1 et 2**)

Les **chapeaux** sont hémisphériques à l'état jeune, de 0,5-0,8 cm de diamètre. Avec la maturité ils s'étalent en devenant convexes sans mamelon et pour la plupart de forme rectangulaire de 1,0–1,6 × 0,7–1,0 cm avec des angles arrondis. Le **voile** du chapeau est totalement composé d'écailles blanches à crème dressées en forme de cône à pointe rousse à brun roux ce qui donne une tonalité roussâtre au chapeau. Ces écailles sont faiblement détersiles. La marge est incurvée à fortement enroulée, faiblement ondulée et appendiculée de restes de **voile** blanc à roussâtre. Les **lames** sont très étroites (au plus 1–1,5 mm), fortement espacées, très libres par rapport au stipe, et de 3 types de longueurs à partir de la marge. Les plus longues sont au maximum au nombre de 25 et les 2 autres types (les moins longues) sont au maximum au nombre de 15. Leur couleur est blanche à crème, l'arête est concolore aux faces. Les **stipes** sont centraux, cylindriques, de dimensions : 6–32 × 1,5–3 mm, avec une base un peu élargie. Ils sont de couleur blanche à crème et devenant roussâtre à partir de la base avec l'âge ou à la détersion. Ils restent longtemps recouverts d'un **voile** blanc pulvérulent sur presque toute la longueur du stipe et qui ne forme pas d'anneau. La **chair** est blanche à crème avec une saveur douce à faiblement amère laissant une impression un peu de fluide glacial. Aucune odeur particulière n'a été décelée.

### Microscopie (**Fig. 3**)

Les **basides** sont tétrasporiques, de forme cylindro-clavée et sans boucle à leur base, de dimensions *:* 13,4–19,5 × 4,3–6,7 µm (n = 10) avec des stérigmates de 1,5–1,8 µm de longueur (**Fig. 3A**).

Les **spores** sont ellipsoïdes à subcylindriques, non amyloïdes, cyanophiles, sans pore germinatif, de dimensions *:* 5,0–6,4 × 2,9–4,0 µm ; moyenne : 5,6 ± 0,42 × 3,5 ± 0,28 µm ; Q: 1,3–1,8 ; Qm = 1,6 ± 0,1 (n= 30) (**Fig. 3B**). La paroi des spores est rugueuse, inégale (0,4–0,8 µm d'épaisseur) ; cette ornementation est visible seulement au plus fort grossissement dans le Melzer (**Fig. 3C**) ou le bleu coton lactique. Les spores ne réagissent au Melzer que très lentement pour devenir quasiment toutes dextrinoïdes au bout de 24 h d'incubation (**Fig. 3C**). Les spores libres restent très souvent organisées en tétrade (non montrée). L'arête des lames est fertile.

Aucune **pleurocystide** ou **cheilocystide** n'ont été décelées sur les lames.

La **trame** des lames est immédiatement dextrinoïde dans le Melzer (**Fig. 3G**).

Le **voile** en surface est constitué de cellules sphériques, subsphériques, globuleuses de dimensions 20–30 × 12–28 µm avec une paroi de 1–1,2 µm parfois jusqu'à 2 µm et un pigment pariétal lisse (**Fig. 3D**). Sous cette couche cellulaire de surface, le **voile** est constitué essentiellement d'hyphes larges, lobées, à gros diverticules, en pièce de puzzle (36–50 × 12–28 µm) et de cellules globuleuses identiques à celles de la surface (**Fig. 3E**). Toutes ces cellules sont liées, non libres, ce qui explique le caractère non détersile de ce revêtement grossièrement pulvérulent.

Le **voile** sur le stipe est constitué d'hyphes cylindriques larges, lobées, à gros diverticules, en pièce de puzzle semblable aux cellules du revêtement mais en plus étroit (15–47 × 5,5–26 µm) (**Fig. 3F**).

Aucune **boucle** aux cloisons des hyphes n'a été décelée dans tous les tissus des basidiomes.

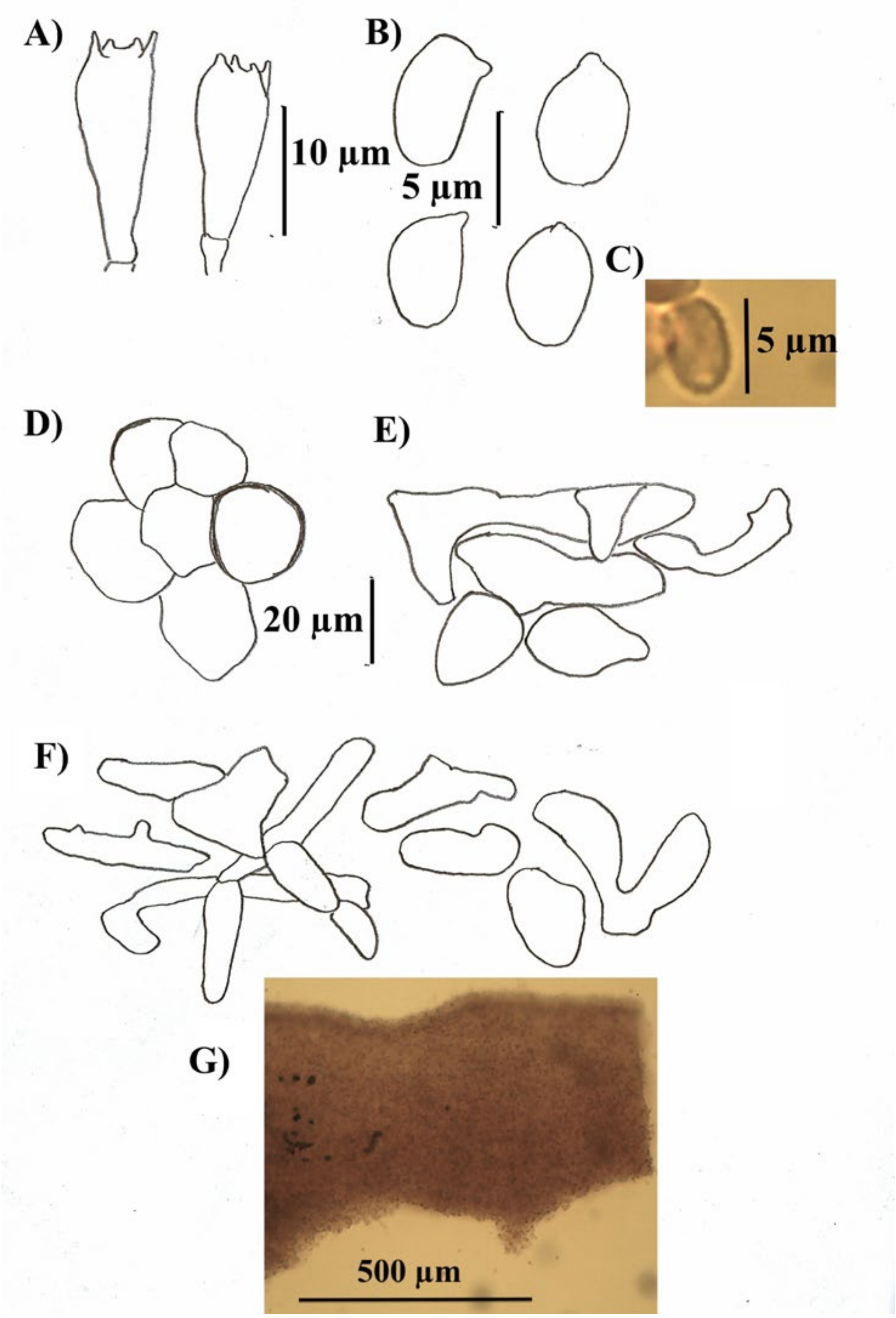

**Fig. 3.** Microscopie de *Cystolepiota oliveirae* :
**A**) basides, **B**) spores, **C**) spore dans le Melzer (24 h), **D**) cellules de la surface du voile du chapeau, **E**) cellules du voile du chapeau sous la surface, **F**) cellules du voile du stipe, **G**) trame d'une lame dans le Melzer (1 min).

### Phylogénie (**Fig. 4**)

Le phylogramme montre que la séquence ITS de notre récolte sur fougère arborescente fait bien partie du clade *Cystolepiota* et est indépendante. La séquence de *C. oliveirae* est identique, à 2 substitutions et 3 indels (insertion-délétion, 99% de similarité) près, à la séquence FJ528742, issue d'un échantillon de sol australien (uncultured fungus, Curlevski et al., 2010). Comme la branche portant ces deux séquences est bien soutenue phylogénétiquement (SH-aLRT = 0,87) et que l'espèce-sœur de *C. oliveirae* actuellement connue, *C. pulverulenta*, en diffère par 26 substitutions et 4 indels (92% de similarité), nous considérons que FJ528742 représente *C. oliveirae*.

| **Taxon** | **ITS : numéro d'accès GenBank** | **Bibliographie** |
|---|---|---|
| *Chamaemyces fracidus* (Fr.) Donk | AY176343 | Vellinga (2004) |
| *Cystolepiota adulterina* (F.H. Møller) Bon | JF907978 | Osmundson *et al.* (2013) |
| *Cystolepiota bucknallii* (Berk. & Broome) Clémençon & Singer | AY176458 | Vellinga (2003) |
| *Cystolepiota cystophora* (Malençon) Bon | U85332 | Johnson (1999) |
| *Cystolepiota fumosifolia* (Murrill) Vellinga | EF121817 (typus) | Vellinga (2007) |
| *Cystolepiota hetieri* (Boud.) Singer | AY176459 | Vellinga (2003) |
| *Cystolepiota luteohemisphaerica* (Dennis) I. Saar & Læssøe | AM946477 | Saar I. & Læssøe (2008) |
| *Cystolepiota pseudofumosifolia* M.L. Xu & R.L. Zhao | KF804000 (typus) | Xu *et al.* (2016) |
| *Cystolepiota pulverulenta* (Huijsman) Vellinga | AF391036<br>AF391037 | Vellinga (2001)<br>Vellinga (2001) |
| *Cystolepiota seminuda* (Lasch) Bon | AY176350 | Vellinga (2004) |
| *Lepiota clypeolaria* (Bull.) P. Kumm. | JN944094 | Genbank |
| Uncultured fungus | FJ528742 | Curlevski *et al.* (2011) |
| Uncultured *Cystolepiota* | KU847887 | Genbank |

**Tab. I**. Séquences utilisées pour cette recherche

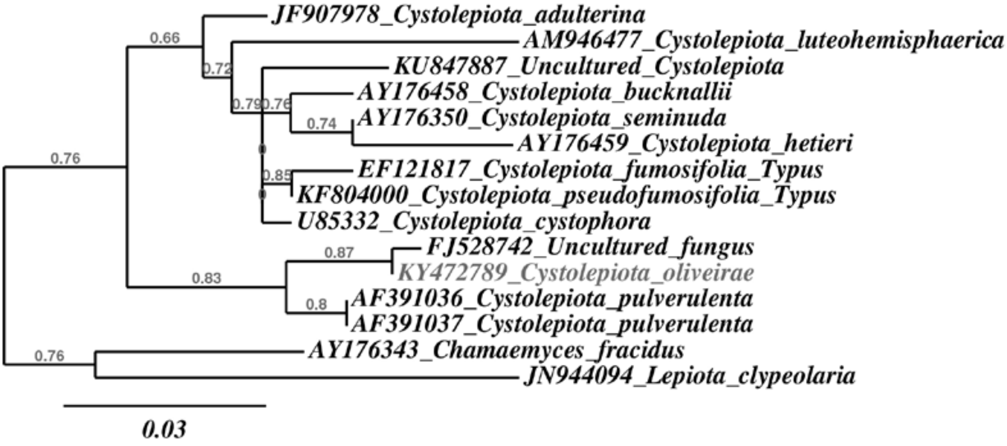

**Fig. 4.** Phylogramme de la région ITS des *Cystolepiota*. *Chamaemyces fracidus* et *Lepiota clypeolaria* ont été sélectionnés comme groupe externe.

### Écologie (**Fig. 5**)

Le 11/11/2015, une dizaine d'exemplaires sur l'humus couvrant un tronc mort et moussu de fougère arborescente (*Dicksonia antarctica*) dans la vallée des fougères ('Vale de fetos') du parc de la Fundação Mata do Buçaco à Luso (Portugal), alt. 540 m. Leg. M. Paraíso. Exsiccata : F. Fouchier n°FF15102, P. Roux n° 95-11-5408.

**Fig. 5**. Ambiance de la station de *Cystolepiota oliveirae* avec le tronc mort de *Dicksonia antarctica* (photo P. Roux)

## Discussion

Notre taxon *Cystolepiota oliveirae* est bien caractérisé par son aspect lépiotoïde à revêtement écailleux roussâtre, un stipe recouvert d'un voile pulvérulent blanc, des lames très étroites et espacées, des spores rugueuses très lentement dextrinoïdes, des cystides et boucles absentes, un revêtement de cellules en pièce de puzzle ainsi qu'une trame des lames dextrinoïde. Cet ensemble de caractères est unique parmi les *Cystolepiota*.

*Cystolepiota violaceogrisea* Singer dont la microscopie n'est pas décrite dans la littérature, diffère de notre taxon par un chapeau beaucoup plus grand et des couleurs lilas gris pour les lames et le chapeau (Rick, 1938 ; Singer, 1973).

De nombreuses *Cystolepiota* se distinguent de *C. oliveirae* au moins par la présence de cheilocystides, de spores lisses de dimensions différentes et de boucles présentes aux cloisons (voir le **Tab. II**).

*Cystolepiota bucknallii* (Berk. & Broome) Clémençon & Singer, *C. pseudogranulosa* (Berk. & Broome) Pegler et *C. sacchariolens* Nonis qui ne montrent pas de cystides, se distinguent de *C. oliveirae*, au moins par la présence de boucles aux cloisons, de spores lisses dextrinoïdes et de dimensions plus petites ou plus grandes (Bon, 1993 : 38, 84 ; Candusso & Lanzoni, 1990 : 108, 356 ; Nonis, 1983 ; Pegler, 1986 ; Vellinga, 2007).

Parmi les *Cystolepiota* acystidiées et à spores non dextrinoïdes : a) *C. cinereofusca* Singer a un chapeau gris cendré à centre brun foncé, ainsi qu'un stipe et une chair blanche immuable ne roussissant pas (Singer & Gómez, 1982) ; b) *C. luteohemisphaerica* (Dennis) I. Saar & Læssøe a un chapeau jaune hémisphérique et des spores beaucoup plus petites (Saar & Læssøe, 2008) ; c) *C. ompnera* (Berk. & Broome) Pegler montre des basidiomes beaucoup plus grands (chapeaux de 2–8 cm de diamètre et stipes de 3–6 cm × 3–8 mm) et des spores de dimensions plus petites (Pegler, 1986) ; d) *C. pumanquensis* Singer a un chapeau vineux à centre brun sombre rosâtre et des spores plus petites et cylindriques (Lazo, 1971) ; e) *C. seminuda* (Lasch) Bon = *C. pusillomyces* Peck montre un stipe qui se tâche de lilacin, de rosâtre et des spores plus petites (Bon, 1993 : 39).

L'espèce la plus proche de notre taxon est *C. petasiformis* (Murrill) Vellinga (= *C. pulverulenta* (Huijsman) Vellinga) qui possède aussi des spores ornementées très lentement dextrinoïdes, un revêtement constitué de cellules non sphériques, aucune boucle aux cloisons des hyphes et aucune cystide (Bon, 1993 : 84 ; Candusso & Lanzoni, 1990 : 356 ; Vellinga, 1992, 2007). *Cystolepiota petasiformis* se distingue notamment de *C. oliveirae* par une trame des lames non dextrinoïde ; des lames plus nombreuses, beaucoup moins espacées, ventrues de 2–4,5 mm de largeur ; une odeur désagréable ; des spores plus petites (4,2–5,3 × 2,5–2,8 µm en moyenne) (Vellinga, 1992, 2007). Il faut remarquer aussi que génétiquement *Cystolepiota petasiformis* (=*C. pulverulenta*) est l'espèce la plus proche de *C. oliveirae* (**Fig. 4**).

Par ses spores lentement dextrinoïdes, son absence de boucle et son voile avec des cellules lobées, diverticulées en pièces de puzzle, *C. oliveirae* appartient à la Section *Pulverolepiota* (M. Bon) Vellinga (Vellinga & Huijser, 1998) qui comprend *C. petasiformis* (= *C. pulverulenta)* et peut-être *C. roseolanata* (Huijsman) Bon si cette espèce n'est pas simplement une variété de *petasiformis* (Bon, 1993 : 84 ; Huijsman, 1960 ; Vellinga, 1992, 2007).

***C. adulterina*** (F.H. Møller) Bon (Bon, 1993 : 40 ; Candusso & Lanzoni, 1990 : 85 ; Vellinga & Huijser, 1998)
***C. albogilva*** Singer (Singer, 1989)
***C. amazonica*** Singer (Singer, 1989)
***C. aurantiaca*** Singer (Singer, 1973)
***C. australis*** Singer (Singer, 1969)
***C. brunneotingens*** Singer (Singer & Digilio, 1952)
***C. constricta*** Singer (Singer & Digilio, 1952)
***C. fumosifolia*** (Murrill) Vellinga = *C. cystidiosa* (A.H. Sm.) Bon (Vellinga, 2007 ; Vellinga & Huijser, 1998)
***C. cystophora*** (Malençon) Bon (Candusso & Lanzoni, 1990 : 91 ; Malençon & Bertault, 1970 : 124)
***C. furfuracea*** T.K.A. Kumar & Manim. (Kumar & Manimohan, 2009)
***C. hetieri*** (Boud.) Singer (Bon, 1993 : 42 ; Candusso & Lanzoni, 1990 : 94 ; Vellinga & Huijser, 1998)
***C. icterina*** F.H. Møller ex Knudsen (Bon, 1993 : 38)
***C. marthae*** Singer (Singer, 1969)
***C. moelleri*** Knudsen = *C. rosea* (Rea) Bon (Candusso & Lanzoni, 1990 : 98 ; Gierczyk *et al.*, 2011 ; Vellinga & Huijser, 1998)
***C. oregonensis*** (H.V. Sm.) Vellinga (Vellinga, 2007)
***C. potassiovirens*** Singer (Singer, 1989 : 99)
***C. purpureoconia*** (G.F. Atk.) Bon (Bon, 1993 : 39)
***C. pusilla*** Nezdojm. (Nezdojminogo, 1981)
***C. pseudofumosifolia*** M.L. Xu & R.L. Zhao (Xu *et al.*, 2016)
***C. rubra*** Singer (Singer & Digilio, 1952)

**Tab. II.** Liste des *Cystolepiota* avec des cheilocystides, des spores lisses et des boucles présentes.

L'étude phylogénétique de notre taxon démontre que notre taxon est bien un membre du genre *Cystolepiota*. Qu'il est de plus présent au Queensland en Australie comme le montre la similitude entre les séquences de *C. oliveirae* et de celle de FJ528742 uncultured fungus. Cette dernière séquence provient d'un ADN extrait du sol d'une forêt du Queensland (Curlevski *et al.*, 2010). Nous avons récolté *C. oliveirae* sur un tronc mort de fougère arborescente *Dicksonia antarctica* ; celle-ci est très fréquente en Australie. Celles du parc de la Fundação Mata do Buçaco à Luso ont été importées à la fin du $19^{e}$ siècle de pépinières françaises et belges (Anonyme, 2015). Ce qui nous amène à proposer que *C. oliveirae* a été introduit par l'entremise d'autres plantes venant directement d'Australie comme les eucalyptus très fréquents dans ce parc. Il semblerait aussi que la croissance de cystolépiotes sur fougère arborescente n'est pas exceptionnelle comme le montre la photo de Michael (2016) d'une *Cystolepiota* sp. qui ressemble fortement à *C. petasiformis* sur *Dicksonia fibrosa*.

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# COMMENT DIFFÉRENCIER MORCHELLA ESCULENTA DE M. VULGARIS

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## Résumé

L'auteur va, grâce à la synthèse de nombreuses observations macroscopiques, présenter des éléments simples et incontournables qui aideront à la différenciation de deux espèces de morilles proches *M. esculenta* et *M. vulgaris* souvent difficiles à séparer. Une étude microscopique novatrice détaillée est également proposée.

## Abstract

The author, through the synthesis of numerous macroscopic observations, presents simple and unavoidable elements which will help the differentiation of two species of close neighboring *M. esculenta* and *M. vulgaris*, which are often difficult to separate. A detailed innovative microscopic study is also proposed.

**Key words**: *Morchella vulgaris, Morchella esculenta,* macroscopy, microscopy.

## Introduction

Nous aimons à dire que l'étude des morilles est une science compliquée, Fries disait « *omnes Morchellae inter se nimis* », toutes les morilles se ressemblent. C'est le cas de morilles comme *M. esculenta* (Fig. 1) et *M. vulgaris* (Fig. 3) que nous avons récoltées et observées pendant de très nombreuses années. Ces morilles largement récoltées en Europe occidentale représentent la quasi-totalité des morilles localisées au nord de la France au niveau du Bassin Parisien (Clowez 1993-1997, Richard 2015).

Ces deux morilles phénicoïdes[1] et saprosymbiotiques[2] de la même section *Morchella* (morilles dites jaunes, schéma 1) partagent souvent les mêmes écologies mais elles ne se

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[1] Stratégie écologique qui démontre une forte aptitude à coloniser des milieux nouveaux, instables, éphémères et perturbés.

[2] Le saprosymbiotisme est un nouveau terme scientifique que nous utilisons pour qualifier le comportement trophique très particulier de certaines morilles qui ont une double stratégie pérenne et colonisatrice (Clowez 1997, 2012 ; discussion avec Jérôme Legros, Mycorium sauvage de France et des DOM-TOM) qui se traduit par la combinaison de caractères trophiques complémentaires : saprophytique et ectomycorhizien ou saprophytique et endophytique. La prédominance d'un caractère par rapport à l'autre dépend essentiellement de la mise en situation du mycélium à un moment donné (ex : blessure des racines d'un arbre ou fruits en décomposition qui privilégieront le caractère saprophyte).

mélangent jamais sous une même essence d'arbre. Il n'est donc pas rare de récolter *M. vulgaris* d'un côté d'un chemin forestier et *M. esculenta* de l'autre côté. Pourtant, certains profils atypiques ne permettent pas avec certitude de donner un nom (Fig. 2, 4), alors nous constatons de possibles inversions de noms sur les photographies proposées dans les quelques rares ouvrages disponibles sur le sujet. Jacquetant E. (1984) nous montre p 94 « les morilles » une photo d'une espèce présentée comme *M. rotunda* var. *esculenta* qui est en réalité, nous semble t-il, *M. vulgaris*. Montégut J. propose dans « l'encyclopédie analytique des champignons » vol. 1 p. 111 photo du bas, une espèce nommée « variation de *M. vulgaris* » qui est en réalité *M. esculenta.*

Breitenbach & Kränzlin (1984) dans « champignons de Suisse » présentent p 46 n°6 une espèce nommée *M. esculenta* var. *vulgaris* qui est *M. esculenta* type.

Au regard de ces incertitudes, il nous fallait trouver des éléments déterminants simples qui permettront de différencier rapidement ces deux espèces sur le terrain. Par la suite, une confirmation microscopique complémentaire pourra être envisagée.

GENRE *MORCHELLA* Dill. ex Pers. : Fr.

A) Section *MORCHELLA*
B) Sous-section *Morchella*
Clade de *M. americana, M. vulgaris*
C) **Série *Vulgaris***
-***Morchella vulgari***s (Pers.) Gray = ***Mes-17***
Clade de *M. esculenta*
**C) Série *Esculenta***
-***Morchella esculenta*** (L.: Fr.) Pers. = ***Mes-8***

**Schéma 1** : Positionnement de *M. esculenta* et *M. vulgaris* dans la classification Clowez (2012). (Mes, O'Donnell 2015)

## Etude macroscopique de *M. esculenta* et *M. vulgaris*

Cette étude sera présentée en deux paragraphes, en effet, à la lumière du premier paragraphe, il sera déjà possible de différencier facilement les deux espèces. Ce sont deux morilles de taille sensiblement égale moyenne à grande, c'est chez *M. esculenta* que nous rencontrerons les plus gros spécimens.

- L'odeur et la vallécule : Ce fut lors d'une sortie mycologique en mai 2017 dans la forêt de Fleurines (Oise) avec François Petit (ABMARS, Association des Botanistes et Mycologues de la Région de Senlis) que nous avons pu collecter un grand nombre de spécimens de *M. esculenta* et *M. vulgaris* et ainsi procéder à une comparaison à grande échelle.

La combinaison d'un élément macroscopique et d'un élément olfactif nous semble alors évidente. La manipulation des deux espèces, une espèce dans chaque main, nous permet immédiatement de constater que *M. vulgaris* est une morille fortement odorante contrairement à *M. esculenta* dont l'odeur est faible. L'odeur caractéristique de certaines morilles jaunes est complexe à définir, elle consiste en un mélange d'odeurs agréables

**Fig. 1** : *M. esculenta* type, (photo P. Clowez).

**Fig. 2 :** *M. esculenta* à faciès *M. vulgaris,* (photo P. Clowez).

**Fig. 3** : *M. vulgaris* type, (photo P. Clowez).

**Fig. 4** : *M. vulgaris* à faciès de *M. esculenta,* (photo P. Clowez).

fortement boisées et légèrement spermatiques. Il suffit ensuite de retourner les morilles pour constater que *M. vulgaris* a une petite vallécule (Fig. 5) bien visible (séparation entre le pied et le chapeau connue principalement dans la section *Distantes*, les morilles dites noires ex : *M. deliciosa*) qui s'amplifie avec l'âge alors qu'il n'existe pas ce type de séparation chez *M. esculenta* (Fig. 6).

En résumé, si la morille récoltée à une forte odeur et qu'il existe une vallécule nous sommes en présence de *M. vulgaris*, si aucun de ces deux éléments n'est présent il s'agit alors de *M. esculenta*.

- Le chapeau, les alvéoles et le stipe : Le chapeau de *M. vulgaris* est majoritairement de forme triangulaire obtus et plus rarement arrondi, il a chez les spécimens âgés une tendance à ressembler à un béret basque. Chez *M. esculenta,* le chapeau est arrondi à ovoïde et plus rarement de forme triangulaire.

Les nuances de couleurs des chapeaux des deux espèces sont particulièrement impressionnantes, elles s'échelonnent du blanc sale en passant par le brun clair et foncé au noir profond (Fig. 7) avec une forte majorité de nuances autour de l'ocre (Fig. 2, 4).

La couleur grise semble réserver à *Morchella vulgaris* (Fig. 3).

La confusion entre les deux espèces est fortement augmentée avec *M. vulgaris* âgée, la sporulation lui donne une couleur qui va vers l'ocre clair, couleur commune de *M. esculenta.*

Les alvéoles ont toujours joué un rôle majeur dans la détermination des morilles. La présence d'alvéoles primaires boursouflés irréguliers (petites boursouflures à l'image de petits appendices ou hernies et de grosses boursouflures) et souvent non fermés permet d'identifier bien souvent *M. vulgaris* (Fig. 8 c) au contraire des alvéoles assez réguliers et fermés avec peu de boursouflures qui orientent la détermination vers *M. esculenta* (Fig. 8, a, b). Ce n'est pourtant pas toujours le cas, en effet il arrive que les alvéoles de *M. vulgaris* soient très proches morphologiquement de ceux de *M. esculenta* (Fig. 8 d ). Chez *M. esculenta*, il existe parfois aussi quelques alvéoles secondaires mal formés et boursouflés.

Plus généralement, les nombreuses boursouflures sur les parois des alvéoles sont propres à un groupe de morilles proches génétiquement comme *M. vulgaris*, *M. dunensis* et *M. prava.*

L'arête des alvéoles est orange sale à maturité, fragile et tombe rapidement à la manipulation sous forme de croûtes. Chez la jeune *M. vulgaris* cette arête est blanc sale et duveteuse (Fig. 8, c), elle devient rapidement orange sale par petits amas irréguliers (Fig. 9, b).

Dans le cas de *M. esculenta* jeune cette arête est légèrement plus claire que la couleur des alvéoles et l'apparition de croûtes orange est moins prononcée (Fig. 9, a). La couleur des bords des alvéoles devient rapidement orange sale pour les morilles de la section *Morchella* ce qui la différencie de celle de la section *Distantes* (les morilles dites noires) qui devient noire avec une exception pour *M. tridentina.*

Le stipe de *M. esculenta* est cylindrique régulier et légèrement élargi à la base, au contraire de *M. vulgaris* qui possède un stipe largement élargi à la base (en forme de patte d'éléphant, remarque P.-A. Moreau) et fortement sillonné. De nombreuses ridules peuvent apparaître avec l'âge sur toute la surface du stipe de chaque espèce. La forme de cette partie de l'ascome n'est pas un élément majeur à la détermination de l'une ou l'autre espèce car il existe là aussi des spécimens intermédiaires. Les blessures et la manipulation du stipe font apparaître une couleur orange à orange-rouge qui s'estompe après quelques heures, elle est renforcée lorsque les conditions climatiques sont sèches.

**Fig. 5** : Séparation entre le pied et le chapeau de *M. vulgaris* (photo P. Clowez).

**Fig. 6** : Séparation entre le pied et le chapeau de *M. esculenta,* (photo P. Clowez).

**Fig. 7** : **a**. *M. vulgaris* blanche (photo Mónica Cravo) ; **b-c**. *M. esculenta* brune et noire, (photos P. Clowez).

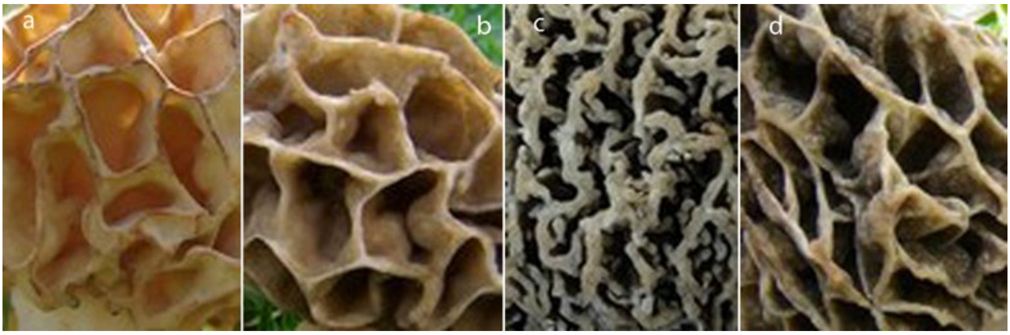

**Fig. 8** : **a-b**. Alvéoles de *M. esculenta* ; **c-d**. Alvéoles de *M. vulgaris,* (photos P. Clowez).

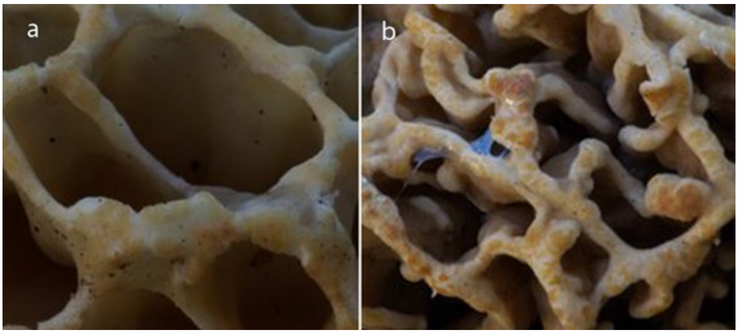

**Fig. 9** : **a**. *M. esculenta* ; **b**. *M. vulgaris* (photos P. Clowez).

**Etude microscopique de *M. esculenta* et *M. vulgaris***

- Les asques : La particularité des asques ne réside pas dans leurs dimensions qui ne varient guère d'une espèce à l'autre (250–300 × 12–20 µm), mais plutôt dans les différentes formes de leurs bases.

Les asques des deux morilles étudiées ont une base de même forme cylindrique légèrement épaissie vers 8 à 10 µm. *M. esculenta* diffère parfois avec une base des asques en forme de pivert /woody woodpecker/ (Fig. 10 c) à régulièrement coudée (Fig. 10 e). Chez *M. vulgaris* cette base pourra être longuement effilée (Fig. 10 f) ou en forme de tête de flamant rose (Fig. 10 f).

(Les mélanges de colorants utilisés ici en microscopie optique consistent en une association d'eau + noir de chlorazol SDS aqueux et parfois + phloxine B alcoolique, Clowez 2017a).

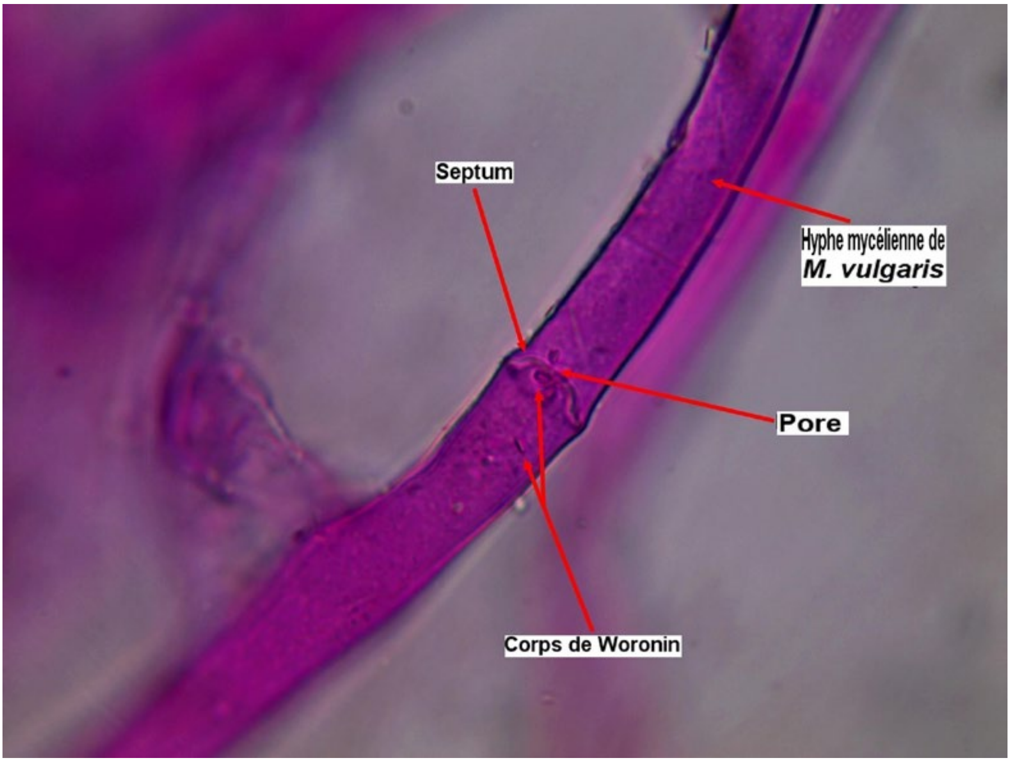

**Fig. 10** : **a, c, e.** Bases des asques de *M. esculenta* ; **b**, **d**, **f**. de *M. vulgaris* (x 1000), photos P. Clowez.

**- Les spores** : Une étude récente approfondie de 27 morilles est proposée (Clowez, 2017b). Comme pour toutes les spores étudiées, nous considérons ici que donner une fourchette avec une limite inférieure et une limite supérieure ne reflète pas la grande variabilité des spores de ces ascomycètes. D'autres paramètres comme la sporulation tardive des ascomes (*M. vulgaris*), la production occasionnelle de spores de tailles différentes au sein d'un même asque sont déroutants. Pour cela, nous proposons ci-dessous des mesures de 30 à 60 spores par espèce, des moyennes et le rapport Q (longueur divisée par la largeur).

Les spores de *M. esculenta* sont plus longues que celles de *M. vulgaris* de 1 voire 2 µm. Le calcul de Q permet de différencier facilement les deux espèces, il est de 1.65 pour *M. esculenta* contre 1.59 pour *M. vulgaris*.

Les deux morilles présentent des sporées de couleur jaune ocre mordoré (Boudier 1909), la sporée de *M. esculenta* (Fig. 11, a) a une couleur d'un jaune plus soutenu et plus foncé que celle de *M. vulgaris* (Fig. 11, b ).

Chez *M. esculenta*, nous observons des amas jaunâtres caractéristiques à chaque extrémité de l'endospore (Fig. 11, c), ce phénomène est moins fréquent et bien moins marqué chez *M. vulgaris* (Fig. 11, d).

Les ornementations négatives des spores visibles sur les rares photos faites en microscopie électronique à balayage (Taşkin 2016) le sont aussi en microscopie optique grâce à un nouveau procédé de coloration à base de glycérine et d'encre à tampon verte Noris (Clowez 2017 a, b). Les spores des deux morilles étudiées sont de type C-B1 pour *M. esculenta* (Fig. 11, e) et de type C1 pour *M. vulgaris* (Fig. 11, f) avec C (longueur de la spore) = 19 à 22 µm, B = 23 à 26 µm, 1 = ornementations négatives longitudinales en sillons profonds à peu profonds de type barbelés ou tracé oscillant régulier sur rouleau de sismographie. Le clade *vulgaris-esculenta* a des spores avec des sillons peu profonds et peu évidents à observer, il est impossible de différencier ici individuellement les morilles.

Les spumosités sont bien visibles aux extrémités de chaque spore dans l'asque mais aussi pendant quelques minutes après leur éjection (Fig. 12). Elles ne permettent pas de différencier les deux espèces.

***M. esculenta* PhC[3] 158 et deux récoltes Aisne 2017. Q=1.65. Moyenne 22.25 × 13.50 µm.**

22×13 ; 21 × 13 ; 22×14 ; 21.5×13 ; 23 ×15 ; 19×12 ; 21 × 13 ; 21×13.5 ; 21×14 ; 21×13 ; 22×13.5 ; 22×13 ; 21×13 ; 22×13.5 ; 21×14 ; 21×12.5 ; 24×14 ; 21×14 ; 22×13.5 ; 21.5×13 ; 22×13 ; 19×13µm ; 26×15 ; 23×13 ; 22×13 ; 23.5×14 ; 22×13 ; 24×14 ; 22×13 ; 20×13 ; 22×13 ; 20×13 ; 22×13 ; 23×13.5 ; 23×14.5 ; 20×13 ; 23×13 ; 22×13 ; 23×13 ; 24×14 ; 25×16 ; 23.5×14 ; 22×14 ; 24×14 ; 23×13 ; 24×14 ; 23×14 ; 23×14 ; 22×14 ; 22×14 ; 24×14 ; 23×14 ; 24×14 ; 22×14 ; 22×14 ; 23×15 ; 24×15 ; 22×13.5 ; 22×14 ; 22×14 ; 22×14 ; 23×14 ; 23×13 µm.

***M. vulgaris* PhC 43, 271 et spécimens frais 2017. Q = 1-59. Moyenne 21.50 × 13.50 µm.**

22×14 ; 23×13 ; 21×14 ; 21×12 ; 22×13 ; 20×12.5 ; 21×12.5 ; 22.5×14 ; 22×12×5 ; 21.5×13 ; 23×13 ; 22×14 ; 20×14 ; 22.5×13.5 ; 21.5×13 ; 20×13 ; 21×13.5 ; 19×12.5 ; 22×13.5 ; 22×15

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[3] : Morilles PhC de l'herbier Clowez, ADN connu, dont 1 exemplaire est au LIP de Lille, 1 exemplaire est au CNRS de Montpellier et 1 exemplaire est chez l'auteur.

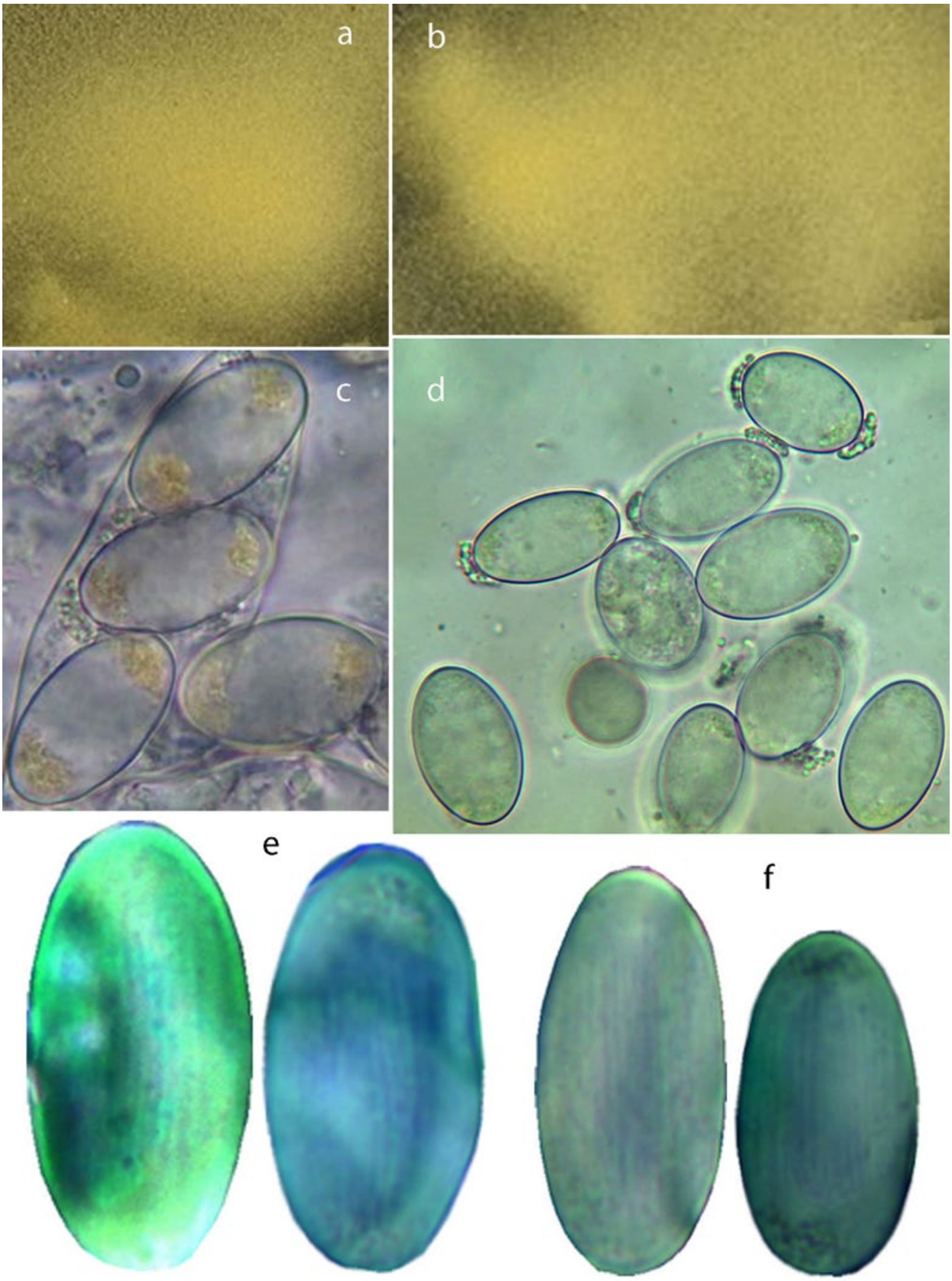

**Fig. 11** : **a-b**. Sporées de *M. esculenta* et de *M. vulgaris* ; c, e. Spores de *M. esculenta* ; **d**, **f**. Spores de *M. vulgaris,* (photos P. Clowez).

**Fig. 12** : Spores de *M. esculenta* et spumosités (x 1000), photo P. Clowez.

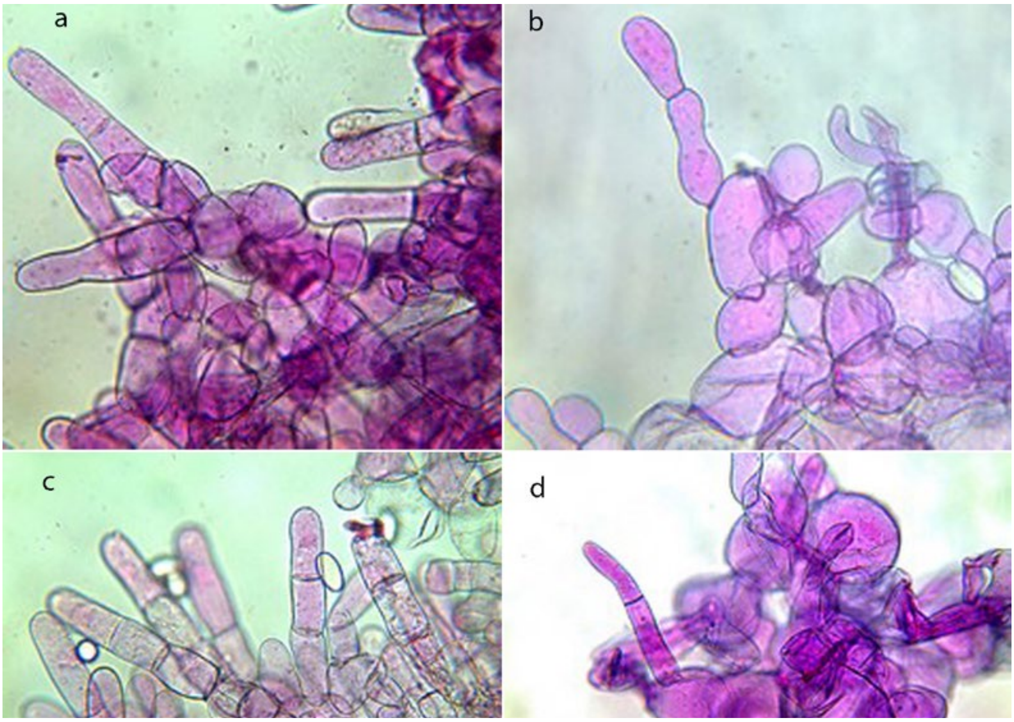

**Fig. 13** : *M. vulgaris* et corps de Woronin (x 1000), photo P. Clowez.

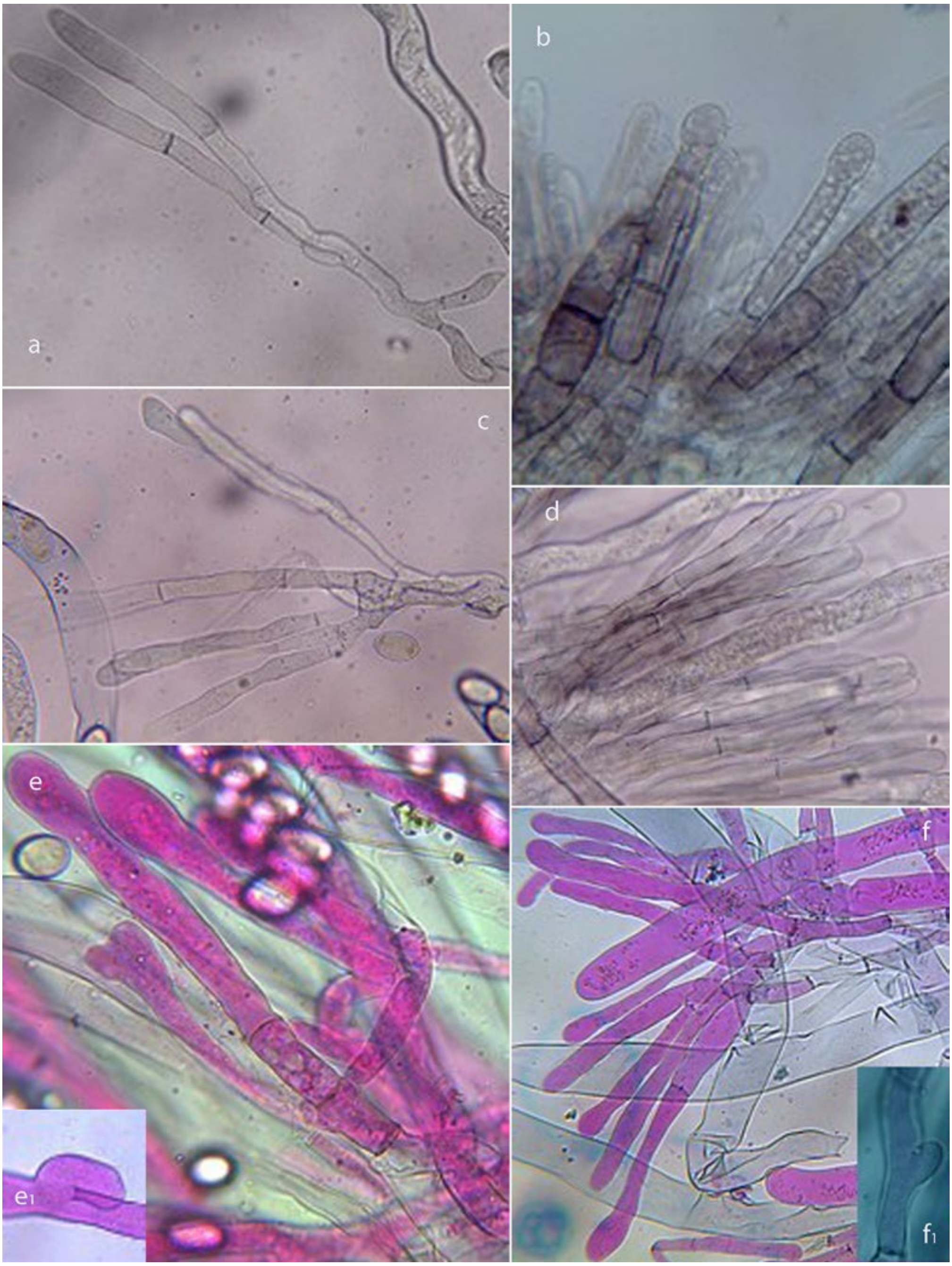

**Fig. 14** : **a**, **c**, **e**. Paraphyses de *M. esculenta* ; d-f. Paraphyses de *M. vulgaris* (x 400), photos P. Clowez.

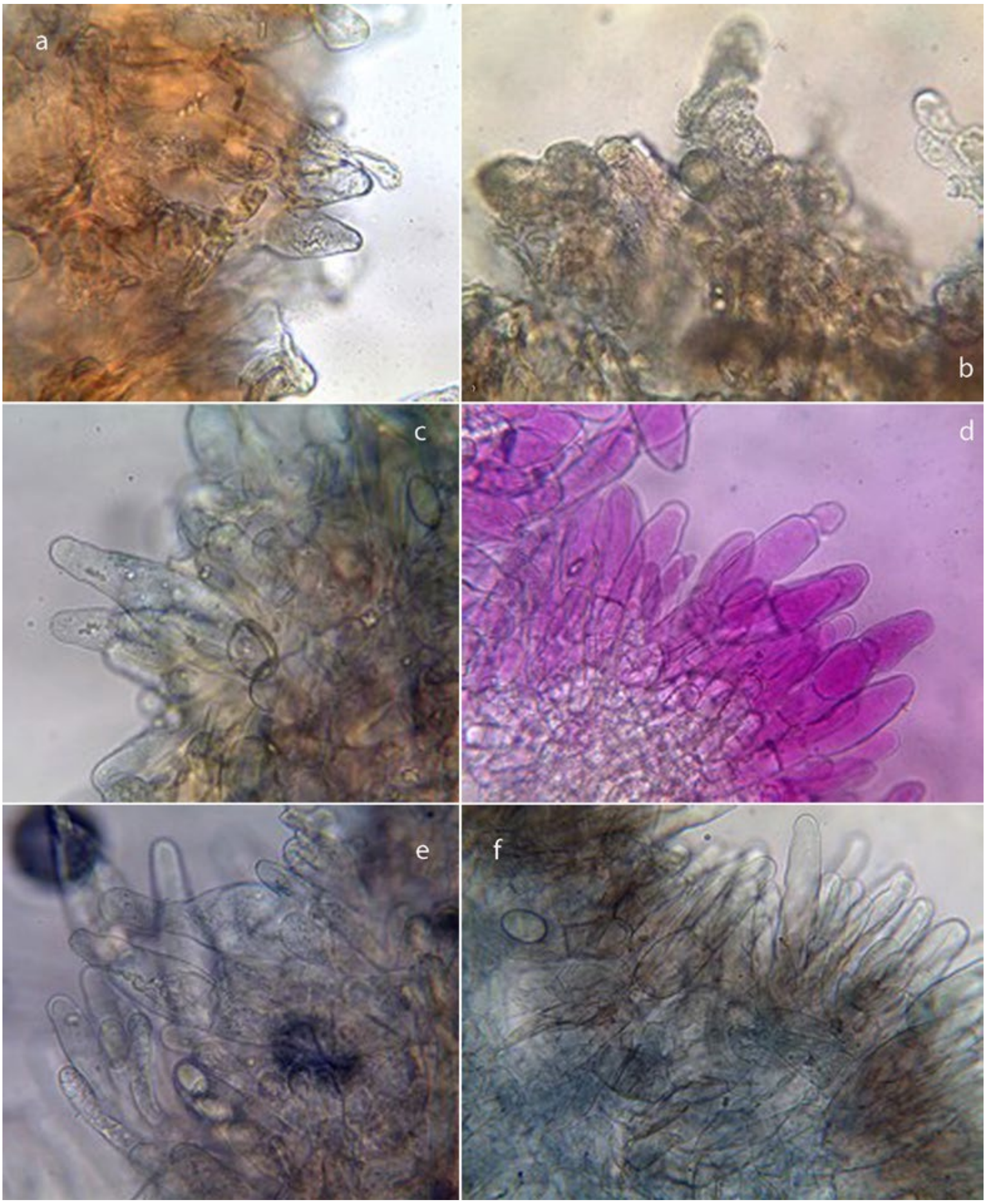

**Fig. 15** : **a**, **c**, **e**. Acroparaphyses de *M. esculenta* ; **b**, **d**, **f**. Acroparaphyses de *M. vulgaris* (x 400), photo P. Clowez.

; 19.5×11.5 ; 20×12.5 ; 21×14 ; 20×13 ; 21×14 ; 20×13 ; 20×12 ; 21×13 ; 20×13 ; 21.5×14 ; 22.5×13.5 ; 20×12.5 ; 22×14 ; 22×14.5 ; 22×14.5 ; 21.5×14,5 ; 18.5×13.5 ; 23×14 ; 20×13 ; 22,5×14.5 ; 24.5×16 ; 22×15 ; 23×14,5 ; 23×14 ; 20×13 ; 23×14.5 ; 22×14,5 ; 22×13 ; 22×13 ; 23×13.5 ; 21×14 ; 22×13.5 ; 22×13 ; 20×13.5 ; 22.5×14 ; 21×14.5 ; 24×14 ; 23×13.5 ; 21.5×13.5 ; 23×13 ; 22×14 ; 22×13.5 ; 22×14 ; 21×13 ; 22×13.5 ; 21×13 ; 19×13 ; 21.5×14 ; 23×13.5 ; 22×13.5 ; 20×13 ; 22×13.5 ; 22×14 ; 23×13.5 ; 22×13.5 ; 21×13 ; 22×14 ; 19.5×12.5 ; 23×13 ; 21×13 ; 21.5×13.5 ; 21.13.5 µm.

- **Les corps de Woronin :** Chez les ascomycètes les parois des éléments cellulaires ne contiennent qu'un seul pore régulé par des corps de Woronin, ils peuvent bloquer les molécules en s'interposant devant le pore. Nous avons rencontré cette structure dans tous les éléments cellulaires des deux morilles étudiées (Fig. 13).

**- Les paraphyses :** Les paraphyses font partie des éléments cellulaires de l'hyménium des morilles parmi les plus difficiles à étudier. En effet, ces éléments stériles évoluent avec le développement des ascomes, ils sont dans un premier temps prédominants par rapport aux asques avec de nombreuses inclusions sous forme de gouttelettes lipidiques (Fig. 14, b). Les paraphyses se ramifient ensuite et finissent au moment de la sporulation par gonfler dans des proportions importantes tout en se déformant. Au sein de l'hyménium de *M. vulgaris,* les paraphyses en bouquets septés sont nombreuses, comportant 2 à 4 articles cylindriques de 15–55 × 5–10 µm et un article terminal souvent ampullacé 70–110 × 6–12 µm (Fig. 14, d-f ). Les paraphyses de *M. esculenta* sont beaucoup moins nombreuses que chez *M. vulgaris*, elles sont de forme identique et elles comportent aussi 2 à 4 articles 10–35 × 6–10 µm avec un article terminal 75–100 × 6–12 µm (Fig. 14, a, c, e ). Nous avons remarqué qu'il existe bien souvent une petite protubérance cylindrique sur les deux premiers éléments à la base des paraphyses de la section *Morchella* (Fig. 14 e, f ).

Avec un montage dans l'eau, les paraphyses de *M. vulgaris* apparaissent plus foncées que les asques, elles sont de couleur gris-noir à brun-noir clair. Ce sont les paraphyses qui donnent la couleur du chapeau des jeunes morilles.

Les hétéroparaphyses sont des paraphyses dont l'élément terminal est parfois bifide à difforme, elles sont souvent présentes chez les morilles de la section *Distantes*, mais peu dans la section *Morchella* (Fig. 14, e).

**- Les acroparaphyses :** Ces éléments cellulaires sont observés sur l'arête des alvéoles des morilles (Andary, 1991 ; Loizides, 2016),), ils font partie des éléments majeurs qui aident à différencier les morilles entre elles en l'absence de spores. Macroscopiquement, les acroparaphyses sont visibles sous forme d'amas cellulaires orange sale à brun-orange pour les sections *Rufobrunnea* et *Morchella* et d'amas noirs pour la section *Distantes* (exception pour *M. tridentina*).

Au niveau microscopique, un pigment fortement incrustant englobe les acroparaphyses de la section *Morchella*, elles sont alors difficiles à visualiser (Fig. 15, a-b), il est donc préférable de faire une observation sur des morilles jeunes. *M. esculenta* a des acroparaphyses de deux types qui donnent une impression de deux couches cellulaires (Fig. 15, c-e). La première couche cellulaire est constituée des plus petites acroparaphyses, elles sont cylindriques obtuses et simples (70 × 15 µm) ou septées (20–30 × 10–12 µm, en haut 55 × 10 µm) ou en forme de massues simples (45–50 × 15–35 µm) ou septées (25–30 × 10–20 µm, en haut 40-

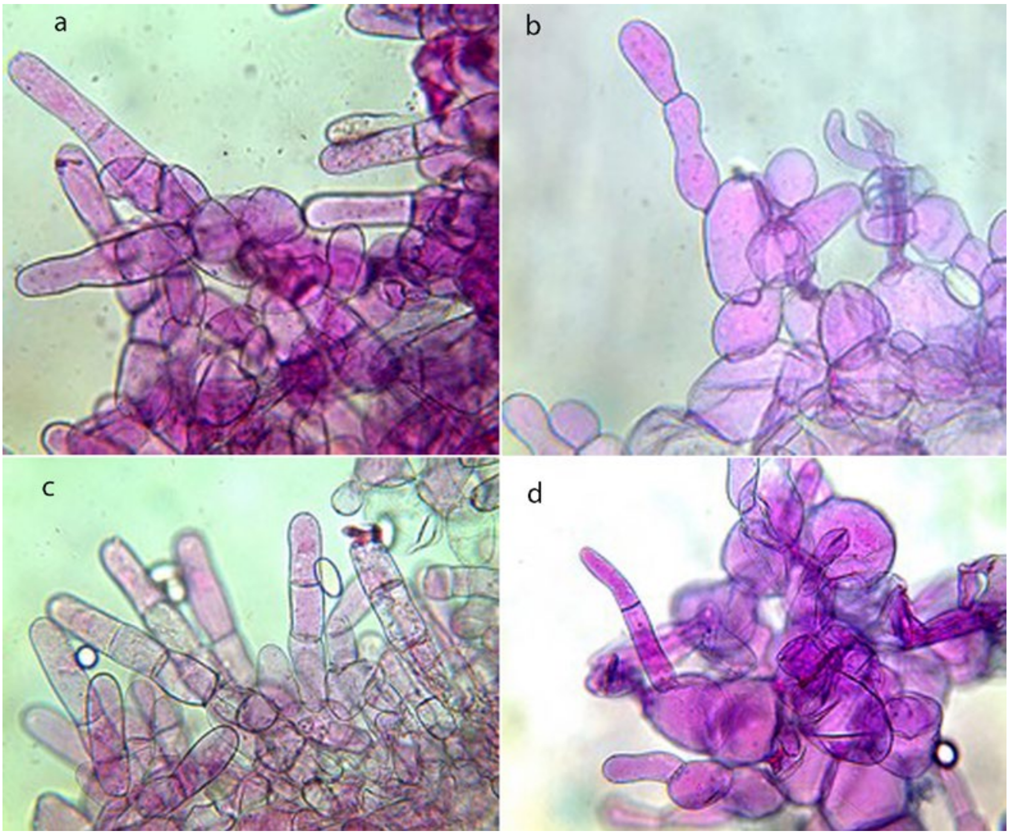

**Fig. 16** : **a**, **c**. Pyrames de *M. esculenta* ; **b**, **d**. Pyrames de *M. vulgaris* (400), photos P. Clowez.

65 × 20-25 µm). La deuxième est constituée de grandes acroparaphyses de forme cylindrique obtuse (110-170 × 15-20 µm) à souvent en forme de quille avec parfois un sommet étranglé (85–170 × 25–40 au plus large) et parfois septées (90 × 25 µm, en haut 100 × 30 µm). Il est aussi possible d'observer plus rarement des acroparaphyses à trois articles et parfois aussi un article sommital légèrement moniliforme ou bifide. La limite au niveau de l'arête des alvéoles entre les paraphyses et les acroparaphyses est souvent difficile à visualiser.

Les acroparaphyses de *M. vulgaris* sont parmi les plus difficiles à observer chez les morilles, elles sont rapidement submergées par un pigment incrustant orangé très envahissant. Il n'est pas rare de visualiser chez les acroparaphyses jeunes de nombreuses inclusions lipidiques mais aussi de nombreuses petites vésicules de couleur brun-gris à brun-noir. Leur forme est cylindrique et obtuse à sommet parfois à tendance ogivale. Les acroparaphyses sont composées d'un ou deux articles rarement trois (30–110 × 10–20µm ; 6–15 × 15–65 µm et l'article sommital 15–35 × 10–15µm), elles sont disposées en une structure plus hyméniforme que celle de *M. esculenta* (Fig. 15, d, f) Nous avons observé quelques acroparaphyses difformes, bifides, avec des tâches réfringentes situées dans la partie supérieure de l'article sommital.

**- Les pyrames** : Nous proposons ce nouveau nom pour définir les amas pyramidaux plus ou moins volumineux du stipe des morilles qui sont constitués principalement de sphérocystes terminés en leur sommet par des éléments simples allongés ou ramifiés et septés. Les furfurations ne sont pas adaptées pour décrire les éléments cellulaires visibles sur le stipe des morilles car elles sont définies comme étant le prolongement des articles des cellules de l'excipulum ectal des Discomycètes. Dans la section *Distantes*, les pyrames ont la particularité de prendre rapidement une couleur brun-noir. A la différence des acroparaphyses, les pyrames sont plus faciles à observer, elles gagnent en volume avec l'avancée en âge de la morille.

Les pyrames de *M. esculenta* sont constituées d'un empilement pyramidal de sphérocystes (15–20 ×15–25 µm) avec au sommet des éléments cellulaires translucides cylindriques et réguliers obtus. Ces éléments sommitaux (Fig. 16 a, c ) ont 2, 3 rarement 4 articles (15–30 × 10–20 µm), l'article sommital est légèrement plus long (20–50 × 10–20 µm).

Chez *M. vulgaris* les pyrames sont différentes, il existe aussi de nombreux sphérocystes (30–40 × 30–35 µm) mais les articles sommitaux sont simples (45-60 x 10-20 µm) ou seulement à deux articles plus petits et moins larges (20–40 × 5–12 µm) avec parfois un article terminal plus court et épaissi au sommet (20 × 10 µm), (Fig. 16 b, d ).

**Ecologie** : La répartition géographique de *M. esculenta* et *M. vulgaris* est superposable, elle se situe principalement dans une grande partie de l'Europe occidentale. En 2016, une année de sécheresse en France nous a permis de confirmer notre hypothèse avec une plus grande précision de la répartition et du pourcentage de chaque espèce en Europe. En effet, nous avons remarqué que *M. vulgaris* est une espèce majoritairement présente dans le nord de la France et tout particulièrement au niveau du nord de Bassin Parisien. Au printemps 2016, cas exceptionnel, *M. vulgaris* est quasi-absente en Europe, seule *M. esculenta* est visible en proportion plus importante vers l'Est de l'Europe. En Europe occidentale, nous constatons que *M. vulgaris* est fortement implantée dans la partie ouest et plus particulièrement dans le nord de la France ; en revanche plus nous allons vers l'est de l'Europe et plus le pourcentage s'inverse à l'avantage de *M. esculenta*.

*M. esculenta* est une morille à tendance plus thermophile. A noter que dans les zones alluvionnaires et dunaires où les conditions écologiques sont plus extrêmes, nous rencontrons *M. dunensis*, une espèce génétiquement proche de *M. vulgaris* (Clowez 1997).

Nous essayons depuis de nombreuses années de travailler à démontrer qu'il est impératif de comprendre le trophisme des morilles et leurs associations végétales. Pour cela, nous avons proposé une présentation simplifiée des relations végétales avec les différentes espèces du genre *Morchella* (Clowez 2012). Dans cette étude, nous montrons que *M. esculenta* et *M. vulgaris* ont pratiquement la même niche écologique. Pour trouver ces deux morilles au printemps, il faut une combinaison de différents éléments comme la présence d'un sol calcicole, peu de végétation au sol (ex : les sites archéologiques au sens large, Clowez 1991), la présence d'arbre dont la sève est riche en glucose (ex ; les *Oleaceae* (*Fraxinus excelsior* et *Ulmus minor*), une mise en place de la reproduction sexuée l'automne de l'année précédente (ex : blessures des racines des arbres par un animal, Clowez 2015 ; un engin mécanique).

*M. esculenta* et *M. vulgaris* sont deux morilles saprosymbiotiques, elles ont deux comportements trophiques complémentaires et complexes, l'un saprotrophe, l'autre ectomycorrhizien ou endophyte (Etudes en cours, INRA de Nancy, Le Tacon F.). Chez *M. esculenta* le caractère saprotrophe s'exprime moins que chez *M. vulgaris*, il est commun de rencontrer *M. vulgaris* sur des stations aléatoires en présence de sucres inertes comme du marc de pommes, plus largement des fruits en décomposition.

Dans des grandes années à morilles *M. vulgaris* s'associe de manière aléatoire à une plus grande diversité d'essences végétales comme avec les genres *Crateagus, Quercus, Pinus, Populus, Prunus,* mais aussi parfois à des plantes comme les topinambours.

(Il existe des morilles uniquement colonisatrices avec un fort trophisme saprophytique, citons *M. rufobrunnea*, *M. importuna*. Il existe aussi des morilles avec un fort trophisme endophytique ou ectomycorhizien, citons quelques morilles de la section *Distantes M. deliciosa*, des morilles des zones brûlées *M. tomentosa*).

**Conclusion** : Notre expérience de terrain nous amène à dire que quand le doute est avéré entre *M. esculenta* et *M. vulgaris*, il s'agit bien souvent de *M. vulgaris.* Il est maintenant assez facile de différencier *M. esculenta* et *M. vulgaris* avec des caractères macroscopiques et olfactifs simples. Si le doute persiste, l'étude des spores, de la base des asques, des acroparaphyses et des pyrames permet facilement de les séparer.

Cette étude participera à donner des bases solides à la différenciation des trois grandes sections du genre *Morchella* mais aussi de différencier plus précisément chaque espèce de morilles.

**Remerciements** : Nous remercions Jacques Melot, modérateur du forum *Mycologia Europaea* pour son aide dans le choix du mot pyrame.

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# THE GENUS HELVELLA IN CENTRAL SERBIA

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## Abstract

During surveys in central Serbia, carried out from 2009 to 2015, from the genus *Helvella* 16 species were found. Descriptions, *in situ* photos, microscopical details are given as notes on distribution, ecology, and taxonomy. Findings rare species in Europe *H. cupuliformis*, *H. atra*, *H. lactea, H. fusca*, and *H. oblongispora* are an important contribution to the knowledge of the Pezizales on the Balkan Peninsula. Key words: *Helvellaceae*, taxonomy, ecology, central Serbia.

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## Izvod

Tokom istraživanja u centralnoj Srbiji od 2009. do 2015. otkriveno je 16 vrsta iz roda *Helvella*. Dati su opisi, fotografije *in situ*, mikroskopski detalji kao i napomene o distribuciji, ekologiji i taksonomiji. Nalazi retkih vrsta u Evropi *H. cupuliformis*, *H. atra*, *H. lactea*, *H. fusca* i *H. oblongispora* su značajan doprinos poznavanju Pezizales na Balkanskom poluostrvu.

**Ključne reči:** *Helvellaceae*, taksonomija, ekologija, centralna Srbija.

## Introduction

Up to now, the research of macromycetes has not been conducted systematically on the national or local level in Serbia. The fate of the genus *Helvella* is, unfortunately, the same. Sporadic findings were rarely published in professional literature and, except photos and short descriptions found on the forums of the mycological community, there are no basic data for it. This study is just a small contribution and an attempt to provide better understanding of *Helvella*, in central Serbia.

## Materials and methods

The research has been conducted on fresh and dried samples using a Biolam C11 optical microscope with a 100-1350× magnification. Samples used for the microscope have been cut manually using a scalpel, and observations have been made in water colored with cotton blue and Congo red. Photographs have been taken using a Canon A530 camera through the microscope eyepiece. The reaction on the top of the ascus has been tested using Melzer's reagent. Photos of the fungal receptacle have been taken in situ using a Canon A630 camera. Water mounts were used to observe pigment colours and measure spores size. At least 30 spores were measured from all the apothecia available. The spore measures were taken randomly among those discharged from the asci.

## Results

Sixteen species from the genus *Helvella* have been collected in central Serbia during systematic study of macromycetes. They have been taxonomically sorted in following subgenera: *Cupuliformae* (2 species), *Elasticae* (4), *Helvellae* (5), *Leucomelaenae* (4) and *Macropodes* (1), according to the classifcation by Abbott & Currah (1997). The fungi have been recorded in the period from 2009 to 2015, and, statistically, most were found in the spring 2014, and at two locations: the Goč mountain and the Žeželj hill near Kragujevac. Spring 2014 was one of the rainiest springs within the last hundred years according to rainfall measurements in Serbia.

Determination of the ecological status is crucial for the segregation of certain species, especially ones which represent the complex of multiple species, like in the case of *Helvella lacunosa* (Landeros et al., 2012; Nguyen et al., 2013). Recent phylogenetic studies have shown that *H. elastica* and *H. atra* are saprotrophic (Hwang et al., 2015). While H. *dovrensis, H. lacunosa, H. zhongtiaoensis*, *H. reflexa, H. cf. crispa* and *H. macropus* are ectomycorrhizal (Nguyen et al., 2013; Hwang et al., 2015). However, as authors state: "*The relation between ecological and genetic divergence of Helvella species (saddle fungi) has been perplexing. While a few species have been clearly demonstrated to be ectomycorrhizal, ecological roles of many other species have been controversial, alternately considered as either saprotrophic or mycorrhizal*" (Hwang et al., 2015) and further studies in this area are required.

All *Helvella* specimens which were analyzed in this study were growing in the vicinity of plant species that were stated by the familiar literature: Dissing (1966a), Weber (1972) Häffner (1987) and Abbott & Currah (1997) and others. A problem during the identification of the possible mycorrhizal partner was that the majority of the species stated in this study were located in mixed forests (except for *H. atra* which was located at the decomposed remains of trees of unknown species and *H. monachella* and *H. fusca* which were growing near *Populus* spp.).

Not counting synonyms, there are 36 acknowledged species of the genus *Helvella* in Europa, 32 in Northern America, 20 in Asia, 3 in South America, 3 in Africa and 2 in Australia (Landeros et al., 2015). The affinity of this species towards the northern hemisphere is obvious. *H. alpestris*, *H. dovrensis, H. fusca*, *H. latispora*, *H. oblongispora*, *H. paraphysitorquata*, and *H. ulvinenii* are recorded only in Europe (Calonge & Arroyo, 1990; Dissing, 1966; Schumacher, 1992). *H. compressa*, *H. crassitunicata, H. griseoalba, H. maculata, H. robusta H. dryophila* and *H. vespertina* are known only from North America (Abbott & Currah, 1997; Weber, 1972, 1994; Nguyen et al., 2013). *H. papuensis* is known only from the tropical areas of Papua New Guinea (Dissing, 1979), while, on the other hand, *H. aestivalis, H. dovrensis* and *H. verruculosa* have artic-alpic distribution (Abbott & Currah, 1997).

Extensive studies on the North-American continent (Landeros et al., 2012; Nguyen et al., 2013) have proven that we should separate at least two species from *H. lacunosa* complex: *H. dryophila* and *H. vespertina*, plus several others that have not been named yet (Nguyen et al., 2013).

In the past ten years, extensive studies were undertaken in PR China: by Hwang et al. (2015), Wang et al. (2016), Zhao et al. (2015, 2016a, 2016b). Phylogenetic, morphological and ecological studies have shown new species in the *H. lacunosa* complex: *H. rugosa* and *H. pseudolacunosa* (Ariyawansa et al., 2015). In the complex of *H. crispa* four new species have been separated: more recently, *H. zhongtiaoensis* (Cao and Liu, 1990) and after further studies conducted by Zhao et al. (2015) *H. orienticrispa, H. pseudoreflexa* and *H. involuta.* Also, in the scope of subgenus *Helvellae*, there is a new species that should be recorded - *H. sublactea* (Wang et al., 2016).

*Helvella* has been fairly well researched during the second half of the past century: Dissing (1964, 1966a, 1966b, 1967), Weber (1972,1975), Harmaja (1974, 1977, 1978, 1979), Häffner (1987) and Abbott & Currah (1988, 1997). But this century sees studies of this genus in which morphological and molecular characters are used, especially in China and in North America: Zhuang (2004), Vite-Garín et al. (2006), Korf (2008) Landeros & Korf (2012), Landeros et al. (2012, 2015), Nguyen et al. (2013), Ariyawansa et al. (2015). Hwang et al. (2015), Wang et al. (2016) and Zhao et al. (2015, 2016a, 2016b).

As far as Europe goes, research has been continued in this century: Baiano, Filippa & Garofoli (2000), Spooner (2003), Dähncke & Innocenti (2007), Jamoni (2008), Carbone (2010), Medardi (2006, 2010), Chaillet & Frund (2010), Moyne (2010), Baiano & Filippa (2011), Perić (1999, 2010, 2011a, 2011b), Angeli & Tullii (2013), Van Vooren (2002, 2010a, 2010b, 2014) and others, but it is obvious that a complete monography of *Helvella* does not exist yet.

## HELVELLA subgenus *Cupuliformae*

### ***Helvella cupuliformis*** Dissing & Nannf., *Svensk bot. tidskr.*, 60 (2), p. 326 (1966

Synonymy:

*Cyathipodia cupuliformis* (Dissing & Nannf.) J. Breitenb. & F. Kränzl., *Champignons de Suisse* 1. Ascomycètes: 58 (1981)
*Helvella cupuliformis* var. *badia* Häffner, *Beih. Z. Mykol.* 7: 70 (1987)
*Helvella cupuliformis* var. *crassa* W.Y. Zhuang, *Mycotaxon* 90(1): 38 (2004)

#### MACROSCOPIC DESCRIPTION

**Cap**: 5–35 mm wide, in the shape of the transversally-squashed cup, later more with a plate-like opening, and finally nearly flat. **Hymenium** glabrous, brownish-gray, darker in the center, and lighter towards the margin. **External surface** (hypothecium) delicately pubescent, grayish-brown to almost fully gray, lighter towards the margin.

**Stipe**: 5–30 mm high, usually shorter than the width of the apothecium, 2–8 mm wide; cylindrical or a tad expanded in the base; often with several shallow longitudinal ribs(edge of the ribs is blunt); white or cream-white, sometimes with a pinky shade near the bottom, delicately pubescent or entirely glabrous.

#### MICROSCOPIC DESCRIPTION

**Asci** 280–365 × 12–18 µm, cylindrical, with eight spores, single-lined, with basal crozier (pleurorhynchous), non-amyloid.

**Ascospores** 16.1 [17.9; 18.7] 20.4 × 11.1 [12.2; 12.7] 13.9 µm, ellipsoid, with round ends, glabrous, transparent, with a large central guttule and sometimes with several smaller at the poles.

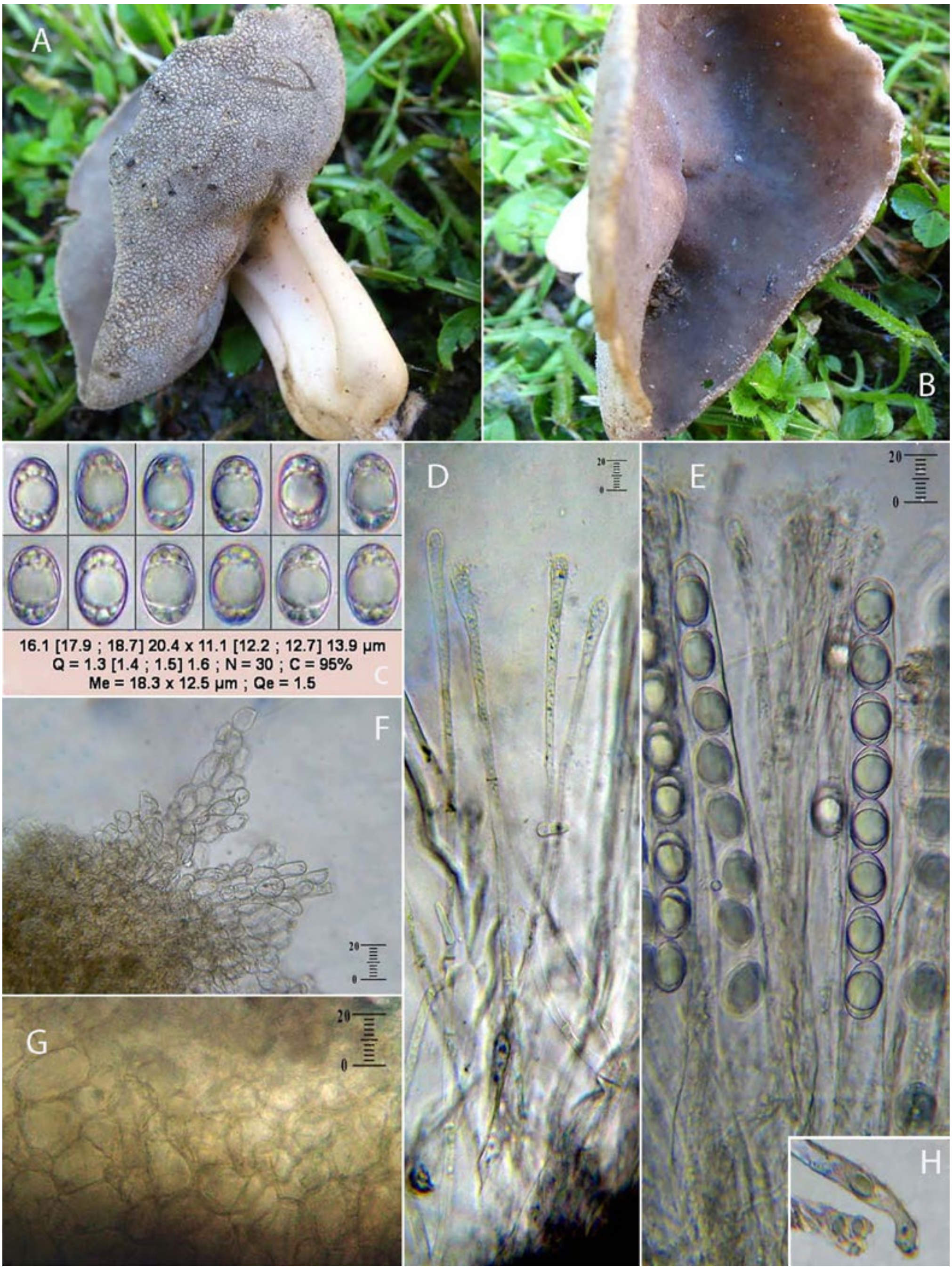

**Fig. 1.** *Helvella cupuliformis* (phot. N. Milosavljević)

**A**-**B**. ascocars; **C**. ascospores; **D**. paraphyses; **E**. asci; **F**. excipular hairs; **G**. cells of ectal excipulum; **H**. asci with basal crozier (pleurorhynchous). All in water. Scale bar is 20 µm.

**Paraphyses** as long, and a bit longer than asci, cylindrical, with a club-like thickening at the top, 3–7µm wide, with compartments, base with hooks, transparent(hyaline) with tiny granules of yellowish-brown pigment.

**Subhymenium** a light-brown *textura intricata*, with branched hyphae of 3-5 µm wide.

**Medullary excipulum** a *textura intricata*, brown colored. Ectal excipulum *textura angularis-globulosa*, composed of up to 20 µm wide brown-pigmented cells.

**Palisade** layer composed of several rows of tufts of fascicled hyphae up to 80 µm length.

### Comments

Characteristics of *H. cupuliformis* which differentiate this from similar species are the apothecium in the shape of a cup and flat stipe, sometimes with folds which can form cavities in the lower section of the stipe (particularly in mature specimens), but they never become true ribs (Landeros et al., 2015) It can be confused with *H. fibrosa, H. macropus* and *H. solitaria*. In the case of *H. fibrosa,* which is the most similar, the stipe is longer than the diameter of the apothecium, and the hymenium is dark-gray, dark gray with brown hue up to dark brown. On mature specimens of *H. cupuliformis* the diameter of apothecium is larger or equal to the size of the stipe, albeit the stipe is more robust, and the hymenium is of brighter color: light-brown to brownish-yellow (Dissing & Nannfeldt, 1966; Abbott & Currah, 1997). Microscopically, on fresh specimens, the ectal excipulum of *H. cupuliformis* is pigmented with yellowish-brown color while *H. fibrosa* is gray (Dissing & Nannfeldt, 1966) *H. macropus* has fusoid up to subfusoid ascospores while *H. cupuliformis* has ellipsoid spores (Weber, 1975). *H. solitaria* might be similar, color-wise, but it differs by distinct ribs at the stipe (Dissing & Nannfeldt, 1966).

#### Found at locations

Location 1: Goč mountain, Brezjak, at the bank of the stream in the mixed fir (*Abies*) and beech (*Fagus*) forests, elevation 890 m, 11.05.2014, *leg*. and *det*. N. Milosavljević.

Location 2: Goč mountain, Prerovo, at the bank of the Gvozdačka river, in the mixed fir (*Abies*) and beech (*Fagus*) forest, elevation 920 m, 25.07.2014., leg. and det. N. Milosavljević.

#### Distribution and habitat

*H. cupuliformis* is a relatively rare species, although it has been reported from the north of Europe (Lundell & Nannfeldt 1934; Dissing & Nannfeldt, 1966) to the south (Bizio, 1998; Perić, 2011). It is a boreal-montane species growing in humid habitats, primarily woodland, but also on sandy banks of mountain streams. In the literature, the following tree species are cited: *Abies* (Dissing & Nannfeldt, 1966; Moyne & Petit, 2007), *Pinus* (Callonge & Arroyo, 1990), *Alnus viridis* (Van Vooren, 2002). Specimens used in this study were located at the banks of the streams in mixed forest of fir (*Abies*) and beech (*Fagus*), which corresponds to the findings from Montenegro (Perić, 2011).

#### Systematics

Dissing (1966a) places *H. cupuliformis* into section *Macropodia*. Häffner (1987) moved it into section *Ephippium*. By the opinion of Abbott & Currah (1997) *H. cupuliformis* belongs to section *Cupuliformis*, along with *H. corium*, *H. fibrosa* and *H. rivularis.*

### ***Helvella fibrosa*** (Wallr.) Korf, *Mycotaxon*103: 311 (2008)

Synonyms:
*Peziza fibrosa* Wallr., *Fl. crypt. Germ.* (Norimbergae) 2: 498 (1833)
*Macropodia fibrosa* (Wallr.) Sacc., *Syll. fung.* 8: 160 (1889)

#### Macroscopic description

**Cap**: 5–20 mm wide; in the shape of a transversally squashed cup, more plate-like opened later, with a margin that is convexly curved or even flat, and radially splintered on the aged specimens. **Hymenium** is glabrous and gray, dark gray, or brownish-gray. **Sterile surface** (exterior) is pubescent, gray, gray-brown. **Stipe**: 10–35 mm high, usually longer than the apothecium width, 2–6 mm wide; cylindrical, sometimes a little curved at the base; gray or, rarely, cream-white; pubescent.

#### Microscopic description

**Asci** 245–310 × 12–14 µm, cylindrical, with eight spores, single-lined, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 16.1 [17.9; 18.7] 20.5 × 10.6 [11.5; 11.8] 12.7 µm, ellipsoid, with roundend ends, glabrous, transparent, cyanophilic, with big central guttule.

**Paraphyses** as long as asci, cylindrical, with a club-like thickening on the top, 5-6µm wide, septate, base with hooks, transparent or brownish-brown colored, cyanophilic.

**Subhymenium** a *textura intricata*, transparent or light grayish-brown composed of branching hyphae.

**Medullary excipulum** a *textura intricata* composed of branching hyphae 3–5 µm wide, grayish -brown colored.

**Ectal excipulum** *textura angularis-prismatica*, composed of cells up to 35 µm wide, colored with a grayish-brown pigment.

**Palisade** layer composed of several rows of cells of different shapes grouped into tufts of fascicled hyphae, transparent or grayish-brown colored.

#### Comments

Characteristics of *H. fibrosa* which differentiate it from similar species are the gray to grayish-brown, cup-shaped apothecium, later with a plate-like opening, cylindrical, pubescent, stipe which is usually gray colored, lighter at the ase. It can be confused with *H. cupuliformis, H. macropus* and *H. ephippium*. In *H. fibrosa*, the stipe is longer than the diameter of the apothecium and the hymenium is dark grayor dark gray with brownish hue. In *H. cupuliformis*, the diameter of the apothecium is greater or equal to the size of the stipe, the stipe itself is more robust, and the hymenium is of lighter color: light brown to brownish-yellow colored, (Dissing & Nannfeldt, 1966; Abbott & Currah, 1997) Microscopically, in fresh specimens, the ectal excipulum of *H. cupuliformis* is yellowi-

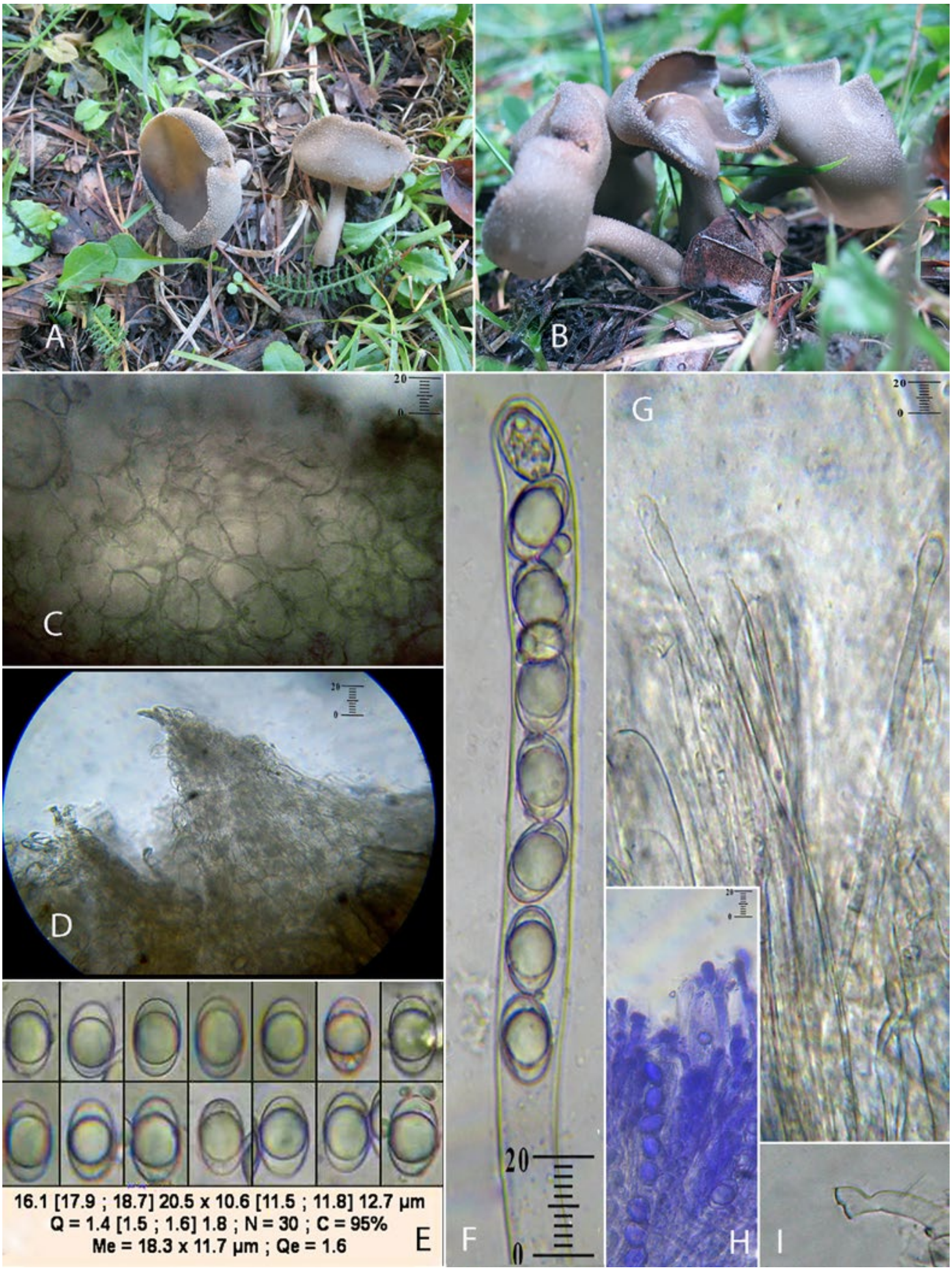

**Fig. 2.** *Helvella fibrosa* (phot. N. Milosavljević)

**A**-**B**. ascocarp; **C**. ectal excipulum cells; **D**. excipular hairs; **E**. ascospores; **F**. asci; **G**. paraphyses; **H**. asci and paraphyses; **I**. ascus with basal crozier (pleurorhynchous); All in water, except for **H** (in cotton blue). – **C**, **D**, **E**, **F**, **G**, **H** scale bar is 20 µm.

sh-brown pigmented, while it is dark grayish-brown colored in *H. fibrosa* (DISSING & NANNFELDT, 1966). *H. macropus* has fusoid to subfusoid ascospores, which is sufficient to differentiate these species, and in *H. fibrosa* they are ellipsoid (WEBER, 1972; ABBOTT & CURRAH, 1997) *H. ephippium* differs by the shape of the apothecium, which, especially in the later phase of maturation, is saddle-like, as well as by microscopic features (DISSING & NANNFELDT, 1966).

### FOUND AT LOCATIONS

Location 1: Goč mountain, Brezna, several specimens in mixed fir (*Abies*), beech (*Fagus*) and oak (*Quercus* sp.) forest, elevation 470 m, 29.10.2014.; Exsicc. GB141029-2; *leg.* and *det.* N. Milosavljević.

Location 2: Goč mountain, Cvetne livade, several specimens in mixed fir (*Abies*), beech (*Fagus*) and hazel (*Corylus*) forest, elevation 890 m, 02.11.2014; Exsicc. GCL141101-1; leg. and det. N. Milosavljević.

### DISTRIBUTION AND HABITAT

*H. fibrosa* is relatively common in Europe, although because of the similarities with *H. cupuliformis*, *H. macropus* and *H. ephippium* rarely recognized as such. This species grows in humid habitats, in deciduous and mixed forests.

### SYSTEMATICS

DISSING (1966a) place *H. fibrosa* (as *H. villosa*) in section *Macropodia*. HÄFFNER (1987) transfers *H. fibrosa* (as *H. villosa*) in section *Ephippium*. In the opinion of ABBOTT & CURRAH (1997) *H. villosa* (now Systematics) belongs in section *Cupuliformis*, along with *H. cupuliformis, H. corium* and *H. rivularis*. KORF (2008) showed that *H. fibrosa* is the correct name for *H. villosa.*

## HELVELLA subgenus *Elasticae*

***Helvella atra*** J. König, in Olafsen & Povelsen, *Reisen ingien. Island, Append.*: 20 (1770)

Synonyms:
*Leptopodia atra* (J. König) Boud., *Hist. Class. Discom. Eur. Klincksieck*. (Paris): 37 (1907)

### MACROSCOPIC DESCRIPTION

**Cap**: 5–25 mm wide; saddle-shaped or with 2 irregular lobes. **Hymenium** glabrous, light gray, dark gray or almost completely black. **Sterile surface** (exterior) glabrous to subpubescent, light gray, dark gray, grayish-brown colored. **Stipe**: 8–20 mm high, 2–6 mm thick; cylindrical or a little widened at base, sometimes slightly curved; sometimes with several barely visible ribes with blunt edge, in the lower third of the stipe; gray, dark gray or almost black, pubescent.

### MICROSCOPIC DESCRIPTION

**Asci** 230–280 × 12–17 µm, cylindrical; with eight spores, single-lined; with basal crozier (pleurorhynchous); inamyloid.

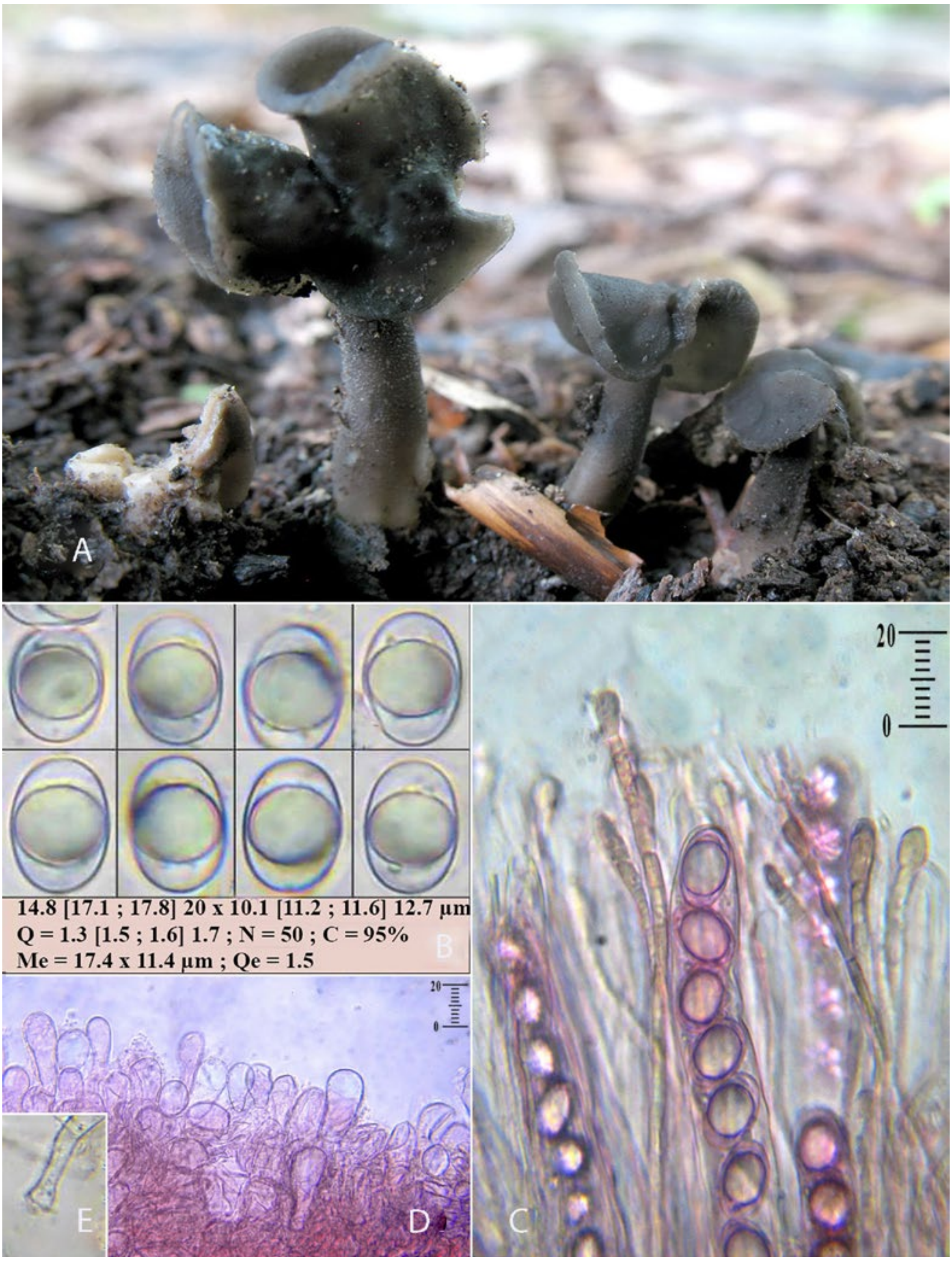

**Fig. 3.** *Helvella atra* (phot. N. Milosavljević)
**A**. ascocarp; **B**. ascospores; **C**. asci and paraphyses in cotton blue; **D**. palisade cells of ectal excipulum in cotton blue; ascus with basal crozier (pleurorhynchous) in water. –**C**, **D** scale bar is 20 µm.

**Ascospores** 14.8 [17.1; 17.8] 20 × 10.1 [11.2; 11.6] 12.7 µm, ellipsoid, glabrous, transparent, with large central guttule and sometimes with several smaller ones at the poles of the spores. Paraphyses equally long or a bit longer than asci, cylindrical with a club-like thickening at the top, 3–7 µm wide, septate, branching in the lower third, brown, transparent and with small granules.

**Subhymenium** a *textura intricata*, light grayish-brown, composed of several branched hyphae.

**Medullary excipulum** a *textura intricata*, grayish-brown, colored, composed of intertwined branching hyphae, septate, 3–5 µm wide.

**Ectal excipulum** a *textura angularis-prismatica,* colored with a grayish-brown pigment, cyanophilic.

**Palisade** layer is made of club-shaped cells.

### Comments

*H. pezizoides* is the most similar, albeit her apothecium is far more opened and curved outwards and the hypothecium is more pubescent than in *H. atra*.

### Found at locations

Location: Goč mountain, Cvetne livade, several specimens in the fir (*Abies*) birch (*Betula*) and beech (*Fagus*) forest, on a decomposed tree at the elevation of 890 m, 24.06.2014.; Exsicc. GCL140624-3; *leg.* and *det.* N. Milosavljević.

### Distribution and habitat

*H. atra* is a rare species in Europe. It grows in group or solitary, from July to November on the ground on decomposed trees, on the humus soil, in deciduous or mixed forests, along with *Carpinus*, *Urtica* (Häffner,1987).

### Systematics

Dissing (1966) and Häffner (1987) place *H. atra* in section *Ephippium*. By the opinion of Abbott & Currah (1997) it belongs in subgenus *Elasticae*.

## ***Helvella elastica*** Bull.: Fr., *Herb. Fr.* (Paris) 6: tab. 242 (1785)

Synonyms:

*Helvella albida* Schaeff. [as 'Elvella'], *Fung. bavar. palat. nasc.* (Ratisbonae) 4: 101 (1774)
*Helvella albida* Pers., *Observ. mycol*. (Lipsiae) 1: 71 (1796)
*Helvella albida* var. *fuliginosa* Pers., *Syn. meth. fung.* (Göttingen) 2: 616 (1801)
*Helvella elastica* f. *guepinioides* (Berk. & Cooke) Boud.
*Helvella elastica* var. *alba* Bull., *Hist. Champ. Fr.* (Paris) 1: 299, tab. 242:ABD-G (1791)
*Helvella elastica* var. *albida* Sacc., *Syll. fung.* (Abellini) 8: 24 (1889)
*Helvella elastica* var. *fusca* Bull., *Hist. Champ. Fr.* (Paris) 1: 299 (1791)
*Helvella elastica* var. *macropoda* Font Quer, *Cavanillesia* 3: 172 (1931)
*Helvella elastica* var. *pallide-fuliginea Sacc., Syll. fung.* (Abellini) 8: 24 (1889)
*Helvella fuliginosa* Dicks., *Fasc. pl. crypt. brit.* (London) 2: 25 (1790)
*Helvella fuliginosa* Sowerby, *Col. fig. Engl. Fung. Mushr.* (London) 2: 65, tab. 154 (1799)
*Helvella guepinioides* Berk. & Cooke, in Cooke, *Mycogr.*, Vol. 1. Discom. (London)(no. 5): 198, fig. 337 (1878)
*Helvella klotzschiana* Corda, in Sturm, *Deutschl. Fl., 3 Abt. (Pilze Deutschl.)* 3: tab. 57 (1831)

*Helvella pulla* Holmsk., *Beata Ruris Otia FUNGIS DANICIS* 2: 49 (1799)
*Helvella pulla* f. *klotzschiana* (Corda) Rehm, in Winter, *Rabenh. Krypt.-Fl., Edn* 2 (Leipzig) 1.3(lief. 53): 1183 (1895) [1896]
*Leptopodia elastica* (Bull.) Boud., *Icon. Mycol.* (Paris) 2: tab. 232 (1907)
*Leptopodia elastica* var. *guepinioides* (Berk. & Cooke) Boud., *Icon. Mycol.* (Paris) 2: tab. 232 (1907)
*Leptopodia klotzschiana* (Corda) Boud., *Hist. Class. Discom. Eur.* (Paris): 37 (1907)
*Leptopodia pulla* (Holmsk.) Boud., *Hist. Class. Discom. Eur.* (Paris): 37 (1907)
*Patella albida* (Schaeff.) Seaver, *North American Cup-fungi*, (Operculates) (New York): 175 (1928)
*Peziza hemisphaerica* Schumach., *Enum. pl.* (Kjbenhavn) 2: 422 (1803)
*Peziza hirsuta* Holmsk., *Beata Ruris Otia FUNGIS DANICIS* 2: 37, tab. 19 (1799)
*Peziza hispida* Huds., *Fl. Angl., Edn* 2 2: 635 (1778)
*Sepultaria albida* (Schaeff.) Morgan, *J. Mycol.* 8(4): 188 (1902)
*Tubipeda elastica* (Bull.) Falck, *Mykol. Untersuch. Ber.* 1(3): 401 (1923)

### Macroscopic description

**Cap**: 10–35 mm wide; saddle-shaped with two or three lobes which are concavely bent towards the stipe. **Hymenium** glabrous, light gray, ochre gray or light-brown, after dehydration, it becomes dark brown. **External sterile surface** is glabrous, in the color of hymenium or bright gray. It is grayish-brown rarely, when connected with the stipe. **Stipe**: 20–80 mm high, 3–7 mm thick, hollow, more or less cylindrical, narrowing on the top, a little wider at the base, it can be slightly curved, sometimes with a few barely visible shallow ribs with blunt edge on the lower part of the stipe, or with one or more shallow cavities; in the color of a sterile surface, gray or cream-white, glabrous.

### Microscopic description

**Asci** 290–320 × 15–19μm, a little taller than paraphyses, cylindrical, with eight spores, with a single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 16.6 [19; 19.9] 22.3 × 10.7 [12; 12.5] 13.7 μm, elongated ellipsoid, glabrous, with curved endings, transparent, with a large central guttule, and sometimes with several smaller ones one the poles of the spores.

**Paraphyses** as equally long as ascus or a little longer, cylindrical, with a club-like thickening at the top, 5–9 μm wide, septate, branching in the lower third, brown colored, transparent with small granules, cyanophilic.

**Subhymenium** is t*extura intricata,* transparent or light brown colored, composed of branching hyphae.

**Medullary excipulum** is *textura intricata,* transparent or light-brown colored, composed of branching intertwined hyphae, septate.

**Ectal excipulum** is *textura angularis.*

**Palisade** layer composed of enlarged, club-like cells, light-gray colored pigmented.

### Comments

*H. elastica* can be easily recognized if it appears in its standard form, with saddle-like apothecium and long stipe. Of the most similar ones: *H. latispora* and *H. albella* differentiate by the shape of cap and a lack of hairs (Abbott & Currah, 1997).

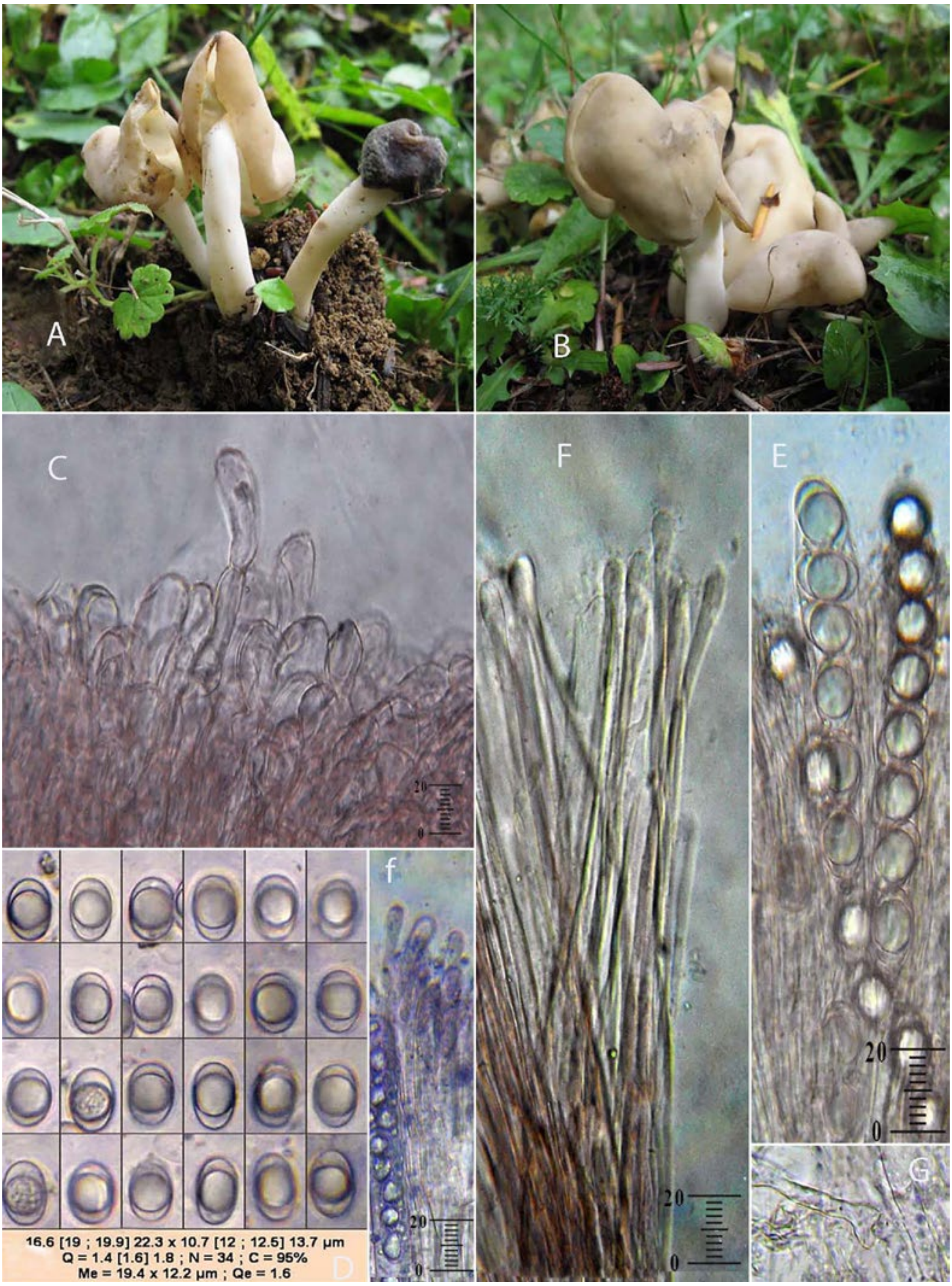

**Fig. 4.** *Helvella elastica* (phot. N. Milosavljević)

**A-B**. ascocarps; **C**. cells of ectal excipulum; **D**. ascospores; **E**. asci; **F**. paraphyses; **f**. asci and paraphyses; **G**. ascus with basal crozier (pleurorhynchous); All in water except for **f** (in cotton blue). – **C**, **E**, **F**, **F**, **f** scale bar is 20 µm.

### FOUND AT LOCATIONS

Location: The Goč mountain, Dobre vode, several specimens near the road in the mixed fir (*Abies*), birch (*Betula*) and beech (*Fagus*) forest, on the ground, at the elevation of 910 m, 11.10.2009., leg. and det. N. Milosavljević.

### DISTRIBUTION AND HABITAT

*H. elastica* is a common species that grows from the lowlands to the mountainous zone in deciduous and mixed forests from July to October. The literature lists: in Europe, deciduous and larch( *Larix*) forests (DISSING, 1966), *Pinus, Abies, Fagus, Quercus, Carpinus, Fraxinus, Acer* (HÄEFFNER, 1987), *Carpinus, Fagus, Picea, Quercus, Populus* (VAN VOOREN 2010). The specimens listed in this study are found near the road in the mixed forest of fir (*Abies*), beech (*Fagus*), hazel (*Corylus*), hornbeam (*Carpinus*) and ash (*Fraxinus*).

### SYSTEMATICS

DISSING (1966a), HÄFFNER (1987) and ABBOTT & CURRAH (1997) *H. elastica* place it in section *Elasticae*.

## ***Helvella ephippium*** Lév., *Annls Sci. Nat., Bot., sér.* 2 16: 240 (1841)

Synonyms:
*Helvella atra var. murina* (Boud.) Keissl., *Annln naturh. Mus.* Wien 35: 13 (1922)
*Helvella murina* (Boud.) Sacc. & Traverso, *Syll. fung. (Abellini)* 19: 849 (1910)
*Helvella murina* var. *huyoti* (Boud.) Sacc. & Traverso, *Syll. fung. (Abellini)* 19: 849 (1910)
*Leptopodia ephippium* (Lév.) Boud., *Hist. Class. Discom. Eur.* (Paris): 37 (1907)
*Leptopodia murina* Boud., *Hist. Class. Discom. Eur.* (Paris): 37 (1907)
*Leptopodia murina* var. *huyoti* Boud., *Hist. Class. Discom. Eur.* (Paris): 38 (1907)

### MACROSCOPIC DESCRIPTION

**Cap**: 5–25 mm wide; in the shape of a transversally squashed cup, later more plate-like opened or bent toward the stipe in the shape of the saddle. **Hymenium** glabrous, light-gray, gray or light-gray or light-brown with a bit of green. Sterile surface (exterior) pubescent, bright gray, grayish-brown or dark gray. **Stipe**: 10–35 mm high, 2–6 mm wide; cylindrical or a bit expanded at the base, sometimes a little curved, sometimes with barely noticeable longitudinal ribs with blunt edge, which do not reach up to hymenium; in the color of sterile surface, gray or cream-white, more or less pubescent.

### MICROSCOPIC DESCRIPTION

**Asci** 210–280 x 15–18 µm, cylindrical, with eight spores, in a single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 16.3 [17.6; 18.1] 19.4 ×10.1 [11.3; 11.7] 12.9 µm, are ellipsoid, glabrous, with dull ends, transparent with a large central guttule and sometimes with few smaller at the spore poles, cyanophilic.

**Paraphyses** equally long or a little longer then asci, cylindrical, with a club-like widening at the top, 3–7 µm wide, septate, branching in the lower third, brown-colored, transparent with smaller granules.

**Subhymenium** a *textura intricata*, light grayish-brown, consisting of the branching hyphae.

***Medullary excipulum*** a *textura intricata*, grayish-brown colored, consisting of the intertwined branching hyphae, septate, 3–5 µm wide.

**Ectal excipulum** a *textura angularis,* consisting of cells up to 45 µm wide, grayish-brown pigmented.

**Palisade** layers are consisted of multiple rows of elongated cells 15–35 × 9–18 µm grouped into cone shaped bundles, cyanophilic.

### Comments

*H. ephippium* is a very variable species, so Häffner (1987) recorded three different forms. Characteristics which differentiate them from similar species are the apothecium in the form of a saddle. The most similar ones are *H. pezizoides*, *H. atra* and *H. albella*, but they have black apothecia and different habitats, while *H. latispora* does not have a pubescent excipulum (Abbott & Currah, 1997). It can be confused with *H. fibrosa*, *H. cupuliformis* and *H. macropus*. *H. fibrosa*, which is the most similar, has a different shape of apothecium. *H. cupuliformis* has a large diameter of apothecium or equal to stipe size, the stipe itself is more robust, and hymenium is light brown to brownish-yellow, while hymenium of *H. ephippium* is light gray to gray. (Dissing & Nannfeldt, 1966; Abbott & Currah, 1997). *H. macropus* has fusoid to subfusoid ascospores and *H. ephippium* has ellipsoid spores (Weber, 1972; Abbott & Currah, 1997).

#### Found at locations

Location 1: the Goč mountain, Cvetne livade, three specimens in the hazel (*Corylus*) forest, with fir (*Abies*), birch (*Betula*) and beech (*Fagus*) in the vicinity, on the ground, at the elevation of 890 m, 23.07.2014., *leg*. and *det*. N. Milosavljević.

Location 2: the Goč mountain, Brezjak, two specimens, in the mixed forest of fir (*Abies*) and beech (*Fagus*) beneath the hazel (*Corylus*) on the ground, at the elevation of 930 m, 28.08.2014, leg. and det. N. Milosavljević.

#### Distributions and habitat

This is a species that grows in humid habitats, mostly on limestone, in deciduous and mixed forests, from June to October. The literature lists in Europe: *Corylus*, *Crataegus*, *Fraxinus, Quercus* (Dissing, 1966)*, Fagus, Quercus, Robinia, Carpinus, Acer* (Häffner, 1987), *Aesculus hippocastanum* (Van Vooren, 2010). The specimens listed in this study were found at the bank of the stream in mixed forest of fir (*Abies*) and beech (*Fagus*), but near hazel (*Corylus*) in both cases.

#### Systematics

Dissing (1966a) and Häffner (1987) *H. ephippium* place in section *Ephippium*. By the opinion of Abbott & Currah (1997), *H. ephippium* belongs in subgenus *Elasticae*.

16.3 [17.6 ; 18.1] 19.4 x 10.1 [11.3 ; 11.7] 12.9 µm
Q = 1.4 [1.5 ; 1.6] 1.7 ; N = 50 ; C = 95%
Me = 17.9 x 11.5 µm ; Qe = 1.6

**Fig. 5.** *Helvella ephippium* (phot. N. Milosavljević)

**A**-**B**. ascocarps; **C**. ascus in congo red; **D**. asci and paraphyses; **d**. paraphyses; **E**, **e**. excipular hairs; **F**. ascospores. – **D**, **E**, **F** in water; **C**, **d** in congo red and **e** in cotton blue. For **C**, **.** scale bar is 100 µm; for **E**, **e**, **d** 10 µm.

## ***Helvella monachella*** (Scop.) Fr., *Syst. mycol.* (Lundae) 2(1): 18 (1822)

Synonyms:
*Helvella monachella* f. *brevistipitata* Bánhegyi, *Borbásia* 1(3-7): 89 (1939)
*Helvella monachella* var. *cohaerens* Chenant., *Bull. Soc. Sci. Nat. Ouest*, sér. 4 1 (1921)
*Phallus monachella* Scop., *Fl. carniol.*, Edn 2 (Wien) 2: 476 (1772)

### Macroscopic description

**Cap**: 7–35 mm wide, in the shape of the saddle or split into two or three lobes. **Hymenium** glabrous, dark brown, brownish-black or completely black. **The sterile surface** (exterior) is glabrous, cream-white, it becomes ochre to light-brown when it dries. **Stipe**: 20–45 mm high, 3–7 mm thick, hollow, cylindrical, narrowing on the top, a little expanded at the bottom, sometimes with a few shallow longitudinal ribs with blunt edge on lower third of the stipe, in the color of the sterile surface, cream-white, glabrous.

### Microscopic description

**Asci** 310–360 × 14–17 µm, are cylindrical, with eight spores, with a single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 17.8 [18.7; 23.2] 24.4 ×12.7 [12.5; 14.9] 15 µm, elongated ellipsoid, glabrous, with round margins, transparent, with big central guttule and sometimes several smaller ones on the poles of the spores.

**Paraphyses** as long as ascus, or a little longer than asci, cylindrical, with a club-like widening at the top, 6–9 µm wide, septate, branching in the lower third, brown colored, transparent with small granules, cyanophilic.

**Subhymenium** a *textura intricata,* transparent or lightly brown colored, composed of branching hyphae.

**Medullary excipulum** a *textura intricata,* transparent or lightly brown colored, composed of branching hyphae, septate, cyanophilic.

**Ectal excipulum** a *textura angularis.*

**Marginal tomentum** composed of club-like cells, with a light pigmentation, cyanophilic.

### Comments

*H. monachella* differs from *H. albella* by size and spores, as well as by different growth period (Calonge & Arroyo, 1990). It differs from *H. atra* by the color of the sterile surface and stem, which is white at first and, after drying, becomes brown colored, (Häffner,1987), while *H. atra* has gray as a dominant color without brown tones (Medardi, 2006).

### Found at locations

Location: the Rudnik mountain, near the Vraćevšnica monastery, one specimen found near *Populus* spp. on the sandy ground near the stream, at the elevation of 411 m, 22.04.2012, Exsicc. RV120422-1; *leg.* and *det.* N. Milosavljević.

**Fig. 6.** *Helvella monachella*, Phot. N Milosavljević
**A**. ascocarp; **B**. excipular hairs; **C**. ascospores; **D**. asci and paraphyse; **E.** asci; **F**. ascus with basal crozier (pleurorhynchous). **D** in water; **B**, **E** in Congo red; **C**, **F** in cotton blue. – **B**, **D**, **E** scale bar is 20 mm.

### Distribution and habitat

*H. monachella* is a relative common species un the middle and south Europe, and an interesting fact is that it has never been recorded on the north of the continent (Dissing, 1966a) It is a species that fruits in the spring season and grows single or in smaller groups on sandy, sedimentary rock in deciduous and mixed forests, mostly near *Populus* spp. (Häffner, 1987).

### Systematics

Dissing (1966a), Häffner (1987) and Abbott & Currah (1997) *H. spadicea* (*H. monachella*) place in section *Elasticae*.

## Helvella subgenus *Helvella*

***Helvella crispa*** (Scop. : Fr.) Fr., *Syst. mycol.* (Lundae) 2(1): 14 (1822)

Synonyms:
*Costapeda crispa* (Scop.) Falck, *Śluzowce monogr., Suppl.* (Paryz) 3: 401 (1923)
*Helvella barlae* Boud. & Pat., *J. Bot.,* Paris 2: 445 (1888)
*Helvella crispa* f. *grevillei* (J. Kickx f.) Massee, *Brit. Fung. -Fl.* (London) 4: 459 (1895)
*Helvella crispa* var. *alba* Fr., *Syst. mycol.* (Lundae) 2(1): 14 (1822)
*Helvella crispa* var. *barlae* (Boud. & Pat.) Boud., *Hist. Class. Discom. Eur.* (Paris): 35 (1907)
*Helvella crispa* var. fulva Bull., *Hist. Champ. Fr.* (Paris) 1: 293 (1791)
*Helvella crispa* var. *fusca* Bull., *Hist. Champ. Fr.* (Paris) 1: 293 (1791)
*Helvella crispa* var. *grevillei* J. Kickx f., *Fl. Crypt. Flandres* (Paris) 1: 504 (1867)
*Helvella crispa* var. *lutescens* Fr., *Syst. mycol.* (Lundae) 2(1): 14 (1822)
*Helvella crispa* var. *pithyophila* (Boud.) Donadini, *Bull. Soc. linn. Provence* 28: 75 (1975)

### Macroscopic description

**Cap**: 10–60 mm wide; at first in the shape of the saddle, later split into irregular shaped lobes. **Hymenium** is glabrous or a little rugose, white to cream-white. The sterile surface (exterior) is pubescent, darker than hymenium, beige or light-brown, sometimes with torn margins, ribs reach out to the third of the outer side of apothecium. **Stipe**: 15–80 mm high, usually longer than the width of the apothecium, 5–30 mm wide; cylindrical or wide on the bottom; cream-white, with longitudinal and transversal ribs, anatomized, with longitudinal chambers and cavities, more or less pubescent.

### Microscopic description

**Asci** 230–350 × 14–17µm, cylindrical, with eight spores, with a single row, with basal crozier (pleurorhynchous), inamyloid. Ascospores17.6 [18.3; 18.6] 19.4 × 11.6 [12.3; 12.6] 13.2 µm, ellipsoid or elongated ellipsoid, glabrous, transparent, with large central guttule.

**Paraphyses** are as long as asci, cylindrical, with club-like widening on the top, 3–6 µm wide, septate, base with hooks, with smaller granules , transparent or light-brown colored.

**Subhymenium** is *textura intricata*, light-brown colored or transparent, composed of branching hyphae.

**Fig. 7.** *Helvella crispa*, (phot. N Milosavljević):
**A**. ascocarps; **B**. asci and paraphyses; **D**. palisade layer of ectal excipulum cells; **C**. ascospores; **E**. ascus with basal crozier (pleurorhynchous). All in water. For **B** scale bar is 100 µm for **D** 20 µm.

**Medullary excipulum** is *textura intricata* composed of branching hyphae, yellowish-brown colored.

**Ectal excipulum** is *textura angularis-prismatica,* composed of cells which are irregular shaped, yellowish-brown colored.

**Palisade** layer composed of short rows of cylindrical cells, with last cell shaped like a club, gathered into cone-shaped bundles, transparent.

### Comments

*H. fusca* is a similar species which differs by size and color, amount of pubescence, and habitat (Abbott & Currah, 1997). It can be confused with *H. lactea*, but it is smaller, has apothecium that is usually connected to the stipe and gets orange-brown when dried (Dissing, 1966b).

Phylogenetic and morphological analyses revealed that *H. crispa* typified by European specimen does not occur in China. Instead, at least six phylogenetic species could be identified among the Chinese collections labeled as *H. crispa* (Zhao et al., 2015). One of these phylogenetic species can be assigned to a known Chinese species, *H. zhongtiaoensis* (Cao and Liu, 1990). Of the remaining five species, three are formally described as *H. orienticrispa, H. pseudoreflexa* and *H. involuta*, respectively, while the other two (*Helvella* spp. 1–2) are left undescribed as a limited number -collections was available (Zhao et al., 2015).

### Found at locations

Location: Kragujevac, Adžine livade, several specimens, in the mixed forest of beech (*Fagus*) and oak (*Quercus*) on the ground, at the elevation of 410 m, 31.10.2010.; Exsicc. GAL101031-5; *leg*. and *det*. N. Milosavljević.

### Distribution and habitat

*H. crispa* is widespread in Europe. It fruits from July to November. It is a species that prefers humid habitats in deciduous, particularly beech (*Fagus*) and oak (*Quercus*), and mixed forests in Europe.

### Systematics

Dissing (1966a) places *H. crispa* in section *Crispae*, Häffner (1987) placed it in section *Helvella*, and Abbott & Currah (1997) consider it to belong in subgenus *Helvella*.

## ***Helvella lactea*** Boud., *Hist. Class. Discom. Eur.* (Paris): 36 (1907)

### Macroscopic description

**Cap**: 10–30 mm wide; in the shape of the saddle, with two or three lobes, sometimes connected to the stipe. **Hymenium** usually rugose or delicately pubescent white, cream white or colored like a white coffee. **The sterile surface** (exterior) is glabrous, with same color as the hymenium. **Stipe**: 15–50 mm high, longer than the width of the apothecium, wide 5–8 mm; glabrous, cylindrical, narrowing at the base; in the color of the apothecium with several longitudinal, deep, parallel ribs which reach from the top to the base, with blunt edge. When dried it becomes orange-brown colored.

### MICROSCOPIC DESCRIPTION

**Asci** 200–260 × 12–17 µm, cylindrical, with eight spores, with a single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 15.6 [17.3; 18] 19.6 × 9.9 [11.1; 11.7] 13 µm, ellipsoid, glabrous, with round ends, transparent with a large central guttule, barely cyanophilic.

**Paraphyses** are as long as asci, cylindrical, with a club-like widening at the top, 4.5–8.9 µm wide, septate, base with hooks, transparent or light yellowish-brown colored, with yellowish-green granules occasionally , barely cyanophilic.

**Subhymenium** is *textura intricata*, 65–80 µm, transparent or light yellowish-brown, composed of branching hyphae.

**Medullary excipulum** is *textura intricata*, 250–380 µm composed of branching hyphae 3–5 µm wide, transparent or yellowish-brown colored.

**Ectal excipulum** is *textura angularis,* 65–85 µm, transparent or yellowish-brown colored, barely cyanophilic.

**Palisade** layer composed of elongated club-shaped cells, light yellowish-brown colored or transparent, barely cyanophilic.

### COMMENTS

HÄFFNER (1987) considered this species a variant of *H. lacunosa* without pigment. *H. lactea* can be confused with *H. crispa*, but it has a larger, brownish apothecium which is not connected to the stipe and doesn't have a glabrous hymenium. *H. lacunosa* has always gray tints, even in light colored specimens (*H. lacunosa* f. *alba,* DÄHNCKE, 2006), gray tone is present. When dried, *H. lacunosa* retains gray color and *H. lactea* becomes orange-brown (DISSING, 1966a; WEBER, 1975; ABBOTT & CURRAH, 1997).

Phylogenetic and morphological study in southwest China (ZHAO et al., 2015), has shown the existence of another white taxon - *H. sublactea* Q. Zhao, M. Wang & Y. C. Zhao, differentiated from *H. lactea* and *H. lacunosa* (WANG et al., 2016).

### FOUND AT LOCATIONS

Location: On the west side of the Rudnik mountain, near the Bare village, two specimens in the mixed forest of oak (*Quercus* sp.) and pine *(Pinus nigra*) at the elevation of 337 m, in the moss on the ground.18.11.2015.; Exsicc. RB201511181; *leg*. and *det*. N. Milosavljević.

### DISTRIBUTION AND HABITAT

*H. lactea* is widespread: there are documented findings in Europe (DISSING, 1966b; CALONGE & ARROYO, 1990), North America (DISSING, 1966a; DISSING and LANGE, 1967; ABBOTT & CURRAH, 1997; LANDEROS, CARRANZA & GUZMÁN-DÁVALOS, 2014) and Asia (LIU and CAO, 1988), but it is rare in every region. Due to its similarity with *H. crispa*,

**Fig. 8.** *Helvella lactea* (phot. N. Milosavljević):

**A-B.** ascocarps; **C**. ectal excipulum; **D**. ascospores; **E**. asci and paraphyses; **F**. ascus with basal crozier (pleurorhynchous). **C-D** in water; **E-F** in cotton blue. For **C** scale bar is 20 µm; for **E** 100 µm.

and especially *H. lacunosa* it is possible that some findings are not determined properly and thus sorted into one of these two species. *H. lactea* is a species which fruits from July to the December, individually or in smaller groups, in humid habitats or on plant remains in deciduous and mixed forests in Europe. It fruits near *Betula* and *Alnus* (Häffner,1987).

### Systematics

Dissing (1966a) places *H. lactea* in section *Lacunosae*, approved by Häffner (1987). According to Abbott & Currah (1997) *H. lactea* belongs to subgenus *Helvella*, along with *H. crispa, H. lacunosa, H. fusca* and two American species *H. maculata* and *H. palustris.*

## ***Helvella lacunosa*** Afzel. : Fr., *K. Vetensk-Acad. Nya Handl.* 4: 304 (1783)

Synonyms:
*Costapeda lacunosa* (Afzel.) Falck, *Śluzowce monogr., Suppl.* (Paryz) 3: 401 (1923)
*Helvella cinerea* (Afzel.) Rea, *Trans. Br. mycol. Soc.* 13(3-4): 254 (1928)
*Helvella infula* var. *nuda* (Afzel.) Pers., *Syn. meth. fung.* (Göttingen) 2: 618 (1801)
*Helvella lacunosa* f. *alba* Dähncke, in Dähncke & Innocenti, *Cantarela* 34: 1 (2006)
*Helvella lacunosa* var. *cerebriformis* Chenant., *Bull. Soc. Sci. Nat. Ouest*, sér. 4 1 (1921)
*Helvella lacunosa* var. *javanica* Penz. & Sacc., *Malpighia* 15(7-9): 201 (1902) [1901]
*Helvella lacunosa* var. *major* Sacc., *Syll. fung.* (Abellini) 8: 19 (1889)
*Helvella lacunosa* var. *minor* Sacc., *Syll. fung.* (Abellini) 8: 19 (1889)
*Helvella lacunosa* var. *sulcata* (Afzel. : Fr.) S. Imai, *Sci. Rep. Yokohama Natl. Univ.*, Sect. 2 3: 20 (1954)
*Helvella lacunosa* var. *tricuspidata* Krombh., *Naturgetr. Abbild. Beschr. Schwämme* (Prague) 3: 35, tab. 21: 22-24 (1834)
*Helvella leucophae*a Pers., *Syn. meth. fung.* (Göttingen) 2: 616 (1801)

### Macroscopic description

**Cap**: 10–50 mm wide; early in the shape of the saddle, later divided into lobes of irregular shape. **Hymenium** glabrous or with small folded, black, dark gray, dark grayish-brown to pale gray. **The sterile surface** (exterior) is glabrous, pale gray to dark grayish-brown, connected to the stipe, sometimes with ribs extending to the margin. **Stipe**:15–60 mm high, usually longer than the width of the apothecium, 3–30 mm wide; cylindrical or widening on the bottom; pale gray, brownish-gray to black, lighter at the base, with longitudinal and transversal ribs with sharp edge forming cavities, lacunose, glabrous.

### Microscopic description

**Asci** 230–310 × 13–17 µm, cylindrical, with eight spores, with a single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 17.6 [18.3; 18.6] 19.4 ×11.6 [12.3; 12.6] 13.2 µm, ellipsoid, glabrous, transparent with large central guttule.

**Paraphyses** as long as asci, cylindrical, with a club-like thickening at the top, 4–7µm wide, septate, base with hooks, with small granules in the plasma, transparent or light-brown colored.

**Subhymenium** is *textura intricata,* yellowish-brown, composed of branching hyphae.

**Medullary excipulum** is *textura intricata,* composed of branching hyphae, yellowish-brown colored or transparent.

**Ectal excipulum** is textura angularis-prismatica, yellowish-brown colored.

**Palisade** layer composed of club-like shaped cells, transparent or light grayish-brown colored.

### Comments

*H. lacunosa* is a very variable species, so mistakes can be made when dealing with similar species. *Helvella lactea* differs by color from *H. lacunosa* which is always gray colored, and even when very bright colored specimens are encountered. (*H. lacunosa* f. *alba* Dähncke, 2006) the gray tone is present. When dried, *Helvella lacunosa* retains gray color, and *H. lactea* becomes orange-brown colored. (Dissing, 1966a; Weber, 1972; Abbott & Currah, 1997). *H. philonotis* and *H. phlebophora*, are smaller in dimensions, have a convex apothecium which is not connected to the stem. (Dissing, 1966a; Abbott & Currah, 1997).

After a series of phylogenetic research in the last few years (Landeros et al., 2012; Nguyen et al., 2013; Ariyawansa et al., 2015), we can conclude that *H. lacunosa* Afzel. is a complex of several species. Research conducted in North America indicates that the species from western North America and Mexico are different from species from eastern North America, Asia and Europe (Nguyen et al., 2013). Two species, *Helvella dryophila* Vellinga & N.H. Nguyen and *H. vespertina* N.H. Nguyen & Vellinga were described as new species in the complex of *H. lacunosa.* (Nguyen et al., 2013).

Similar studies have been done in China and two new species: *H. rugosa* Q. Zhao & K.D. Hyde and *H. pseudolacunosa* Q. Zhao & K.D. Hyde were recognized (Ariyawansa et al., 2015). The latter species also occurs in Europe and was known as quintessential *H. lacunosa* (Dissing 1966a, Nguyen et al., 2013; Ariyawansa et al., 2015).

This phylogenetic studies have shown that even in Europe there are more species in the complex *H. lacunosa* and that a new phylogenetic study of European species is badly needed.

### Found at locations

Location 1: The Goč mountain, Prerovo, several specimens, in the mixed forest of beech (*Fagus*) and fir (*Picea*), on the ground, at the elevation of 1141 m, 06.08.2014.; Exsicc. GP140806-1 *leg*. and *det*. N. Milosavljević.

Location 2: The Goč mountain, Brezjak, several specimens, in the mixed forest of beech (*Fagus*) and fir (*Picea*), on the ground, at the elevation of 897 m, 03.10.2014.; Exsicc. GB141003-1; *leg*. and *det*. N. Milosavljević.

Location 3: Gledićke planine, Adžine livade, several specimens, in the mixed forest of beech (*Fagus*) and oak (*Quercus*) on the ground, at the elevation of 410 m, 31.10.2010.; Exsicc. GAL101031-1; *leg*. and *det*. N. Milosavljević.

### Distribution and habitat

*H. lacunosa* is widespread in Europe. It fruits from June to November. It is a species that prefers humid habitats, in deciduous and mixed forests. In Europe it fruits in coniferous and deciduous forests (Dissing 1966a).

### Systematics

Dissing (1966a) and Häffner (1987) place *H. lacunosa* in section *Lacunosae*, and

**Fig. 9.** *Helvella lacunosa* (phot. N. Milosavljević): **A**-**B**. ascocarps; **C**. ectal excipulum; **D**. ascospores with pustules; **E**. asci and paraphyses; **F**. paraphyses; **G**. ascus with basal crozier (pleurorhynchous). **F** scale bar is 20 µm;  All in water except for **G** (in cotton blue) and for **D** (in Congo red). – **E**. scale bar is 100 µm.

Abbott & Currah (1997) consider it to belong in subgenus *Helvella*.

***Helvella sulcata*** Afzel., K. Vetensk-Acad. Handl. 4: 305 (1783)

Synonyms:

*Helvella lacunosa* var. *sulcata* (Afzel.) S. Imai, *Sci. Rep. Yokohama Natl. Univ., Sect.* 2 3 :20 (1954)

### Macroscopic description

**Cap**: 10–35mm wide; saddle-shaped, with two or three slices with a relatively regular shape. **Hymenium** is smooth or slightly wrinkled, pale gray, dark gray, dark grayish-brown, or black. **Sterile surface** (exterior) is smooth, pale gray to dark grayish-brown, connected with the stipe sometimes with the ribs going to the margin. **Stipe**: 8–30mm, 3–10mm wide; cylindrical or expanded at the bottom, white, pale gray, brownish-gray, a bit lighter at the base with longitudinal ribs, glabrous.

### Microscopic description

**Asci** 230–310 × 13–17 µm, cylindrical, with eight spores, single-row, ending with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 14.9 [16; 16.8] 17.9 × 10.3 [10.8; 11.2] 11.7 µm ellipsoid, smooth, transparent, with a large central guttule.

**Paraphyses** as long as asci, cyllindrical, with a club-like thickening at the top, 4–7 µm wide, septate, base with hooks, with granules in the plasma, transparent or bright-brown colored.

**Subhymenium** is *textura intricata*, yellowish-brown, consisting of branched hyphae.

**Medulary excipulum** *is textura intricata* consisting of branched hyphae, yellowish-brown or transparent.

**Ectal excipulum** is *textura angularis-prismatica*, with yellowish-brown color.

**Palisade** layer consists of cells which are club-shaped, transparent or barely grayish-brown.

### Comments

The opinions regarding *H. sulcata* as a species are long divided. Dissing (1966a) as well as Abbott & Currah (1997) consider it a synonym of *H. lacunosa*, whilst Weber (1972), Landeros & Korf (2012) and Landeros & Guzmán-Dávalos (2013) consider it to be a separate species. Häffner(1987) proposes that *H. lacunosa* var. *sulcata* f. *minima* is classified as a separate entity. Phylogenetic studies encompassing *H. lacunosa* Nguyen at al. (2013) and Landeros at al. (2015) have shown that *H. sulcata* possibly deserves the status of an individual species. Further research regarding the *H. lacunosa* complex will be necessary, especially in Europe.

*H. sulcata* differs from *H. lacunosa* by its smaller size, dimension-wise, and yet it has relatively an even cap shape, in a form of a saddle, with two or three lobes and ribbed stipe, but without cavities. Fruits in spring and summer. Observed specimens match the original description (Afzelius, 1873).

### Found at locations

Kragujevac, Žeželj hill – several specimens, in the mixed forest of beech (*Fagus*) and oak

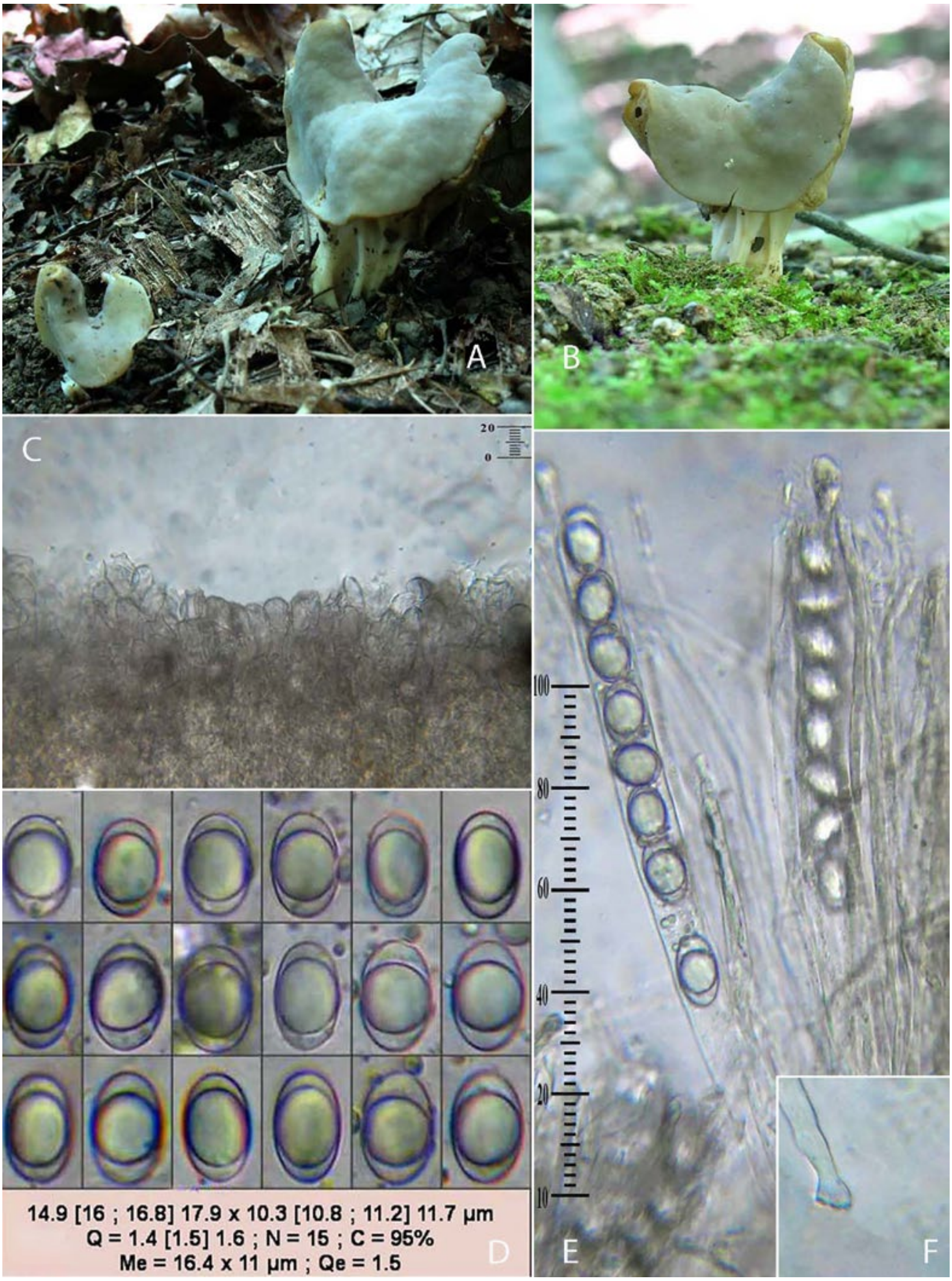

**Fig. 10.** *Helvella sulcata* (phot. N. Milosavljević):
**A**-**B**. ascocarps; **C**. ectal excipulum; **D**. ascospores; **E**. asci and paraphyses; **F**. asci with basal crozier (pleurorhynchous). All in water. For **C** scale bar is 20 µm, for **E** 100 µm.

(*Quercus*), on the ground, at the elevation of 384 m, 22.05.2014. *leg*. and *det*. N.Milosavljević.

### DISTRIBUTION AND HABITAT

*H. sulcata* is widespread in Europe, but it is likely that its findings were classified under *H. lacunosa*. It fruits from May to September. It is a species which prefers humid habitats, in deciduous and mixed forests of *Quercus*, *Populus*, *Alnus, Salix* and *Corylus* on calcareous soil.

### SISTEMATICS:

WEBER (1972) placed it in section *Lacunosae.*

## ***Helvella fusca*** Gillet, *Champignons de France, Discom.* (1): 9 (1879)

Synonyms:

*Helvella fusca* var. *bresadolae* Boud., *Icon. Mycol.* (Paris) 2: 15 (tab. 557) (1910)

*Helvella fusca* var. *gyromitroides* Chenant.*, Bull. Soc. Sci. Nat. Ouest,* sér. 4 1 (1921)

### MACROSCOPIC DESCRIPTION

**Cap**: 20–35 mm wide; in the shape of a saddle, or split into lobes of irregular shape, later with a convex opening, free or connected with the stipe. **Hymenium** is glabrous or with small folded, bright to dark brown. **The sterile surface** (exterior) is glabrous or delicately pubescent, white to bright brown, with ribs extending towards the margin. **Stipe**: 20–35 mm high, 10–15mm wide; cylindrical, a little expanded at the bottom; white or bright brown, with longitudinal and transversal ribs with cavities, glabrous or delicately pubescent.

### MICROSCOPIC DESCRIPTION

**Asci** 260–330 x 14–16 µm, cylindrical, with eight spores, single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 16.5 [18.6; 19.3] 21.3 × 10.8 [11.9; 12.2] 13.3 µm, ellipsoid, glabrous, transparent with a large central guttule.

**Paraphyses** long as asci, with a club-like thickening at the top, 5–8 µm wide, septate, branching near the bottom, with granules in the plasma, transparent or with bright-brown colored.

**Subhymenium** a *textura intricata*, bright yellow to brown, consisting of branched hyphae.

**Medullary excipulum** a *textura intricata,* consists of branched hyphae, almost transparent.

**Ectal excipulum** a *textura angularis-prismatica*, bright yellow to brown.

**Palisade** layer composed of several rows of tufts of fascicled hyphae, with ending cells of cylindric or club-like shape, transparent or barely yellowish-brown, cyanophilic.

### COMMENTS

*H. fusca* could be mistaken for *H. lacunosa*, but the difference in color, ribs on the external side of the apothecium and spore distinguish these two species (DISSING,1966a).

**Fig. 11.** *Helvella fusca* (phot. N. Milosavljević):
**A**-**B**. ascocarp; **C**. ascospores; **D**. ectal excipulum; E. asci and paraphyses; **F**. asci and paraphyses; **G**. ascus with basal crozier (pleurorhynchous). – **C**-**E** in water; **F**-**G** in cotton blue. For **E**, **F** scale bar is 100 µm, for **D** 20 µm.

### Found at locations

Location: Kragujevac, Žeželj hill, two specimens in the mixed forest, under the aspen (*Populus*) on the ground, at the elevation of 418 m, 22.05.2014., *leg*. and *det*. N. Milosavljević.

### Distribution and habitat

After recent phylogenetic studies (Landeros at al., 2015) and taxonomic corrections (Landeros & Korf, 2012), it was concluded that *H. fusca* is exclusively a European species, but that it is also quite rare in Europe, and more common in the south of the continent and grows in the spring. This species prefers humid habitats and its tied to *Populus* spp. (Dissing, 1966a; Häffner, 1987; Calonge & Arroyo, 1990; Dupuy, 2008).

### Systematics

Dissing (1966a) placed it in section *Crispae*, and Häffner (1987) in section *Helvella*, while Abbott & Currah (1997) consider that it belongs to subgenus *Helvella*.

## Helvella subgenus *Leucomelaenae*

***Helvella acetabulum*** (L.) Quél., *Hyménomycètes, Fasc. Suppl. (Alençon)*: 102 (1874)

Synonyms:
*Acetabula acetabulum* (L.) Underw. & Earle, Bull. *Alabama Agricultural Experiment Station* 80: 200 (1897)
*Acetabula barlae* Boud., *Hist. Class. Discom. Eur.* (Paris): 40 (1907)
*Acetabula sulcata* (Pers.) Fuckel, *Jb. nassau. Ver. Naturk*. 23-24: 330 (1870) [1869-70]
*Acetabula sulcata* var. *pinetorum* Maire, *Bull. Soc. Hist. nat. Afr. N.* 8: 177 (1917)
*Acetabula vulgaris* Fuckel, *Jb. nassau. Ver. Naturk*. 23-24: 330 (1870) [1869-70]
*Acetabula vulgaris* f. *barlae* (Boud.) Keissl., *Annln naturh. Mus. Wien* 35: 10 (1922)
*Acetabula vulgaris* f. *pallescens* Keissl., *Annln naturh. Mus. Wien* 35: 10 (1922)
*Acetabula vulgaris* var. *alba* Velen., *Novitates Mycologicae*: 200 (1939)
*Aleuria acetabulum* (L.) Gillet, *Champignons de France, Discom.*(2): 36 (1879)
*Helvella dalgeri* Donadini, *Bull. Soc. linn. Provence* 36: 136 (1985) [1984]
*Macroscyphus acetabuliforme* Gray, *Nat. Arr. Brit. Pl.* (London) 1: 672 (1821)
*Octospora acetabulum* (L.) Timm, *Fl. Megapol. Prodr.*: 260 (1788)
*Paxina acetabulum* (L.) Kuntze, *Revis. gen. pl.* (Leipzig) 2: 864 (1891)
*Paxina barlae* (Boud.) Seaver, *North American Cup-fungi*, (Operculates) (New York): 205 (1928)
*Paxina sulcata* (Pers.) Kuntze, *Revis. gen. pl.* (Leipzig) 2: 864 (1891))
*Peziza acetabulum* var. *velutina* Lév., *Annls Sci. Nat., Bot.*, sér. 3 5: 251 (1846)
*Peziza sulcata* Pers., *Syn. meth. fung*. (Göttingen) 2: 643 (1801)
*Phleboscyphus vulgaris* (Fuckel) Clem., *Bull. Torrey bot. Club* 30: 94 (1903)

### Macroscopic description

**Cap**: 10–80 mm wide; and cup-shaped, sometimes transversally squashed, later with a more plate-like, on mature samples sometimes radially torn. **Hymenium** glabrous or with small folds, ochre, bright brown, dark brown, or brownish gray. **The sterile surface** (exterior) is pubescent, sometimes almost completely glabrous, with external margin in the color of

**Fig. 12.** *Helvella acetabulum* (phot. N. Milosavljević):
**A**. ascocarps; **B**. ascospores; **C**. asci and paraphyses; **D**. ectal excipulum; **E**. ascus with basal crozier (pleurorhynchous); **F**. asci and paraphyses. All in water except for **E** (in Congo red) and **F** in cotton blue. Scale bar is 20 µm.

hymenium, gradually brighter at the bottom, towards cream-white. **Stipe**: 5–45 mm high, shorter than the width of the apothecium, 2–30 mm wide, cylindrical or gradually narrower at the bottom, cream-white to bright brown; ribs may arrive halfway, some to three quarters, and others to the edge of the apothecial sterile surface; ribs have sharp edges, pubescent.

### MICROSCOPIC DESCRIPTION

**Asci** 280–360 × 10–15µm, cylindric, with eight spores, with a single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 17.6 [18.3; 18.6] 19.4 × 11.6 [12.3; 12.6] 13.2 µm, ellipsoid, glabrous with round margins, transparent with a large central guttule.

**Paraphyses** as long as asci, cylindrical, with a club-like thickening at the top, 3–6 µm wide, branching near the bottom, with granules in the plasma, transparent or with yellowish hue.

**Subhymenium** a *textura intricata*, yellowish or transparent, consisting of branching hyphae.

**Medullary excipulum** a *textura intricata* consisting of branching hyphae, yellowish-brown.

**Ectal excipulum** a *textura angularis-prismatica*, consisting of irregularly shaped yellowish-brown cells.

**Palisade** layer consisting of several rows of cells of different shapes, gathered into tufts of fascicled hyphae, which are transparent or with a yellowish-brown intracellular pigment.

### COMMENTS

*Helvella costifera* is a similar but smaller species, with ribs with blunt edge sometimes reaching the margin of apothecium, colored gray and brown, with transparent excipular hair and somewhat smaller spores. (DISSING, 1966b; DISSING & LANGE, 1967), (HARMAJA, 1979a), (ABBOTT & CURRAH, 1997). *H. griseoalba* and *H. unicolor* are also similar, yet differentiate in color and size. *H. hyperborea* a cryophilic species, is considered a synonym of *H. costifera*, based on molecular phylogenetic studies (LANDEROS at al., 2012).

### FOUND AT LOCATIONS

Location: Kragujevac, Žeželj hill, several specimens, in the mixed forest of beech (*Fagus*), oak (*Quercus*) and hornbeam (*Carpinus*), on the ground, at the elevation of 410 m, 03.05.2014. Exsicc. GZ140503-1; *leg.* and *det.* N. Milosavljević.

### DISTRIBUTION AND HABITAT

*H. acetabulum* is widespread in Europe. It fruits from April to June. It is a species which prefers humid habitats in deciduous and mixed forests on limestone in Europe.

### SYSTEMATICS

DISSING (1966a), WEBER (1972) and HÄFFNER (1987), place it in section *Acetabulum*, and ABBOTT & CURRAH (1997) transferred it into subgenus *Leucomelaenae*.

## ***Helvella costifera*** Nannf., *Fungi Exsicc. Suec., Fasc*. XLI-XLII(sched.): 37 (1953)

Synonyms:
*Acetabula costifera* (Nannf.) Benedix, *Westfälische Pilzbriefe* 5: 113 (1965)
*Discina costata* (Fr.) Sacc., *Syll. fung. (Abellini)* 8: 103 (1889)
*Paxina costifera* (Nannf.) Stangl, *Pilzfunde aus der Augsburger Umgebung* (1963)
*Peziza costata* Fr., *Nova Acta R. Soc. Scient. upsal., Ser*. 3 1(1): 120 (1851) [1855] 63).

### Macroscopic description

**Cap** : 15–55 mm wide and cup-shaped, sometimes transversally squashed, later with a plate-like opening, often radially split on mature samples. **Hymenium** glabrous or folded bright gray, gray, grayish-brown, dark gray. **The sterile surface** (exterior) is pubescent, external margin is in the color of hymenium, becoming gradually brighter until cream-white, ribs sometimes reach the external margin of apothecium. **Stipe**: 5–30 mm high, shorter than the width of apothecium, 5–12 mm wide; becomes narrower towards the bottom; cream-white to bright gray, with longitudinal anastomosing ribs; ribs with blunt edge, more or less pubescent.

### Microscopic description

**Asci** 250–320 × 10–15 µm, cylindrical, with eight spores, in a single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 17.6 [18.3; 18.6] 19.4 × 11.6 [12.3; 12.6] 13.2 µm, ellipsoid, glabrous, transparent, with a large central guttule.

**Paraphyses** as long as asci, cylindrical, with a club-like thickening at the top, 3–6 µm wide, septate, branching near the bottom, with granules in the plasma, transparent or with weak, grayish-brown pigment.

**Subhymenium** a *textura intricata,* transparent, consisting of branching hyphae.

**Medullary excipulum** a *textura intricata* consists of branching hyphae, brown and gray colored.

**Ectal excipulum** a *textura angularis-prismatica,* consisting of irregularly shaped cells, yellowish-brown colored.

**Palisade** layer consisting of several rows of cells of different shape, gathered in tufts of fascicled hyphae which are transparent or yellowish-brown.

### Comments

*H. acetabulum* is a similar, but larger species, with ribs with a sharp margin, with brown color and excipular hair pigmented with brown and somewhat larger spores. (Dissing, 1966b; Dissing & Lange, 1967), (Harmaja, 1979b), (Abbott & Currah, 1997). *H. griseoalba* is also similar, with ribs, with sharp margins.

### Found at locations

Location: Kragujevac, Žeželj hill, several specimens, in the mixed forest of beech (*Fagus*), oak (*Quercus*) and hornbeam(*Carpinus*), on the ground, at the elevation of 410 m, 24.06.2014, *leg*. and *det*. N. Milosavljević.

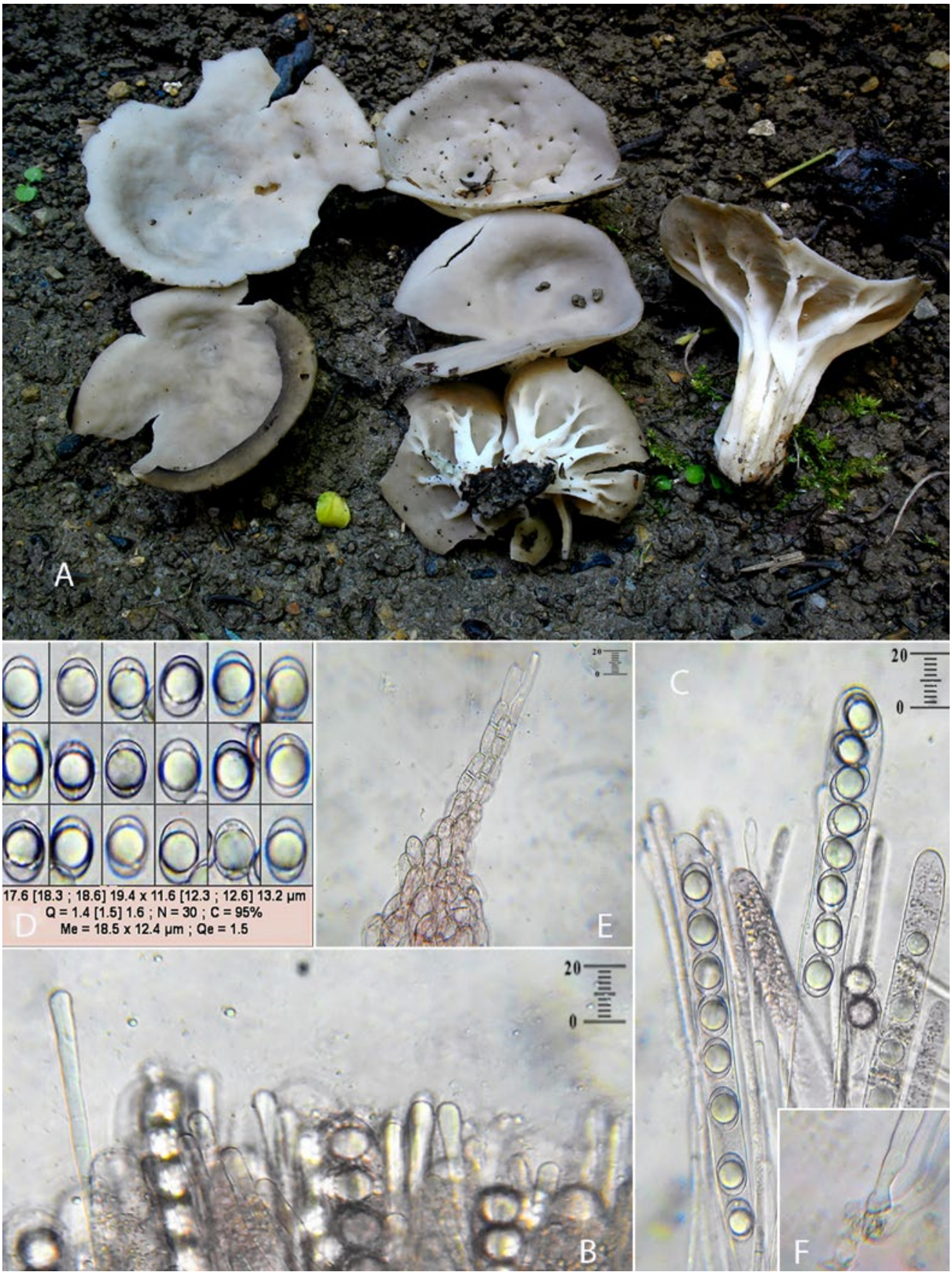

**Fig. 13.** *Helvella costifera* (phot. N. Milosavljević):
**A**. ascocarps; **B**. paraphyses; **C**. asci and paraphyses; **D**. ascospores; **E**. ectal excipulum; **F**. asci with basal crozier (pleurorhynchous). All in water except for **E** (in Congo red). – **B**, **C**, **E** scale bar is 20 µm.

### DISTRIBUTION AND HABITAT

*H. costifera* is relatively rare in Europe. It fruits from June to September. In Europe, this species prefers humid habitats, deciduous and mixed forests on limestone.

### SYSTEMATICS

DISSING (1966a), WEBER (1972) and HÄFFNER (1987), place it in section *Acetabulum*, and ABBOTT & CURRAH (1997) transferred it to subgenus *Leucomelaenae*.

## ***Helvella oblongispora*** Harmaja, *Karstenia* 18: 57 (1978)

### MACROSCOPIC DESCRIPTION

**Cap**: 15–55 mm wide and cup-shaped, sometimes transversally squashed, later more and more with a plate-like, sometimes radially torn in mature specimens, often with holes. **Hymenium** glabrous or slightly rugose, light ochre to brown, brown-gray or dark brown, after drying brown-black. **External margin** is somewhat lighter then hymenium, gradually lighter towards the bottom until it becomes cream-white or white. Ribs have blunt edge and sometimes reach the external margin of the apothecium. Ribs are sometimes transversally connected (anastomized). **Stipe**: 15–30 mm high, shorter than width of the apothecium, 5–12 mm wide; cream-white; tapered to the bottom, glabrous, with longitudinal anatomizing ribs; ribs with blunt edge.

### MICROSCOPIC DESCRIPTION

**Asci** 250–320 × 10–15 µm, cylindrical, with eight spores, in a single row, with basal crozier (aporhynchous), non-amyloid.

**Ascospores** 18 [19.6; 20.2] 21.8 × 11.3 [12.5; 13] 14.2 µm, elongated ellipsoid, glabrous, with round margins, transparent, with a large central guttule.

**Paraphyses** long as asci, cylindrical, with a club-like thickening at the top or with a spindle-like ending (fusoid), 6-8 µm wide, septate; base with hooks, transparent and light brown colored.

**Subhymenium** a *textura intricata*, transparent, consisting of branched hyphae.

**Medullary excipulum** a *textura intricata* consisting of branched hyphae, transparent.

**Ectal excipulum** a *textura angularis*, consisting of irregular shaped cells, light yellowish-brown.

**Palisade** cells consisting of club-like cells, transparent or barely yellowish-brown.

### COMMENTS

*H. acetabulum* is a similar, but larger species, with ribs with sharp edge, brown colored, with excipular hair pigmented with brown color; with somewhat larger spores and with a crozier at the base of the asci (DISSING, 1966b, DISSING & LANGE, 1967), (HARMAJA, 1979a), (ABBOTT & CURRAH, 1997). *H. confusa* is also similar, but fruits in spring; *H. pendiculata* and *H. aestivalis* are two an alpine and Nordic species (DISSING, 1966b).

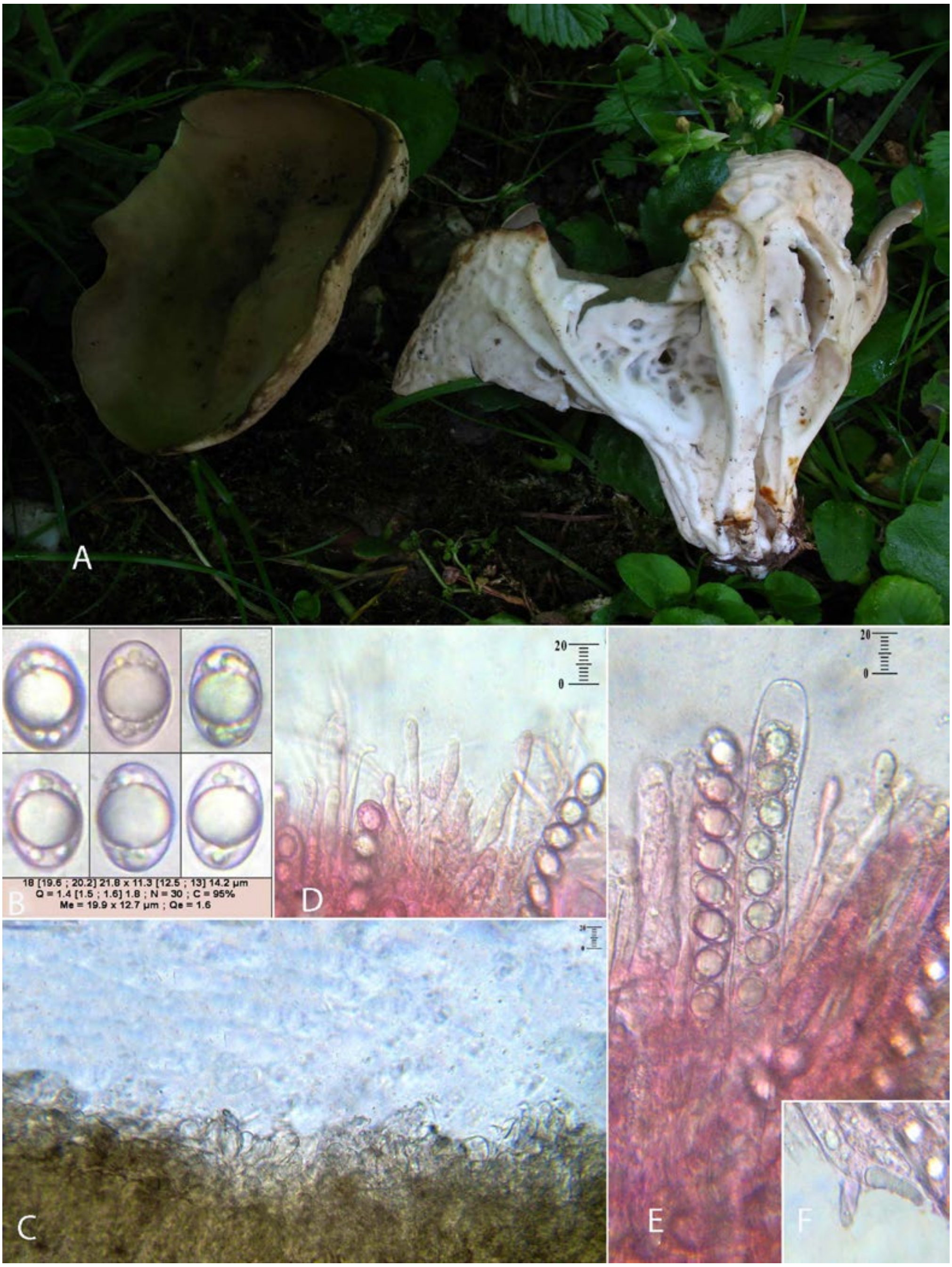

**Fig. 14.** *Helvella oblongispora* (phot. N. Milosavljević):
**A**. ascocarps; **B**. spores; **C**, **D** endings of the paraphyses x400; **E**. palisade cells x400; **F**. asci x400; **G**. ascus without basal crozier (aporhynchous). – **B**, **E** in water; **C**-**D**, **F**-**G** in Congo red. For **C**, **D**, **E**. scale bar is 20 µm.

### Found at locations

Location: Goč mountain, Cvetne livade, two samples, in the mixed forest of beech (*Fagus*), spruce (*Picea*) and fir (*Abies*), on the ground, at the elevation of 890 m, 24.06.2014., *leg*. and *det*. N. Milosavljević.

### Distribution and habitat

*H. oblongispora* is not known from the American continent, (Abbott & Currah,1997), (Landeros et al., 2015), and it is fairly rare in Europe. It fruits from June to September. This species prefers humid habitats in fir and mixed forests on limestone. Grows along: *Betula*, *Pinus* and *Abies* (Häffner, 1987) Specimens used in this study were located in mixed forest of beech (*Fagus*), spruce (*Picea*) and fir (*Abies*).

### Systematics:

Häffner (1987) classifies it in section *Leucomelaenae*.

## ***Helvella solitaria*** (P. Karst.) P. Karst., *Bidr. Känn. Finl. Nat. Folk* 19: 37 (1871)

Synonyms:

*Acetabula amphora* (Quél.) Sacc., Syll. fung. (Abellini) 8: 60 (1889)
*Acetabula calyx* Sacc., *Mycotheca veneti*: no. 168 (1873)
*Acetabula calyx* var. *amphora* (Quél.) Boud., *Hist. Class. Discom. Eur.* (Paris): 40 (1907)
*Lachnea solitaria* Bizz. & Sacc., *Mycotheca veneti:* no. 323 (1876)
*Paxina amphora* (Quél.) Kuntze, R*evis. gen. pl.* (Leipzig) 2: 864 (1891)
*Paxina calyx* (Sacc.) Kuntze, *Revis. gen. pl.* (Leipzig) 2: 864 (1891)
*Peziza amphora* Quél., *Bull. Soc. bot. Fr.* 23: 331 (1877) [1876]
*Peziza solitaria* P. Karst., *Not. Sällsk. Fauna et Fl. Fenn. Förh.* 10: 111 (1869)

### Macroscopic description

**Cap**: 10–50 mm wide; in the shape of transversally squashed cup, later more with a plate-like opening but with an margin convexly bent or flat, sometimes with a torn margin on mature specimens. **Hymenium** is glabrous, brownish-gray, or dark brown. **Sterile surface** (exterior) is pubescent, exterior margin in the color of hymenium, becoming gradually lighter until it reaches cream-white at the external side of the apothecium. **Stipe**: 10–70 mm high, longer or of apothecium width, 5–15 mm wide; cylindrical, sometimes a bit elongated and bent in the base, cream-white, rarely grayish or light-brown, with longitudinal ribs with round blunt edgs, pubescent.

### Microscopic description

**Asci** 290–340 × 14–18 µm, cylindrical, with eight spores in a single row, with basal crozier (pleurorhynchous), inamyloid.

**Ascospores** 16.4 [18.3; 19.2] 21.1 × 10.7 [12; 12.7] 14µm, are ellipsoid, glabrous with round margins, transparent, cyanophilic, with a large central guttule.

**Paraphyses** long as asci, cylindric with club-like thickening at the top, 5–7 µm wide, septate, base with hooks, transparent, with granules in the plasma, lighter or darker brown colored.

**Subhymenium** a *textura intricata*, transparent or barely yellowish-brown, consisting of branched hypes.

**Medullary excipulum** a *textura intricata* consisting of branched hyphae and gray.

**Ectal excipulum** a *textura angularis-globulosa,* consisting of irregular shaped cells, yellowish brown.

**Palisade** layer consists of several rows of cells of different shape, grouped into transparent tufts of fascicled hyphae, or barely yellowish-brown.

### Comments

One of the similar species is *H. leucomelanea* along with *H. hyperborea* and *H. unicolor* but the spore sizes differ, as well as shape and color of the ascomata (Dissing, 1966), (Abbott & Currah, 1997).

### Found at locations

Location: Kragujevac, Žeželj hill, several collections, in mixed forest of oak(*Quercus*), beech (*Fagus*), hornbeam (*Carpinus*) and pine (*Pinus*) at an elevation of 410 m, 03.05.2014; Exsicc. GZ140503-1; *leg.* and *det.* N. Milosavljević.

### Distribution and habitat

*H. solitaria* is relatively common in Europe, widespread from north to south and inhabits terrain from lowlands to high alpine habitats. It fruits from April to September. It is the species which prefers humid habitats, in the conifer and mixed forests on limestone. It grows next to: *Larix* and *Pinus* (Bizio,1998).

### Systematics

Dissing(1966a) and Abbott & Currah(1997) classified in section *Leucomelaenae*. But Häffner (1987) formed a separate section *Solitariae* for *H. solitaria* along with *H. alpestris* and *H. ulvinenii.*

## Helvella subgenus *Macropodes*

***Helvella macropus*** (Pers.) P. Karst., *Bidrag Känn. Finl. nat. Folk*, 19, p. 37 (1871)

Synonyms:
*Aleuria macropus* (Pers.) Gillet, *Champignons de France*, Discom.(2): 35 (1879)
*Cowlesia bulbosa* (Hedw.) Nieuwl., *Am. Midl. Nat.* 4: 380 (1916)
*Cowlesia macropus* (Pers.) Nieuwl., *Am. Midl. Nat.* 4: 380 (1916)
*Cyathipodia bulbosa* (Hedw.) Boud., *Hist. Class. Discom*. Eur. (Paris): 39 (1907)
*Cyathipodia macropus* (Pers.) Dennis, *British Cup Fungi & their Allies:* 7 (1960)
*Helvella bulbosa* (Hedw.) Kreisel, *Boletus, SchrReihe* 1: 29 (1984)
*Helvella macropus* f. alba (Wichanský) Šebek, *C.C.H.* 48: 41 (1971)
*Lachnea bulbosa* (Hedw.) W. Phillips, *Man. Brit. Discomyc.* (London): 205 (1887)
*Lachnea macropus* (Pers.) W. Phillips, *Man. Brit. Discomyc.* (London): 207 (1887)

**Fig. 15.** *Helvella solitaria* (phot. N. Milosavljević):
**A**. ascocarps; **B**. ectal excipulum; **C**. ectal excipulum; **D**. ascospores; **E**-**F**. asci and paraphyses; **G**. with basal crozier (pleurorhynchous). All in water except for **B**, **F** (in Congo red) and **G** (in cotton blue). For **B**, **C**, **E**, **F**. scale bar is 20 µm.

*Macropodia bulbosa* (Hedw.) Sacc., *Syll. fung. (Abellini)* 8: 158 (1889)
*Macropodia macropus* (Pers.) Fuckel, *Jb. nassau. Ver. Naturk*. 23-24: 331 (1870) [1869-70]
*Macropodia macropus* f. *alba* Wichanský, *C.C.H.* 46: 101 (1969)
*Macropodia macropus* var. *gilva* Imbach, *Mitt. naturf. Ges. Luzern* 15: 69 (1946)
*Macroscyphus macropus* (Pers.) Gray, *Nat. Arr. Brit. Pl.* (London) 1: 672 (1821)
*Peziza bulbosa* (Hedw.) Nees, S*yst. Pilze (Würzburg):* fig. 289 (1816) [1816-17]
*Peziza macropus* Pers., *Observ. mycol.* (Lipsiae) 1: 26 (1796)
*Peziza macropus* Sturm, *Deutschl. Fl.* (Frankfurt) (1798)
*Peziza macropus* var. *communis* Alb. & Schwein., *Consp. fung.* (Leipzig): 313 (1805)
*Peziza macropus* var. *erosa* Pers., *Mycol. eur.* (Erlanga) 1: 237 (1822)
*Peziza macropus* var. hirta Pers., *Observ. mycol.* (Lipsiae) 1: 26, tab. 1:3 (1796)
*Peziza macropus* var. *tephromelas* Pers., *Observ. mycol.* (Lipsiae) 1: 26 (1796)
*Peziza stipitata* Huds., F*l. Angl., Edn* 2 2: 639 (1778)
*Peziza stipitata* var. *alba* Bull., *Hist. Champ. Fr.* (Paris) 1: 271, tab. 457:2STXZ (1791)
*Peziza stipitata* var. *fusca* Bull., *Hist. Champ. Fr.* (Paris) 1: 271, tab. 196:A-C (1791)

### Macroscopic description

**Cap**: 0.8–35 mm wide; in the shape of a transversally squashed cup, later with a plate-like, sometimes radially torn. **Hymenium** glabrous, light-gray, grayish-brown or dark gray and brown. **Sterile surface** (exterior) is in the color of hymenium, furfuraceous, especially on the exterior margin. **Stipe**: 25–45 × 3–6 mm, cylindrical, narrow at base, concolorous to apothecium or darker, rarely cream-white, and in the lower third sometimes with shallow ribs, furfuraceous.

### Microscopic description

**Asci** 250–340 × 14–18 µm, cylindrical, with eight spores in a single row, with basal crozier (pleurorhynchous), cyanophilic in the upper third.

**Ascospores** 16.4 [18.3; 19.2] 21.1× 10.7 [12; 12.7] 14 µm, fusoid, subfusoid, glabrous or sometimes with pustules (verruculose), transparent, with a large central guttule and several smaller ones at the poles.

**Paraphyses** long as asci, cylindrical, with a club-like thickening at the top, 5–9 µm wide, septate, base with hooks, transparent, with granules in the plasma, colored with lighter or darker gray, cyanophilic.

**Subhymenium** a *textura intricata*, transparent or barely yellowish-brown, consisting of branching hyphae.

**Medullary excipulum** a *textura intricata* consisting of branching hyphae, yellowish-brown.

**Ectal excipulum** a *textura angularis-prismatica,* consisting of cells of irregular shape, colored with yellowish-brown pigment, cyanophilic.

**Palisade** layer consists of several long rows of cells of different shape, grouped into tufts of fascicled hyphae, which are transparent or colored with yellow and brown, cyanophilic.

## Comments

*H. macropus* differ from the species of subgenus *Cupuliformae*, primarily from *H. cupuliformis* and *H. fibrosa,* by its color and spore shape.

### FOUND AT LOCATIONS

Location 1: Goč mountain, Brezjak, several specimens, in the mixed forest of fir (*Picea*) beech (*Fagus*) and hornbeam (*Carpinus*), at the surface level, at the elevation of 878 m,12.07.2014.; Exsicc. GCL140712-1; *leg.* and *det.* N. Milosavljević.

Location 2: planina Goč, Dobre vode, several specimens, in the mixed forest of fir (*Picea*) beech (*Fagus*), birch (*Betula*) and hornbeam (*Carpinus*), at the surface level, at the elevation of 914 m, 02.11.2014.; *leg.* and *det.* N. Milosavljević.

### DISTRIBUTIONS AND HABITAT

*H. macropus* is relatively common and widespread in Europe, inhabiting areas from lowlands to high mountains. It fruits from May to November. This is a species which prefers humid, swampy habitats, in conifer or mixed forests. In reference with: *Populus*, *Quercus*, *Fagus*, *Betula*, *Corylus* and *Alnus* (HÄFFNER,1987).

### SYSTEMATICS

DISSING (1966a) and HÄFFNER (1987) placed *H. macropus* in section *Macropodes*. ABBOTT & CURRAH (1997) believe that it belongs to subgenus *Macropodes*.

## CONCLUSION

*Helvella* has not been extensively studied in the countries of the Balkan peninsula. *Helvella* species that are considered rare and endangered and included in Red Lists in Balkan countries are listed in table 1 Serbia, Greece and Albania do not list any as endangered or rare. *H. atra* is listed in four countries and could be considered the rarest species in the Balkans. This species is also on the list of 51 rare and endangered macromcyetes composed by the European Council for Conservation of Fungi (FRAITURE and OTTO (2015).

This is the first study of the genus *Helvella* in Serbia. Very little can be found on the Internet, at mushroom forums, regarding the presence of *Helvella*, in Serbia. The available data are provided by amateur mycologists from non-governmental organizations active in mycology on the territory of Serbia and its neighbouring countries. Those are, most commonly, just photographs of the found fungi, and information on habitat, location, time of discovery or other important data thereof is hardly ever presented. According to these incomplete data, *H. oblongispora*, *H. costifera*, *H. cupuliformis*, *H. fusca*, *H. lactea*, and *H. atra* should be considered for a Red Data List. Considering the data from table 1, and bearing in mind that neighbouring countries possess similar geographic, biological, climate and geomorphological characteristics (apart from the coastal parts of Greece, Croatia, Slovenia and Albania), we can assume that, in the near future, we can expect more discoveries of other species from this list in Serbia.

**Fig. 16.** *Helvella macropus* (phot. N. Milosavljević):

**A**-**B**. three ascocarps *in situ* ; **C**. ectal excipulum; **D**. ascospores ; **d**. ascospores with pustules; **E**. paraphyses; **F.** asci and paraphyses; **G**. with basal crozier (pleurorhynchous). All in water. For **C** scale bar is 100 µm, for **E**, **F** 20 µm.

| | | Ser. | Slo. | Cro. | BiH. | Mne | Mac. | Gr. | Alb. | Rom. | Bul. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *H. acetabulum* | | + | | | | | | | + | |
| 2 | *H. albella* | | | + | | | | | | | |
| 3 | *H. atra* | | + | | | + | + | | | + | + |
| 4 | *H. barlae* | | | | | | | | | + | |
| 5 | *H. branzeziana* | | | + | | | | | | | |
| 6 | *H. crispa* | | + | | + | | | | | | |
| 7 | *H. cupuliformis* | | | + | | | | | | | |
| 8 | *H. dissingii* | | + | | | | | | | | |
| 9 | *H. elastica* | | + | | | | | | | | |
| 10 | *H. ephippium* | | + | | | | + | | | | + |
| 11 | *H. helvellula* | | | + | | | | | | | |
| 12 | *H. lactea* | | | + | | | | | | | + |
| 13 | *H. lacunosa* | | + | | + | | | | | | |
| 14 | *H. latispora* | | | | | | | | | + | |
| 15 | *H. leucomelaena* | | + | | | | | | | + | + |
| 16 | *H. macropus* | | + | | | | | | | | |
| 17 | *H. pezizoides* | | | | | | | | | + | + |
| 18 | *H. phlebophora* | | | + | | | | | | | + |
| 19 | *H. queletiana* | | | + | | | | | | | |
| 20 | *H. spadicea* | | + | + | | | | | | | |

**Tab. 1.** - *Helvella* on the Red Data List in the countries of the Balkan peninsula; Ser.-Serbia; Slo.-Slovenia; Cro.-Croatia; BiH -Bosnia and Herzegovina; Mne-Montenegro; Mac.-Macedonia; Gr.-Greece; Alb.-Albania; Rom.-Romania; Bul.- Bulgaria.

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# SEVEN INTERESTING BASIDIOMYCETES RECORDED IN GREECE FOR THE FIRST TIME

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## Abstract

In this work, new information is provided on seven interesting and uncommon Basidiomycetes of Greece: *Agaricus pseudolutosus, Coprinopsis cordispora, Coprinopsis strossmayeri, Crepidotus macedonicus, Lactarius mediterraneensis*, *Panaeolus guttulatus, Panaeolus subfirmus.* Their presentation consists of descriptions of the above mentioned specimens, which were collected in various areas of the country, and are accompanied by macro-morphological depictions and microscopical characteristics of the species.

**Keywords:** *Basidiomycota, Agaricus pseudolutosus, Coprinopsis cordispora, Coprinopsis strossmayeri, Crepidotus macedonicus, Lactarius mediterraneensis, Panaeolus guttulatus, Panaeolus subfirmus,* Greece, taxonomy.

## INTRODUCTION

Amateur mycologists have contributed considerably to discovering and recording the wealth of Mycobiota in Greece. This effort has resulted in the recording of a good number of Basidiomycetes which are first-time recordings for the country. Only a very small part of those recordings has just started being published in mycological journals. Therefore, after the publication of the works of ZERVAKIS et al. (1998), and KONSTANTINIDIS (2006), which are probably among the most complete descriptions of Basidiomycetes in Greece, the afore-mentioned species are presented in Greece for the first time.

## Materials and methods

Microscopic examination was conducted in fresh state and was performed under four different binocular microscopes with plan-achromatic objective lenses (4X, 10X, 40X, and 100X oil immersion). Dextrinoid reaction was ascertained by use of Melzer's solution. Microscopic features were observed and measured in water and dyes. KOH was used to highlight spore ornamentation. Congo Red was used to highlight the walls of elements and floxine to accentuate element contents. Spore dimensions were measured after examining at least 30 randomly selected basidiospores. The specimens are kept in the authors' personal herbaria (where GK- George Konstantinidis, DS – Dimitrios Sofronis, MG – Michael Gkilas, LK- Linos Kottis).

## Survey of taxa

***Agaricus pseudolutosus*** (G. Moreno, Esteve-Rav., Illana & Heykoop) G. Moreno, L.A. Parra, Esteve-Rav. & Heykoop, *Micol. Veg. Medit.* 14(1): 60 (1999)

= *Agaricus goossensiae* var. *pseudolutosus* G. Moreno, Esteve-Rav., Illana & Heykoop, *Mycol. Res.* 94 (6) : 781 (1990)

### Description

**Basidiomes** small to large, with an initially hemispherical and later convex pileus (diam. 3–6 (9.5) cm), with a flat to nearly flat center. Whitish to white-ocherish, at first smooth and later scaly, yellowing in maturity or when touched, with purple-brownish triangular scales and a slightly woolly margin when young. **Lamellae** free, close, gray-pink and finally gray-purple with a fertile, concolorous edge. **Stipe** cylindrical, usually with a narrower, never broader, sometimes curved base, whitish with a slightly woolly base that discolors yellow when pressed or with a bulbous, slightly marginate base (up to 1.3 cm in diameter). Annulus simple, smooth, white, sometimes with a brownish margin, narrow, thin and fragile, more or less membranous. Flesh whitish to ocherish, becoming slightly pink. Odor of bitter almonds or anise. **Basidiospores** smooth, large, brownish, broadly elliptical to ovoid, 6.3–7.5 (8) × 4.4–5.4 µm, without a germ pore, with 1 drop. **Basidia** clavate to slightly narrower at the top, hyaline, 4-spored (18–30 × 7–9.5 µm). **Cheilocystidia** of various shapes and sizes, multi-septate, clavate, fusiform, 50–60 × 5–10 µm.

### Habitat

It fruits in autumn and winter in small to large groups in grassy places, orchards, gardens, meadows and pastures, under *Quercus* sp. or *Picea abies.*

### Material examined

**Greece**, Paros island, 16.I.2016, in dunged meadow, (LK 851). *Idem* 29.I.2016, (LK 870).

### Note

Moreno et. al. (1990) describe for the first time *Agaricus goossensiae* var. *pseudolutosus* and emphasize its macroscopic resemblance to *A. lutosus*. Moreno et. al. (1999) introduce the

**Fig. 1.** – *Agaricus pseudolutosus*, phot. L. Kottis: basidiomes in dunged meadow (coll. 16.I.2016).

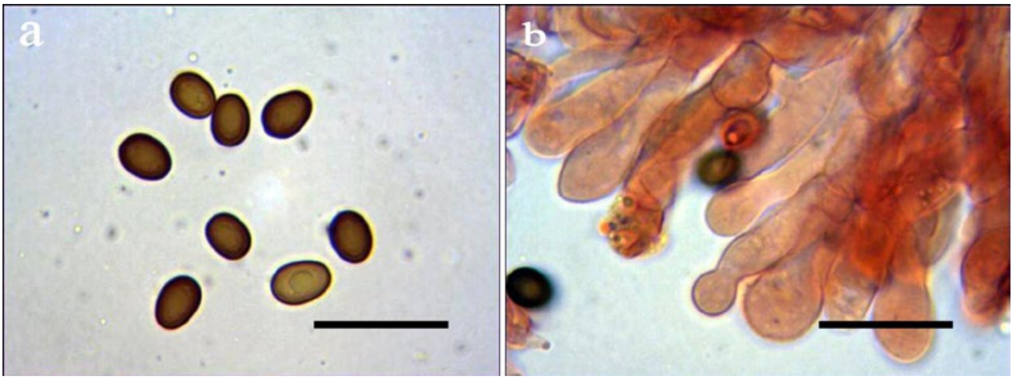

**Fig. 2.** – *Agaricus pseudolutosus,* phot. L. Kottis: **a**. basidiospores in Congo red, **b.** cheilocystidia in Congo red. Scale bar 20 µm.

species *Agaricus pseudolutosus* and report the very rare presence of hyaline clavate cells, which could be interpreted as cheilocystidia similar in shape and size to basidioles. Noordeloos et. al. (2001) report the macroscopic resemblance to *A. luteomaculatus*, but point out the absence of cheilocystidia in *A. pseudolutosus.* Chen et. al. (2012) report a similarity in spore size to *A. megalosporus*, but the latter's cylindrical to bulbous stipe is different from that of *A. pseudolutosus*, which tapers at the stipe base. Finally, Parra Sánchez (2013) reports that its cheilocystidia are very variable in size, shape and abundance.

## ***Coprinopsis cordispora*** (T. Gibbs) Gminder [as 'cordisporus'], in Krieglsteiner & Gminder, *Die Großpilze Baden-Württembergs* (Stuttgart) 5: 650 (2010)

≡ *Coprinopsis cordispora* (T. Gibbs) Watling & M.J. Richardson, *Edinb. J. Bot.* 67(3): 406 (2010)
≡ *Coprinus cordisporus* T. Gibbs, *Naturalist*, Hull: 100 (1908)
≡ *Coprinus volvaceominimus* Crossl., *Grevillea* 21(no. 99): 69 (1893)

### Description

**Basidiomes** small, with an elliptical, conical to convex-flat, radially furrowed whitish pileus (0.4–1.2 cm tall × 0.3–0.6 (0.8) cm in diameter while still closed), completely covered with a brown-pink, pruinose veil which forms small conical tufts at the pileus center and hair-like fibers at the margin when young. **Lamellae** white then gray to black, mostly not deliquescing (18–24). **Stipe** whitish-hyaline or sometimes brownish (1.5–6 × 0.01–0.02 cm), sometimes forming a fibrous collar at the base. **Basidiospores** pentagonal-chickpea-shaped to elliptical (depending on viewing angle), dark brown-red, 8.5–11.3 × (6.2) 6.6–10.3 μm, with a central germ pore. **Clamps** absent. **Basidia** clavate, (2) 4-spored, 20.3–28.5 × 8.25–8.45 μm. **Cheilocystidia** utriform, subspherical, elliptical to subcylindrical, 20-50 × 17-32 μm, interspersed with lageniform ones, 20–50 × 8–12 × 3–5 μm. **Pleurocystidia** utriform, subspherical, elliptical to subcylindrical, 50–110 × 20–35 μm. **Pileipellis** consisting of smooth to granular, subspherical to elliptical elements (<50 μm in diameter).

### Habitat

It fruits all year round, primarily in autumn, solitary or in small groups on dung of various animals (horse, bovines, wild rabbit, deer, roe).

### Material examined

**Greece**, Anoixi Grevena, 30.IV.2014, on horse dung, (GK 7190).

### Note

Watling & Richardson (2010) report the resemblance to *C. patouillardii* and *C. ephemeroides*, an observation repeated by Radu & Sesan (2013), who also make mention of the view held by several authors that it is synonymous to *C. patouillardii.*

**Fig. 3**. – *Coprinopsis cordispora*, phot. G. Konstantinidis: Basidiomes on horse dung (coll. 30.IV.2014).

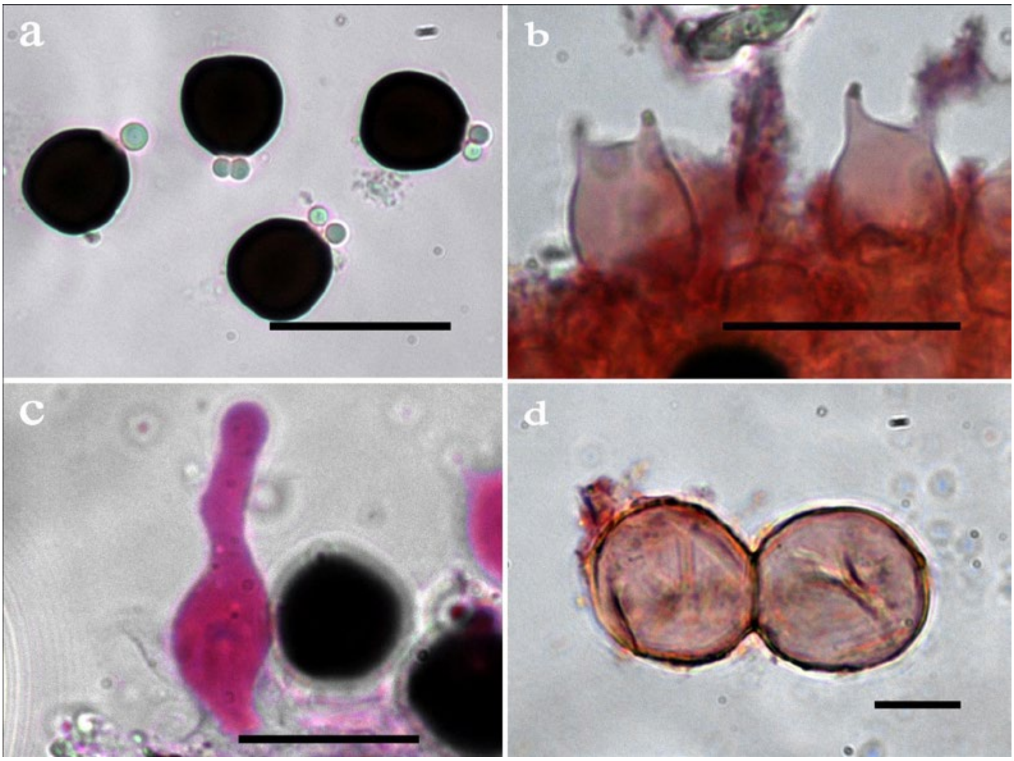

**Fig. 4.** – *Coprinopsis cordispora*, phot. G. Konstantinidis: **a.** basidiospores in floxine, **b.** basidia in Congo red, **c.** cheilocystidium in floxine, **d.** spherical elements of the pileipellis in Congo red. Scale bar 20 µm.

***Coprinopsis strossmayeri*** (Schulzer) Redhead, Vilgalys & Moncalvo, in Redhead, Vilgalys, Moncalvo, Johnson & Hopple, *Taxon* 50(1): 231 (2001)

= *Coprinus populicola* Mornand, *Docums Mycol.* 28(nos 109-110): 70 (1998)
≡ *Coprinus strossmayeri* Schulzer, *Verh. zool.-bot. Ges. Wien* 28: 430 (1879)
≡ *Coprinus strossmayeri* var. *populicola* (Mornand) Bon, *Docums Mycol.* 31(no. 124): 21 (2002)
≡ *Coprinus strossmayeri* Schulzer, *Verh. zool.-bot. Ges. Wien* 28: 430 (1879) var. *strossmayeri*

## Description

**Basidiomes** medium-sized, with an elliptical, ovoid, campanulate to nearly flat, grayish to ocher-brownish pileus (diam. 1.5–4 (8) cm, 1–2.5 cm tall), with large, cream to dirty yellowish flakes. **Lamellae** very close, slightly deliquescing, white initially then cream, gray, and finally black. **Stipe** cylindrical, white to yellowish (4–10 (12) × 0.4–0.8 (1) cm), with dense brown-orangish rhizomorphs. Odor of truffle or mold. **Basidiospores** elliptical to ovoid, 7.4–10.7 × 4,9–6.55 µm, with a central germ pore. Spore print black. **Basidia** clavate, 4-spored, 20–30 × 7–9 µm. **Cheilocystidia** utriform, elliptical, fusiform to sub-lageniform, 32–80 × 10–38 µm. **Pleurocystidia** similar, 60–130 × 27–55 µm. **Pileipellis** consisting of thin-walled, clamped, septate, slightly diverticulate elements.

**Fig. 5**. – *Coprinopsis strossmayeri,* phot. G. Konstantinidis: Densely growing basidiomes (coll. 08.VI.2014).

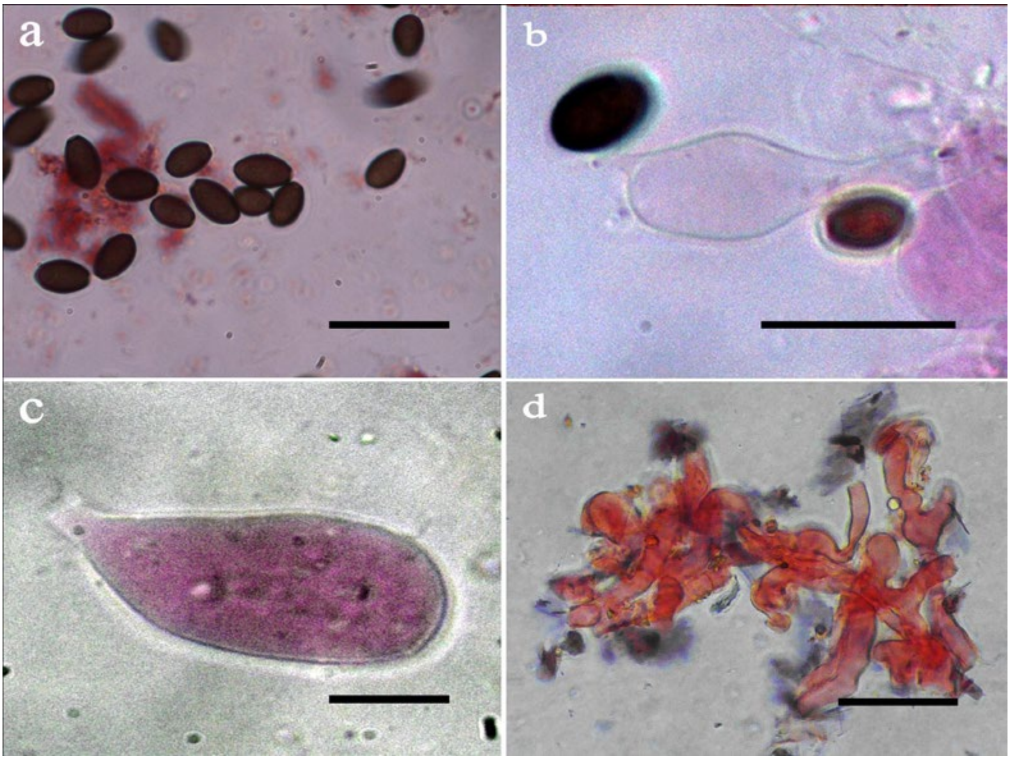

**Fig. 6.** – *Coprinopsis strossmayeri,* phot. G. Konstantinidis: **a.** basidiospores in Congo red, **b.** basidium in floxine, **c.** cheilocystidium in floxine, **d.** pileipellis in Congo red. Scale bar 20 µm.

### Habitat

A rare species appearing from May to June, in groups that sometimes consist of dozens of confluent basidiomes, on wood and woody remains of broad-leaved trees.

### Material examined

**Greece**, Lesvos, 08.VI.2014, in a garden, at the base of an ornamental bush (GK 7276).

### Note

*C. strossmayeri* is defined by certain characteristics, such as the medium to large size, dirty white felty scales on the pileus which has a veil consisting of cylindrical, hyaline hyphae, and presence of rhizomorphs at the stipe base. Lanconelli (2000) reports a first-sight macroscopic resemblance to *C. atramentarius, C. domesticus, C. stanglianus* and *C. flocculosus,* but all doubt is eliminated after an examination under the microscope. Noordeloos et. all. (2001) report that the only common feature with *C. atramentarius* is its clustered growth. Pilei can be differentiated, especially at a young age, by the presence of an abundant, thick veil, unlike *C. atramentarius*, which has a nearly smooth pileus.

## ***Crepidotus macedonicus*** Pilát, *Stud. Bot. Čechoslav.* 10(4): 153 (1949)

≡ *Crepidotus macedonicus* Pilát, C. r. Acad. Sci., U. R. S. S.: 70 (1948)

### DESCRIPTION

**Basidiomes** small to medium-sized, 2–7 cm in diameter, stipeless or with an indistinct stipe, with a fan-shaped to kidney-shaped, whitish to dirty cream and finally ocherish, downy to tomentose pileus with a smooth margin. **Lamellae** quite close, white to ocher-orange to finally reddish. Odor not detected, taste mild. Stipe indistinct, discernible only in youth, eccentric, downy. Pileal flesh dirty white, without a gelatinous layer. **Basidiospores** yellowish to ocher-brownish, rough, elliptical to broadly elliptical, almond-shaped to drop-shaped, ocher, 5.8–6.8 (7.3) × (3.8) 4–4.7 (5.2) µm. **Basidia** hyaline, clavate, thin-walled, 4-spored, with a clamp. **Pileipellis** consisting of hyaline, large cylindrical hyphae, 3–5 µm broad, straight to slightly bent, without differentiated terminal cells, with abundant clamps. **Cheilocystidia** hyaline, thin-walled, utriform, sometimes clavate, sometimes forked or horn-shaped, 31–44 × 8–10 µm.

### HABITAT

A rare species appearing from June - October, usually in groups, on dead logs and branches of broad-leaved trees (*Fagus* sp., *Quercus cerris*, *Quercus ithaburensis* subsp. *macrolepis*).

**Fig. 7.** – *Crepidotus macedonicus,* phot. L. Kottis: Mature basidiome (coll. 04.VI.2016).

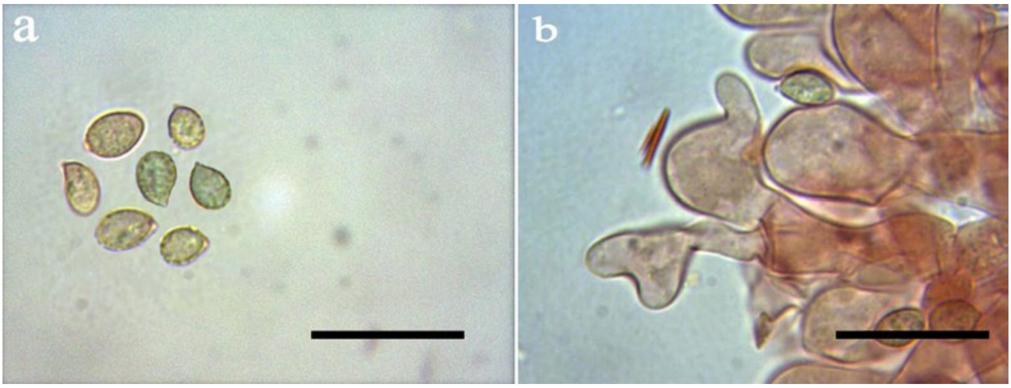

**Fig. 8.** – *Crepidotus macedonicus,* phot. L. Kottis: **a.** basidiospores, **b.** cheilocystidia. Scale bar 20 μm.

### Material examined

**Greece**, Kipi Ioannina, 04.VI.2016, on dead oak wood, (LK 925).

### Note

*Crepidotus macedonicus* was described by Pilat (1948a, 1948b). The species was formally published later, when a Latin diagnosis was added, Pilat (1949). Pilat (1948a, 1948b) noted that *C. macedonicus* is macroscopically similar to *Crepidotus panuoides* Fr. [=*Tapinella panuoides* (Fr.) E.-J. Gilbert.]. The same author admitted that his macroscopic description was based on dry material. Senn-Irlet (1992) reports that the species' description in her work was based on unpublished notes by Hesler L.R, as well as on her own observations. Also, Senn-Irlet (1995) reports that cheilocystidia and spores, as seen under the microscope, strongly resemble those of *Crepidotus cesatii*. Ripkova (2002) makes an up to that time historical review of the species and mentions the bad condition the holotype was in.

## ***Lactarius mediterraneensis*** Llistos. & Bellù, *Mycotaxon* 57: 176 (1996)

≡ *Lactarius mediterraneensis* f. *citrina* Llistos. & Bellù, *Mycotaxon* 57: 182 (1996)
≡ *Lactarius mediterraneensis* Llistos. & Bellù, *Mycotaxon* 57: 176 (1996) f. *mediterraneensis*

### Description

**Basidiome** fleshy, with a pileus measuring 50-140 mm, convex then depressed in the center, with an incurved margin, shiny with a thick, elastic, not easily detachable cuticle, lubricate in wet weather, yellow-ocher, yellow-cream with flesh-colored tones and many pink-brownish, drop-shaped scrobiculations which are more pronounced at the margin. **Lamellae** close, adnate, some forked, cream, ocher-yellowish with concolorous edges. **Stipe** 20–60 × 15–30 mm, fragile, cylindrical, ocher-white and often with ocher-brownish scrobiculations, solid at first, hollow when mature. Flesh whitish, cream-yellowish where it meets the lamellae, with an acrid-bitter taste and a fruity odor. Latex white discoloring yellow-ocher after 2-3 minutes. **Basidiospores** broadly elliptical, 9.5–12 × 8–9.5 μm, with

**Fig. 9**. – *Lactarius mediterraneensis,* phot. D. Sofronis: Basidiomes in their natural habitat. (coll. 16.XII.2012)

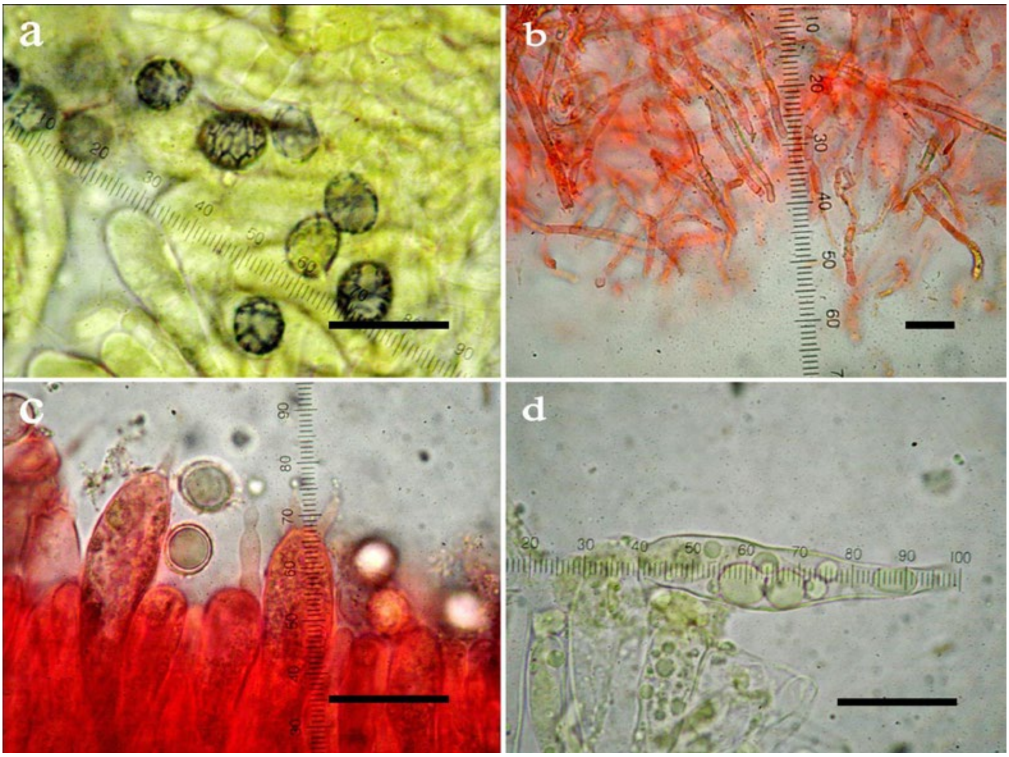

**Fig. 10.** – *Lactarius mediterraneensis,* phot.: D. Sofronis: **a.** basidiospores in Melzer, **b.** pileipellis in Congo red, **c.** cheilocystidia with basidia in Congo red, **d.** basidia. Scale bar 20 µm.

a reticulation up to 1 μm in height.**Basidia** 4-spored, 55–75 × 12–14 μm. Macrocystidia cylindrical, narrowly fusiform, 50–70 × 4.5–7 μm. **Pileipellis** an ixotrichoderm of entangled, cylindrical hyphae with septa 3–4 μm thick, and cylindrical dermocystidia with rounded tips 4–7 μm thick.

### Habitat

This is a Mediterranean species fruiting among maquis vegetation (*Pinus halepensis, Cistus* sp., *Quercus coccifera*), especially with *Quercus ilex.*

### Material examined

**Greece**, Keratea Attica, 16.XII.2012, among maquis vegetation under kermes oak (*Quercus coccifera*), (DS 945).

### Note

It resembles *L. acerrimus* (which, however, has 2-spored basidia, larger spores up to 14 μm and white, not discoloring latex) and *L. scrobiculatus*, which fruits in mountainous areas under spruce and has smaller spores (7–9 × 6–7 μm). Llistosella & Bellu (1996), who were the first to describe the species, report its macroscopical resemblance to *L. acerrimus, L. zonarius* and *L. intermedius.* Basco (1999) also mentions a possible confusion with *L. acerrimus* and *L. zonarius,* as well as a yellow discoloration of the flesh in KOH. Consiglio & Papetti (2009) also report a macroscopical resemblance to *L. acerrimus*, but differ as regards the 2-spored basidia and non-yellowing latex. In addition, they report a common habitat with *L. chrysorrheus*, which has distinct zones on the pileus, more abundant latex, a more intense and faster discoloration, as well as smaller spores.

## ***Panaeolus guttulatus*** Bres., *Fung. trident.* 1(1): 36 (1881)

= *Coprinarius remotus* var. *guttulatus* (Bres.) Quél., *Enchir. Fung.* (Paris): 119 (1886)
≡ *Panaeolus guttulatus* Bres., *Fung. trident.* 1(1): 36 (1881) var. *guttulatus*
≡*Panaeolus guttulatus* var. *merrisiani* Panchetti, *Riv. Micol.* 58(4): 321 (2015)

### Description

**Basidiomes** small to medium-sized, 1.5–3.5 (4) cm in diameter, with a pileus which is convex to nearly flat, slightly umbonate, dull, irregular, slightly warty or dented, slightly hygrophanous and translucent-striate in wet weather, slightly frosted, dark olivaceous-brownish to blackish (when wet), gray-brownish to gray (when dry), with a smooth, acute margin. **Lamellae** adnexed, grayish to brown-blackish, with yellow-whitish, fibrillose edges, sometimes with small, yellowish, sticky drops also visible in dry specimens. **Pileipellis** consisting of subspherical to pyriform, hyaline to slightly yellowish elements measuring 30–45 × 10–20 μm, with clampless septa. **Stipe** cylindrical, straight to bent, dark brownish, 2–5 × 0.2–0.5 cm, covered with whitish longitudinal fibrils and white down at the – sometimes – slightly bulbous base. Flesh brown-blackish, thin. Odor rather unpleasant, taste mild. **Basidiospores** small, (7.4) 8.2–8.9 (10) × (4.2) 4.6–5.1 (5.6) ×

**Fig. 11.** – *Panaeolus guttulatus,* phot. M. Gkilas: Basidiomes in their natural habitat. (coll. 31.I.2014).

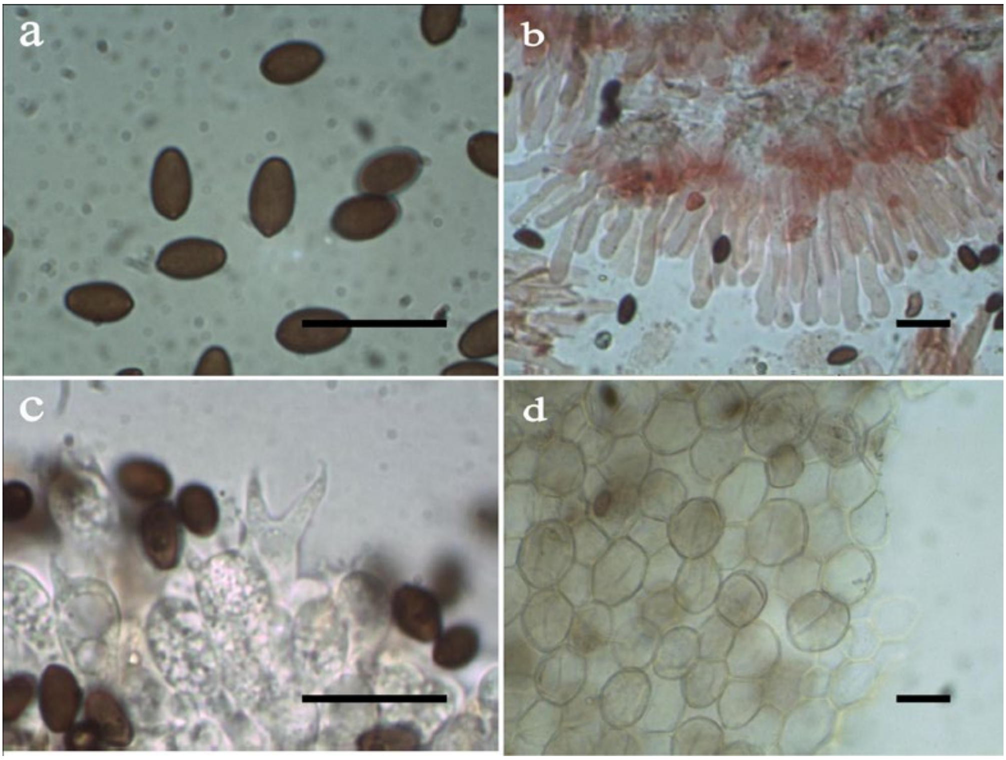

**Fig. 12.** – *Panaeolus guttulatus,* phot. M. Gkilas: **a.** basidiospores in water, **b.** cheilocystidia in Congo red, **c.** basidia in water, **d.** spherical elements of the pileipellis. Scale bar 20 µm.

4.8–5.5 µm, narrowly elliptical to almond-shaped, smooth, pale brownish, thick-walled, with a central germ pore and two oily drops, spore print black. **Basidia** (2) 4-spored, cylindrical-clavate, 22–27 × 8–10 µm, with a basal clamp. **Cheilocystidia** cylindrical, thin-walled, slightly clavate to subcapitate, (27) 35–47 (55) × 5–7.5 µm, without pleurocystidia.

### Habitat

It fruits in summer and autumn, commonly aggregate, in woods, usually along paths, among needle and leaf litter, on conifer cones and woody remains of broad-leaved and coniferous (*Abies* sp.) trees.

### Material examined

**Greece**, Korinthos, 31.I.2014, in pine wood, (MG 77).

### Note

Gerhardt (1996) reports that exudation of a viscid substance (guttation) on the lamellae of this species was observed for the first time in genus *Panaeolus*. Pegler & Henrici (1998) report that, despite belonging in different groups, *Panaeolus guttulatus* is similarly colored to *P. atrobalteatus*. Doveri (2004) reports that this species fruits in Central Europe and in the Mediterranean and that it does not grow in dunged places, unlike most species of the genus which are dung-loving. Siquier & Salom (2005) report the resemblance to *Panaeolus ater*.

## ***Panaeolus subfirmus*** P. Karst., *Hedwigia* 28: 365 (1889)

=*Panaeolus speciosus* P.D. Orton, *Notes R. bot. Gdn Edinb.* 29: 108 (1969)

### Description

**Basidiomes** with a hemispherical, initially convex to conical then nearly flat pileus, 15–28 mm, smooth, hygrophanous, pale honey-brown to gray with a darker zone at the margin, later pale gray, ocher to cream. **Lamellae** adnate, averagely close, brownish then soon olivaceous-black with pale edges. **Odor** unpleasant, not distinctive. **Stipe** 55–90 × 3-5 mm, cylindrical, straight, ocherish with a darker base. **Caulocystidia** 20–95 × 7–11 µm, abundant, similar to the cheilocystidia. **Basidiospores** elliptical, lemon-shaped, 15.5–19 × 10–11.5 × 8–10 µm, with a distinct central germ pore. **Spore** print nearly black. **Basidia** 4-spored, clavate, 33–38 × 12–15µm, with a basal clamp. **Cheilocystidia** 37–65 × 6–10 µm, colorless, thin-walled, cylindrical to narrowly lageniform, spiral, with enlarged tips. **Pleurocystidia** not present. **Pileipellis** a hymenoderm consisting of yellow-brownish, clavate-subspherical elements 20–53 × 15–47 µm. **Septa** with clamps. **Pileocystidia** 50–85 × 5–10 µm.

### Habitat

This is a rare species of Northern Europe growing in dunged pastures.

Fig. 13. – *Panaeolus subfirmus,* phot. D. Sofronis: basidiomes in their natural habitat. (coll. 22.IX.2012)

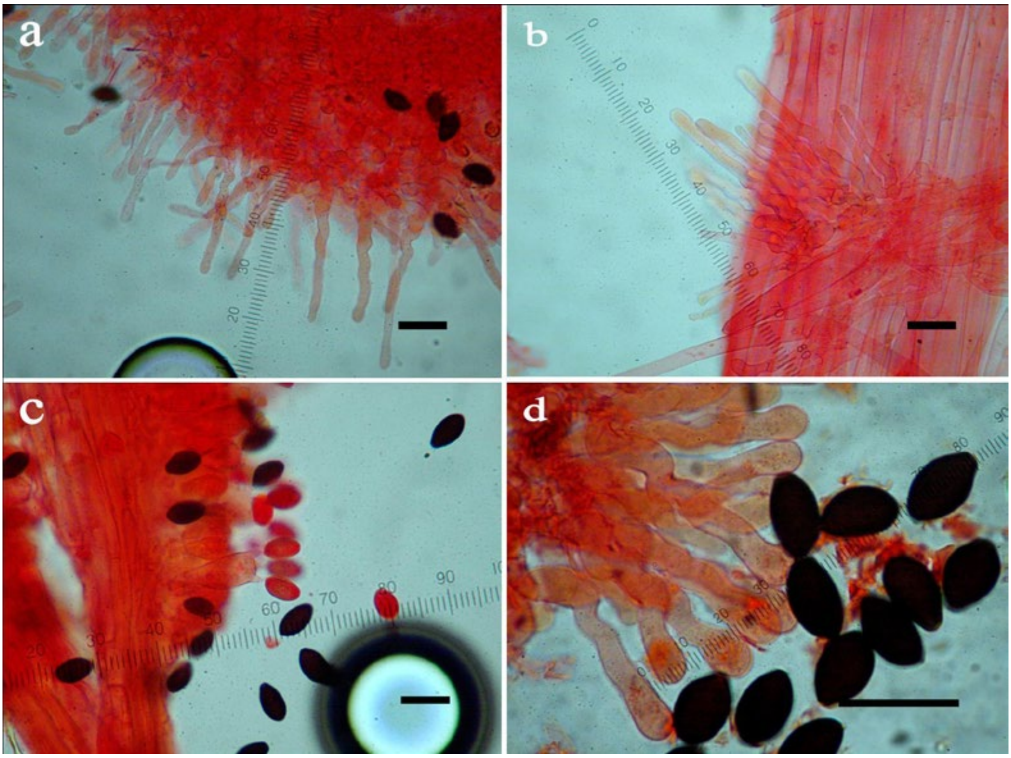

**Fig. 14.** – *Panaeolus subfirmus*, phot. D. Sofronis: **a.** pileipellis, **b.** caulocystidia, **c.** basidia with basidiospores, **d.** cheilocystidia with basidiospores. All in Congo red. Scale bar 20 µm.

### MATERIAL EXAMINED

**Greece**, Oete, 22.IX.2012, in dunged meadow, (DS 840).

### NOTE

DOVERI (2004) reports that this species fruits in a habitat similar to that of *P. cinctulus* and points out the resemblance, as regards its microscopical features, to *P. antillarum.* HALAMA (2014) reports that it is difficult to confuse with other species of the genus, except only occasionally when faded cream to dirty white, not so fresh specimens of *P. antillarum* bear a superficial resemblance.

### ACKNOWLEDGENENTS

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# MIKOLOGIJA ISKOSA

# MYCOLOGY SIDEWAYS

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*Mycol. Monten.* XIX (2016): 115-124

# MEĐUSOBNA ZAVISNOST NAUKE I UMETNOSTI

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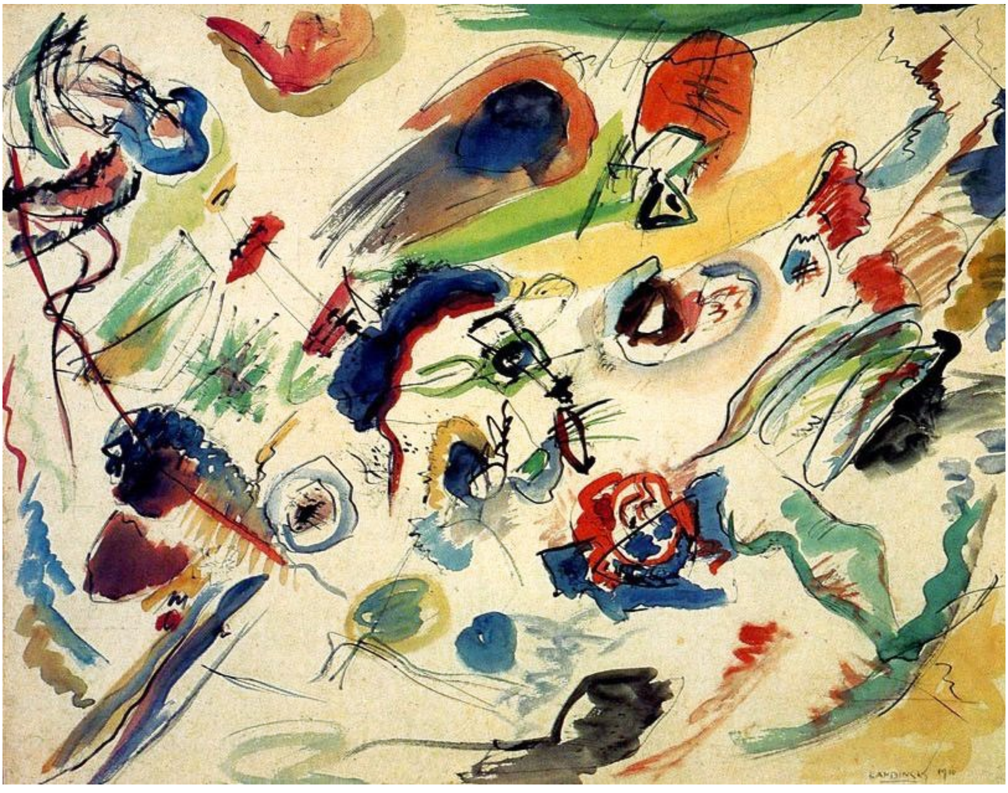
„Postoji jedinstveni front celokupnog oblikovanja i istraživanja (nauka o prirodi, filozofija, literatura, likovna umetnost i muzika). Kada razgledamo naučne fotografske snimke, mikrosnimke, spljoštene ili skulpturalne dijagrame, pada u oči njihova sličnost sa uobličenjima ostvarenim u okviru likovne umetnosti današnjice, izvestan međusobni odnos. Samostalni oblici koje pronalazi današnja umetnost čine pritom, takoreći, izbistrene konačne forme u smislu jednog višeg ovladavanja svime što je sagledivo: u smislu apsolutnog vida...” (Vili Baumajster)

Jedna od velikih prekretnica u istoriji čovečanstva bila je sinteza naučnih dostignuća i umetnosti početkom XX veka. Onog trenutka kada je Vasilij Kandinski pročitao članak



**Slika 1**.Vasilij Kandinski, Bez naziva (prvi apstraktni akvarel u zapadnoj umetnosti), 50 × 65 cm, 1910.

u kome je pisalo da je razbijen atom, tog trenutka je nastala prva apstraktna kompozicija u istoriji zapadne umetnosti. To je bilo 1910. godine. Kandinski je događaj ovako opisao: „Jedan naučni događaj je zbrisao sve najvažnije prepreke koje su me ometale na tom putu. To je bilo otkriće deljivosti atoma. Za mene je podela atoma bila slična cepanju celog sveta i uskoro su se debeli zidovi srušili. Sve je postalo meko, neodređeno, nesigurno. Ne bih se začudio da sam video kako se kamen topi u vazduhu i isparava." Slika o prirodi i o toj realnoj stvarnosti kojom je čovek okružen postala je drugačija, duhovnija i slojevitija. Ona više nije upućivala na svet koji je spolja zatvoren čvrstom i nepokretnom ljušturom već na „unutrašnju prirodu" u kojoj vladaju kosmički zakoni koji postaju delotvorni i za umetnike. Sve se promenilo početkom veka. Ljudska percepcija sveta više nije bila ista.

Klasična fizika je bila zasnovana na pretpostavci da je materija opipljiva, inertna i snabdevena konstantnom masom. Nasuprot tome, vladalo je ubeđenje da energija postoji nezavisno od mase i nevidljivo. U svojoj specijalnoj teoriji relativiteta Ajnštajn je klasičnu razdvojenost materije i energije ukinuo i dokazao da masa i energija predstavljaju jedinstvo različitih oblika iste supstance. tj. dokazao je da se energija pretvara u materiju, a materija u energiju u večnom cikličnom kretanju. Ova činjenica je radikalno uticala na formiranje savremene umetnosti. „Boja je trag energije u kretanju", govorio je Kazimir Maljevič. Umetnost dolazi do saznanja da materija koja nastaje kao umetnički predmet direktno zavisi od kvaliteta energije koja je u nju utkana. Sve to dovodi do zaključka da je rođena nova etika u procesu stvaranja savremene umetnosti. Jer energija koju umetnost involvira u medij isijava putem tih medija u dijalektičkom jedinstvu.

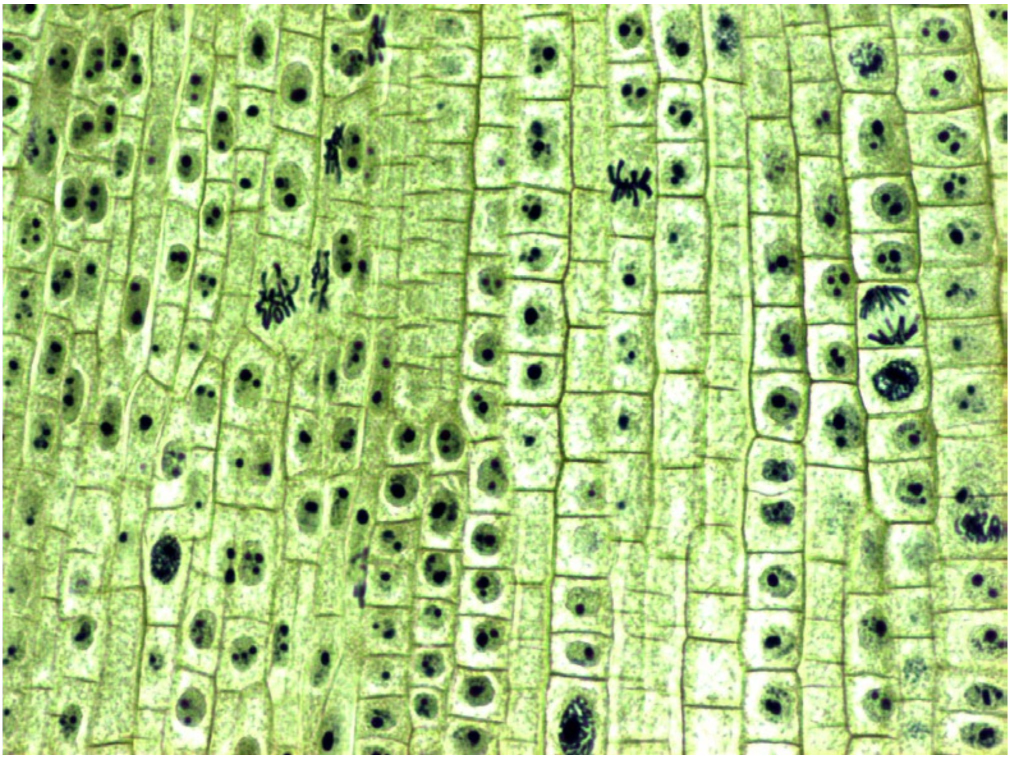
Renesansa je klasičnim učenjem o perspektivi proširila dvodimenzionalni prostor i plastično ga uobličila. Ajnštajn je potpuno srušio klasičnu predstavu o vremenu i prostoru. Sa njegovom teorijom relativiteta (1905, 1915) u fizici se formiralo novo shvatanje o strukturi prostora koje pod tim pojmom više ne podrazumeva statičnu i ravnu trodimenzionalnu šupljinu već jednu elastičnu i pokretljivu višedimenzionalnu strukturu koja je zakrivljena u stepenu u kome druge sile deluju na nju. I umetnička slika više nije „prozor u svet". Ona ne prenosi ono što vidi nego istražuje sam fenomen gledanja što umetnika dovodi u dinamičnu poziciju. On slikom pronalazi istinu, a ulazeći u prostor slike koji je vekovima bio udaljen od njega, zabranjen, hermetičan, on simbolično i stvarno ruši stari način slikarskog mišljenja.

Ajnštajn je, takođe, dokazao da svaki sistem ima svoje vreme i svoj prostor, samim tim i svoju perspektivu gledanja. U likovnim umetnostima posledica toga je činjenica da svako delo ima svoje vreme, prostor i perspektivu. Ono je nezavisni univerzum paralelan prirodi. Renesansnom odvajanju vremena i prostora u fizici Albert Ajnštajn je suprotstavio organski uzajamni odnos između njih. U krajnjoj liniji, refleksija ovog naučnog stava se najviše odrazila na radikalni stav Nikolasa Šefera koji je „vajanjem vremena" stvorio vremensku arhitekturu kao umetničko delo.

U dosadašnjim predstavama vreme je bilo neka vrsta istorijskog redosleda, linearna kontinualnost prošlosti, sadašnjosti i budućnosti. Danas je problem vremena skokovit i diskontinualan, i to ne samo za fizičare već i za umetnike. Vreme više nije odvojeno od prostora, nije više jednosmerno upravljeno u budućnost. Savremena umetnost odražava taj novi odnos prostor–vreme u procesu nastanka umetničkog dela.

Fenomenološki gledano, razvojem nauke i prefinjenih tehnika i aparata pojam „realnog" se značajno proširio. Umetnici su inspirisani osetljivim mogućnostima savremenih aparata, džinovskih teleskopa, mikroskopa i rendgenskih filmova. Slikari su ušli u do sada skriveni svet oblika, koji, iako postojeći, još nije bio zaveden ni u kakvim katalozima. Paul Kle govori o tom pomeranju dimenzija predmetnosti u umetnikovoj svesti: „On stvari koje mu priroda iznosi pred oči uobličene posmatra prodornim pogledom. Ukoliko dublje gleda, utoliko mu je lakše da ispreda misli koje vode iz današnjice u jučerašnjicu. Utoliko mu se više, mesto gotove slike prirode, useca jedina bitna slika stvorenja sveta kao geneze. A nije li istina da nam već relativno mali korak gledanja kroz mikroskop otkriva slike koje bismo svi oglasili za fantastične i preterane kada bismo ih, ne znajući o čemu je stvar, negde videli potpuno slučajno..."

Slika stvarnosti svojstvena našem vremenu postala je kompleksnija. Rendgenski snimak prenosi oblike u kojima se javlja slika unutrašnje strukture. Mikrofotografija otvara galerije do sada neispitanih životnih prostora. Makrofotografija donosi slikovnu dokumentaciju vasione. Postupak elektromikroskopom pomaže da se pronikne u svet kristalnih sklopova metala i istovremeno u strukture ćelijskih supstanci, praoosnove sveukupnog života. Još dalje doseže elektronski mikroskop za ispitivanje gravitacionih polja. Iako je još nemoguće snimati atomska jezgra, ipak se mogu uočiti putanje nuklearnih reakcija u takozvanim zamagljenim komorama, gde se propuštaju kroz određen sloj boja, u kome ostaju osvetljeni tragovi kretanja.



**Slika 2**. Mikroskopski snimak ćelije korena biljke

Ti snimci se ne razlikuju samo po obličju do sada još neopaženih objekata stvarnosti, već, pre svega, reprodukovanjem trodimenzionalnih procesa u dvodimenzionalnoj projekciji. Snimak ovde nije elementarna čestica koja može da se predstavi samo kao tačka nego je suma njenog kretanja. Trag njene putanje.

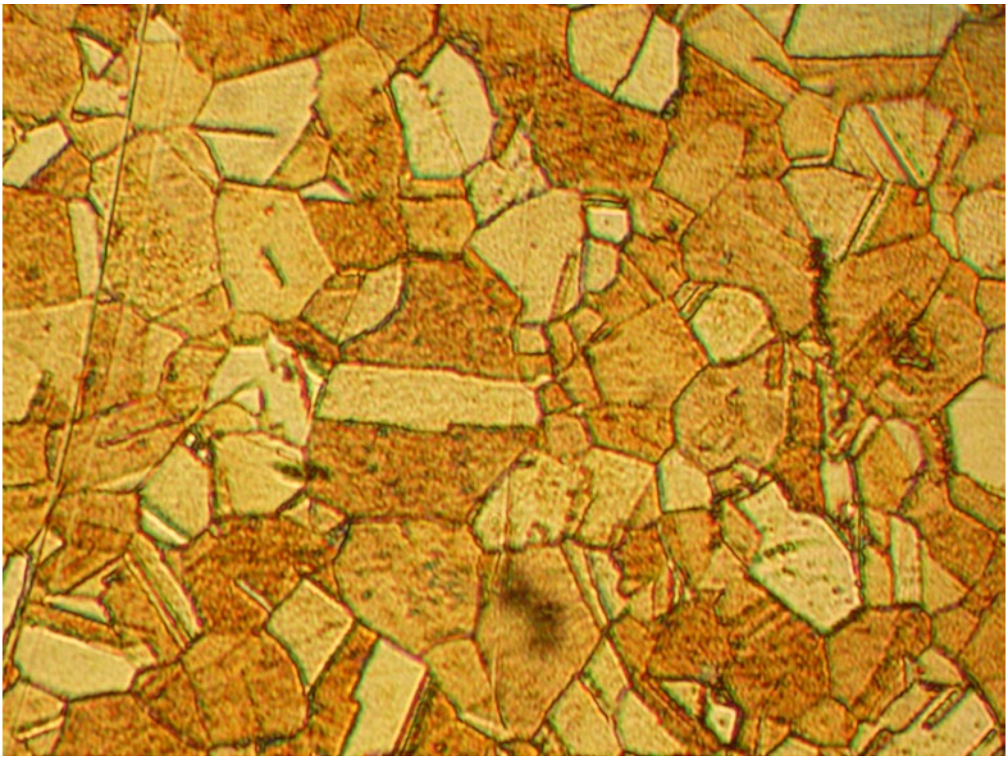
Svet koji nam otkriva elektronski mikroskop nije irealan. Ono što se tu vidi, to su, istina, vanljudske, ali od ljudi otkrivene dimenzije egzistencije, i bilo bi pojmljivo kada bi senzitivno umetnikovo oko, svesno ili nesvesno primalo podsticaje od tih strukturnih oblika materije i tih tajnih sastava molekula.

Mikrosnimak ćelijskih gredica u stabljici biljaka nije bez sličnosti sa raster-slikom koju je Pit Mondrijan izradio 1918. godine. Novosagledana priroda srodna je novim oblicima umetnosti.

**Slika 3**. Pit Mondrijan, Kompozicija VII, ulje na platnu, 105 × 114 cm, 1913.

Mikroskopski snimak grudvice mulja pokazuje da priroda od kreča ili kamena, zemlje, celuloze ili keratina, stvara elastične, otporne, funkcionalne konstrukcije, koje su isto tako savršene kao i građevine znamenitih inženjera i arhitekata.

Ornamentalna struktura, površinski uzorak kristala i kamenja, sastav najsitnijih živih bića, konstrukcija njihovih tkiva unapred su uobličili beskrajne mogućnosti ljudske mašte. Morske životinje i biljke, stavljene pod mikroskop, razotkrivaju jednu stvarnost koju je umetnik osetio, iako je nikada nije video. Mikrofotografije morske stonoge liče na velikopotezne geometrijske površine, na intenzivne ritmove i prigušene tonove slikarstva Sergeja Poljakova.



**Slika 4**. Mikroskopski snimak strukture mesinga

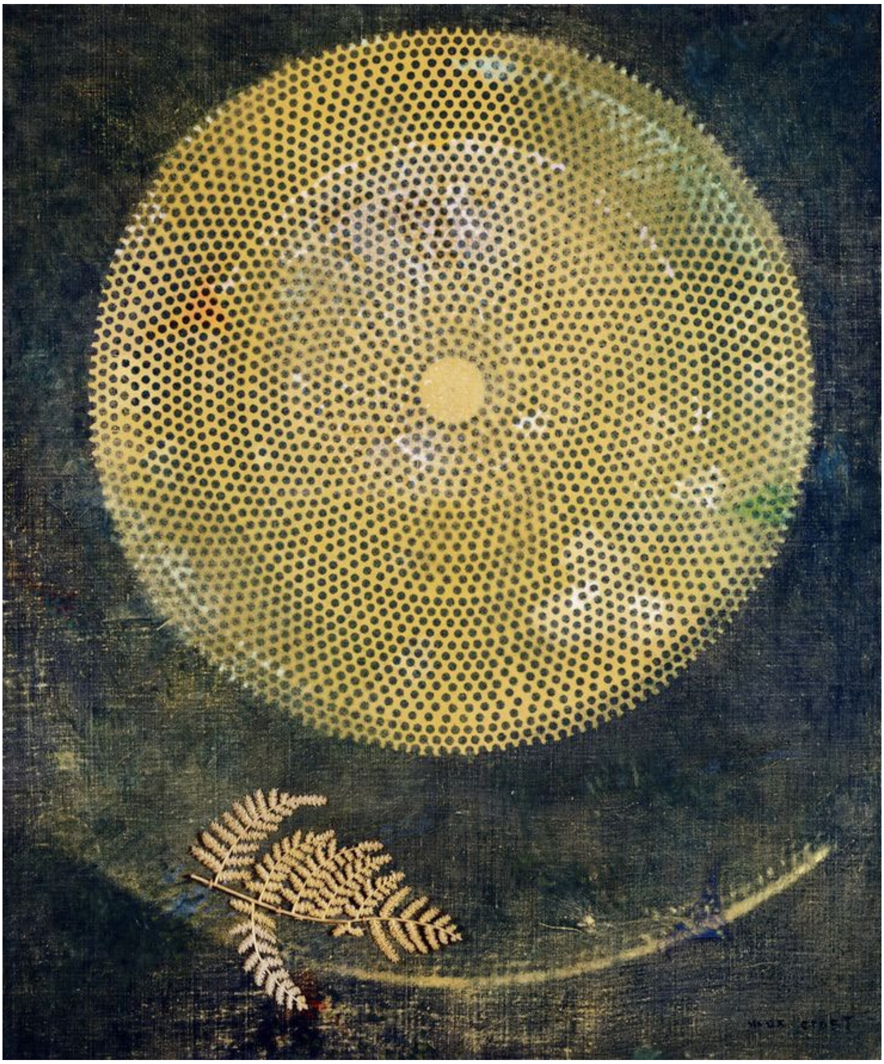
Struktura termički nagrizenog srebra, u povećanju od 12.000 puta, liči na strukturne ritmove u metalnom reljefu skulptora Zoltana Kemenija, dok talasasto kretanje interferencijalnog modela nagrizenog cinka podseća na ritmički reljef koji je stvorio Rober Delone.

Vizuelnu fantaziju umetnika ne zaokuplja samo gledanje spolja i iznutra, kao dve strane dijalektički sagledanog jedinstva, već i gledanje iz perspektive leta, u projekciju gradova, globalni pregled strukture zemlje, samokretanja i stvari u pokretu.

Putovanje avionom izmenilo je vizuelnu predstavu zemljine površine. Daleka područja se zbijaju, duge krivulje i dijagonale puteva skraćuju se, šume se pretvaraju u zelene ustreptele bukete, a visoki planinski lanci u bore na koži zemlje. Obrađena polja nizija liče na raširene šarene ćilime. I Paul Kle voli te duge ćilimolike pruge koje istovremeno predstavljaju bašte i sela, polja, staze i puteve. Ali one nisu svrstane strogo geometrijski jer umetnikova ličnost proniče i preobražava materiju. Fascinira ga pokretna slika prostorno-vremenske ravni koja se odmotava, razvija.

**Slika 5**. Paul Kle, Putevi, ulje na platnu, 84 × 67 cm, 1929

Dospeli smo do prvog sprata beskonačnosti. Visoko iznad atmosferskog krova Zemlje kruže sateliti. Šalju nam serijske slike iz dalekih prostora, fotografske aspekte do sada skrivene strane Meseca. Maks Ernst je nazivao svoje slike na osnovu prirodnih struktura i fenomena. Njega ne privlači samo slikarska definicija nesvesnog nego i pronalaženje najudaljenijih mesta egzistencije. Njegova slika liči na svet Meseca, a možda i na obličje kakvo će Zemlja imati kada proteknu milioni godina. Na astronomskim fotografijama možemo videti mesečeve planine koje bacaju senke, površine okružene kraterima. Oko te ugašene zvezde kruže ljudske planete. Za njima će možda uskoro poći kosmički Kolumbo, čiji je prethodnik umetnik.



**Slika 6**. Maks Ernst, Tišina kroz vekove, kombinovana tehnika, 70 × 55 cm, 1968.

Još jedan segment razvoja nauke, gotovo paralelno razvijan i na polju umetnosti, jeste psihologija. Racionalističkom pristupu svetu već krajem XIX veka suprotnost čini proučavanje ljudskog nesvesnog. Psihoanaliza Sigmunda Frojda i učenje Karla Gustava Junga direktno utiču na umetničke metode. Andre Breton, koga su zvali „patrijarhom nadrealizma”, u vezi sa tim izjavljuje: „Verujem da će se prividna protivrečnost između snova i stvarnosti ubuduće rešiti u nekoj vrsti apsolutne stvarnosti nadrealnog...”

Veza između naučnog saznanja i umetničkog postupka dolazi do jačeg izražaja u estetici nadrealizma nego u ostalim težnjama moderne umetnosti. Razlog za to je krajnje jednostavan – nadrealizam više odgovara književno-misaonom nego emocionalnom u odnosu prema životu. Andre Breton se još kao student medicine upoznao sa psihoanalitičkim metodom.

Sigmund Frojd je izuzetno veliki značaj pripisivao nesvesnom. Ključna uloga snova i polnih nagona u objašnjavanju ljudskih postupaka odgovarali su težnjama umetnika i pesnika koji su upravo predeo nesvesnog smatrali svojim domenom. U svom Nadrealističnom manifestu Andre Breton kaže: „... konačno, oslanjajući se na Frojdova otkrića, ocrtava se jedna struja pod čijim će okriljem posmatrač ljudi moći dalje da vrši svoja istraživanja, nevezan više isključivo za golu stvarnost. Frojd se s punim pravom posvetio snovima. Zaista je neshvatljivo da je tom širokom području psihičke aktivnosti bilo poklonjeno toliko malo pažnje, iako kod čoveka od rođenja do smrti suma elemenata snova vremenski nije manja od sume budne svesti...”

Nadrealizam je postao neka vrsta antiteze tehnifikovanju i neprestanoj jurnjavi civilizacije velikih gradova. Kao i dadaizam, sa kojim je imao srodnosti i od koga je poprimio buntovni stav, on je izrastao iz jedne „antiestetske” teorije, s tim što je sistematizovan i dalje razvijan. Da bi odrešio jezik čistom i autentičnom glasu podsvesti, nadrealizam se služi automatskim pisanjem.

Kao antiteza tradicionalnom reprodukovanju spoljne, racionalne i svesne stvarnosti, automatski tekstovi i slike doprinose širenju horizonta budući da u svest unose likove iz podsvesti i snova. Dok tradicionalna umetnost delimično odražava vidljivu sliku postojanja, nadrealizam je automatski evociranim, fotografski vernim snimcima nesvesnog dao samo delove celokupnosti, ali u njihovom unutrašnjem odrazu.

Nadrealizam je otkrio mnoge nove stvaralačke metode, kao što su frotaž, kolektivni rad, anketa, zatim je usavršio dadaističke kolaže, asamblaže i redimejde. Sa druge strane, on je produbio klasičnu slikarsku tehniku. U početku je nadrealizam bio protiv „umetničkog slikarstva”, pa su stoga i njegove rane tehnike usmerene ka oslobođenju automatskog stvaralaštva.

Tu spada frotaž koji je 1925. godine pronašao Maks Ernst poučen dečjim igrama. Preko drvenih daščica ili osušenih biljaka ili bilo kakvog predmeta, stavlja se papir i šrafiranjem dobija struktura materijala, ili neki plitak reljef na njemu. „Tok rada frotaža”, kaže Ernst, „koji se oslanja samo na pojačanje intenziteta razdraženosti umnih sposobnosti pomoću odgovarajućih tehničkih sredstava, a isključuje sva svesna duhovna vođstva (razuma, ukusa, morala) i svodi na najmanju meru aktivnu ulogu onoga koga smo do sada nazivali autorom dela, otkriva da je ovaj proces stvarni ekvivalent onoga što je već poznato pod imenom automatsko pisanje. Autor u svojstvu gledaoca prisustvuje rođenju svog dela i posmatra faze njegovog razvoja”. On gleda kako njegova dela nastaju, spontano, nenamerno, kao priroda. Na ovaj način je nastala njegova serija frotaža „Istorija prirode”.

Slobodno proticanje misli i spontanost u postupku u velikoj meri su obezbeđeni u kolažu i asamblažu. Ove tehnike su u potpunosti odgovarale nadrealističkom jeziku. U lepljenju i montaži isečaka iz novina i različitih predmeta ostvarena je ona, kako Breton kaže „divna sposobnost spajanja dveju udaljenih realnosti bez napuštanja područja našeg iskustva”.

**Slika 7**. Maks Ernst, frotaž iz serije Istorija prirode, 20 × 16 cm, 1925.

**Slika 8**. Maks Ernst, Arizona, frotaž i ulje na papiru, 9,5 × 14 cm, 1957.

Psihologija razgolićavanja jedna je od fundamentalnih pojava naše epohe i izraz je sveukupne civilizacijske krize. Njena pojava je rezultat čovekovog otuđenja od prirode. Psihička automatska pražnjenja predstavljaju mogućnost ispovesti frustracija i libida savremenog čoveka. Ta ispovest je potpuno bila blokirana u racionalističkom pristupu tradicionalne evropske umetnosti. Ispovest je prvi stupanj ka oslobađanju, dok je metod automatskog pisanja oslobodio umetnika psihičke napetosti i omogućio put savremenog čoveka ka „okeanskom" osećanju, osećanju jedinstva sa prirodom i univerzumom koje su posedovale drevne civilizacije. Pit Mondrijan bi to nazvao „dinamikom u ravnoteži."

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# *LIVING FORM OF NATURE IS ART FORM

## ŽIVA FORMA KAO UMJETNIČKA FORMA

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Our interaction with nature can take a myriad of forms, each impacting our cognitive and aesthetic experiences, and each determining what we see and feel, how we experience and learn. Irrespective of how such natural forms, living or not, impact us, whether they are visible or hidden, explicit or implicit, they still seem to exist within a measured circle of possibilities – as if in the middle of an opening, albeit with no apparent borders. Even the non-living forms of Nature can have a life force of their own, inherent artistic power and beauty with which, at times, they can blind us to nearly anything we may have seen beforehand. Perhaps it is because Nature is the First Artist, or perhaps it is because Nature is the work of the First Artist, but even the non-living forms of Nature seem eager to comply with mankind's artistic parameters and expressions to become a work of art in their own right.

Sve što priroda, kao predmet saznanja ili estetskog doživljaja iznosi pred nas ima formu koja naše pristupe čini lakšim ili težim, ugodnim ili neugodnim. Bilo da izražava ili skriva, bilo da upućuje ili nagovještava, bilo da zavodi ili odbija živa forma uvijek stoji u odmjerenom krugu mogućeg, sred čistine kojoj niko ne poznaje granice. Osim žive i neživa forma prirode, poput umjetničkog djela, može imati životni zamah, umjetničku snagu i ljepotu kojom, nerijetko, u nama zasjeni sve, do tada, viđeno. I da li samo stoga što je priroda Prvi umjetnik ili zato što se iskazala kao djelo Prvog umjetnika, iste su proporcije, sile i nužnosti otisnute u njenim formama našle izraz i u onome što je kao ljudska rukotvorina odavno već prepoznato kao umjetnost.

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Through tangible structures woven into the various forms of Nature, just as such are woven into the various forms of art, such structures lead us to see what lies beyond, lead us to feel what is real, to perceive reality as presented through its aesthetic qualities. That is also how we recognize what is already known and what is already a possibility.

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* The text is published as a preface in the catalog of exhibition *Forma viva* in the XIV$^{th}$ International Congress of Esthetics (Esthetics as Phylosophy), in Ljubljana 1998. It was conceived as a dash for a more extensive reflection on the subject *Naturally beauty as an aesthetic category.*

* Tekst je publikovan kao predgovor katalogu izložbe *Forma viva*, održane u okviru XIV Internacionalnog kongresa estetičara (Estetika kao Filosofija) u Ljubljani 1998 godine. Zamišljen je kao crtica za opsežnije razmišljanje na temu *Prirodno lijepo kao estetska kategorija.*

**Fig. 1-** *Forma viva* (*Clavaria salentina* Agnello & Baglivo), phot. B Perić.

Kroz opipljivi sloj onog materijalnog od kojeg su satkane njihove strukture, prirodne i umjet-ničke forme upućuju na ono iza (μετά), na ono što se osjeća jednako stvarnim, kao što se stvarnim predstavljaju estetski kvaliteti. Otuda, poznato izgleda kao pre-poznato iz svojih mogućnosti, iz pra-forme koja pojedinačnim formama daje pojavnost i značenja.

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The living form as an object of aesthetic experience and understanding demonstrates as many modalities as we are able to recognize. The varied levels of the forms' transparency firstly highlight how seductive our material reality is. And yet, within the limitations of a posibility, as natural laws and balance are maintained, seemingly random play of natural elements, often visible in art forms, lead us from the real towards the abstract.

As substance manifests itself through this play, so does Nature reveal its creativity as an art form. Natural form, like artistic form, in the multitude of its existences, and through its aesthetic and cognitive approaches, offers a plethora of manifestations, two of which are particularly important: beauty and vitality.

Živa forma kao predmet estetskog doživljaja i promišljanja iskazuje onoliko modaliteta koliko smo u stanju da prepoznamo. Transparentnost njenih slojeva, čas veća - čas manja, upućuje najprije na zavodljivu dopadljivost našeg materijalnog realiteta. U odmjerenom krugu mogućeg, postojani zakon zemlje koji ravnotežom nastajanja i nestajanja čuva bespredmetni smjer slobodne igre elemenata, tako vidljive na umjetničkim formama, vodi nas od realnog ka pozadinskom planu iz kojega zrači tajanstvena svjetlost trajanja.

Konačno tu gdje se, otvara transcendentni sloj zjapi ponor iz čijih nam dubina, provaljuje skrivajuća neskrivenost bića. Tu gdje se suština iskazuje kroz igru, tu se i priroda svojom kreativnošću, raskriva kao umjetnost. Prirodna forma kao i umjetnička forma, sred ukupne raznoobraz-

**Fig. 2** -The forest trumpets / Šumske trube (*Tremiscus helvelloides* (DC.) Donk), phot. B Perić.

**Fig. 3 -** The prayer / Molitva (*Clavaria cornea* Batsch), phot. B Perić.

nosti bivstvujućeg, estetetičkom i misaonom pristupu nude mnoštvo kategorija od kojih su za nas posebno važne dvije: ljepota i vitalnost.

Konačno, tu gdje se za nas otvara transcdentni sloj, zjapi ponor iz čijih nam dubina provaljuje skrivajuća neskrivenost bića. Tu gdje se suština iskazuje kroz igru, tu se i priroda svojom kreativnošću raskriva kao umjetnost. Prirodna forma kao i umjetnička forma, sred ukupne raznoobraznosti bivstvujućeg, estetetičkom i misaonom pristupu nude mnoštvo kategorija od kojih su za nas posebno važne dvije: ljepota i vitalnost.

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On one hand, when accepting something as naturally beautiful, we typically associate it with whatever our idea of ideal beauty is, regardless how such an idea manifests itself to us, through melodies, harmonies, symmetries, shapes, variations, or some other forms that beauty, as an idea and an ideal, may hold in our mind's eye.

Resembling a witty riddle, the beauty of natural form both reveals and conceals. Moreover, from the first moment we set our eyes on a beautiful form, such form evokes in us a desire to possess it, to let our soul roam and play with, and within it, in a true aesthetic act.

Naturally beautiful form, as understood within the framework of Aristotle's philosophy of nature, through its layers, transports the inner beauty all the way to the surface. Thus, what was born out of life juices, grown between the earth and sky by water and

**Fig. 4 -** The develop / Razviće (*Laetiporus sulphureus* (Bull.) Murrill), phot. B Perić.

light, at the same time new and ancient, becomes the very face of being.

On the other hand, vitality is an imminent characteristic of all natural forms, living and non-living. The power that molded natural forms manifests itself in any measure, regardless how small or large. No one felt this better than artists, and no one understood it deeper than Henry Moore.

Realizing the depth and secrets of natural forms and how diverse their meanings can be, Henry Moore replaced the ideal of beauty with the ideal of vitality. And even though, vitality could be "*a temporary term by which we hide the fact that we don't know the nature of life and that we cannot measure it*" (Herbert Read), vitality recognizes the human need to overreach. The vitality of natural forms, as Moore perceived it, reverberated throughout his career, in his creations of abstract forms in which one could recognize the artist's genius as he steps out of the architypes of human condition that existed for millennia, between life and death, between the earth and sky.

Prihvatajuće nešto za prirodno lijepo mi predpostavljamo idealni status ljepote, prepoznajemo stvarnost njenih, principa, bilo da se oni ogledaju u harmoniji, simetriji, promjeni, raznovrsnosti, melodiji ili nekim drugim kosmičkim svojstvima koje ljepota, kao ideja, sadrži.

Ljepota prirodnog oblika, kao zagonetka, skriva i otkriva i već prvi dodir s njome budi u nama želju za prisvajanjem, kroz igru duševnih moći, u istinskom estetskom aktu

Prirodno lijepa forma kao morfé (μορφή) u Aristotelovom smislu, svojim vanjskim slojevima iznosi ono unutarnje, nevidljivo i čini ga dostupnim. Ono što se kristalizovalo kroz životne sokove, dejstvom vode i zemlje, svjetlosti i neba, što je izraslo iz postojanosti svog vremena kao vremenito, pokazuje se kao samo lice bivstvujućeg.

S druge strane, vitalnost je imanentno svojstvo prirodnih oblika, bilo da su one žive ili nežive

**Fig. 5** - Group / Grupa II (*Stemonitis fusca* Roth), phot. B Perić.

strukture. Snaga koja ih je oblikovala kroz beskonačni stvaralački proces, manifestuje se u najsitnijim kao i najkrupnijim razmjerama. Niko to ne može bolje osjetiti od umjetnika i niko to nije tako duboko sagledao kao Henry Moore.

Uvidjevši kolike su dubine i tajne prirodnih oblika i koja sve značenja Duh može da provede, kroz njihovu raznoobraznost, on je ideal ljepote zamijenio idelom vitalnosti. I makar da je "*vitalnost privremeni termin kojim prikrivaamo činjenicu da mi ne poznajemo prirodu života i da je ne možemo mjeriti* " (H. Read), ona projektuje ljudsku potrebu za prekoračenjem. Vitalnost prirodnih oblika iskazala se kao povod za veliko Murovo djelo, za kreaciju simboličkih formi u kojima je prepoznatljiv genijalan iskorak umjetnika prema arhetipskim likovima ljudske drame između života i smrti, između zemlje i neba, koja traje već milenijumima.

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The unveiling of Nature's structure, laws and logic is an act that requires a trifecta of powers: the power of intellect, the power of imagination and the power of emotion. This unveiling has been happening since the dawn of time, as it is still happening, only for us, today, it is happening in considerably different circumstances.

The exploitation of our planet, which may have started out of necessity, is nearing its last phase, if it is not already here. The absolute domination of the rational mind seems to have imprisoned us in a vicious circle of diminishing returns where violence against nature is not merely a means to an end, but practically a law. The rational mind, with its both subtle and brutal methods, forces us to keep on supplementing our own limitations. Thus, technology today creates a kind of sameness of everything that is human on this planet, the sameness that forgets the world of Nature, which is our only real realm of existence. This sameness, the consequence of destroying the Nature's ancient genetic secrets, is becoming a pandemic of global proportions.

**Fig. 6** -The prayer II / Molitva II (*Xylaria hypoxylon* (L.) Grev.), phot. B Perić.

The unveiling of the elusive essence of Nature has always been only a possibility, not an actuality. That what is unique does not care for how hard it is to be found and understood, whether it be through science, art or religion. This planet is what it has always been and it is us who must choose: are we going to continue to abuse it mercilessly or shall we "accept its blessing and stiffen in the course of the low of this acceptance, in order to keep the secret of Being and watch the inviolability of the possible" (Heideger).

Raskrivanje po sebi skrivenog lica priride, u čiju strukturu, zakone i logiku već od pamtivijeka nastojimo da proniknemo je čin koji zahtijeva objedinjene duhovne snage: ratia, imaginacije i sen- zibiliteta. To raskrivanje zbiva se jednako danas ako i u davnini, ali u, za nas, znatno izmijenjenim okolnostima.

Pustošenje zemlje, započeto kao racionalan proces nalazi se pred svojm poslednjom fazom. Apsolutna dominacija racionalnog uma zatvorila nas je u prisilni krug procjenjivanja i računan-

**Fig. 1-** Group II/ Grupa II (*C. salentina*), phot. B Perić.

ja; krug u kojem vlada nasillje kao opšti zakon. Svojim suptilnim i brutalnim metodama, racionalni um primorava svijet da tehnologijom iskorači van granica mogućeg. Tehnologije već danas ispostavlja jednoobraznost svega ljudskog na zemlji, jednoobraznost kao veliki zaborav svijeta prirode u kojem stanuje naša prava mogućnost. Jednobraznost se kao epidemija razliva licem svijeta kao posledica neprirodnog razdiranja genetske tajne, postavljene nam od pamtivijeka kao okvir života kojemu se sve živo povinuje.

Raskrivanje po-sebi-skrivenog bića prirode oduvijek je bila samo naša mogućnost. Ono što stoji kao jedno-jedinstveno ne haje ne mari za naše teškoće da mu se približimo, danas odijeljenim stazama nauke, umjetnosti, religije. Zemlja ostaje još uvijek ono što jeste a na nama je presudan izbor: ”*ili ćemo primiti njen blagoslov i skrućivati se u zakonu ovog primanja, da bi se čuvala tajna Bića i bdilo na nepovredivošću mogućeg.”* (M. Hajdeger).

Translated /prevod: Inja Ivković

# RECENSIONI

## AGARICA 37, 2016

-Habitat specificity of selected grassland fungi in Norway (**J.B. Jordal, M. Evju & R G. Gaarder**): 5-32 (funghi praticoli, check-list commentata con fotocolor).

-*Atractosporocybe polaris* – a new clitocyboid agaric described from arctic-alpine and northern boreal regions in Svalbard and Scandinavia (**G. Gulden & E. Larsson**): 33-44 (*Atractosporocybe polaris* sp. nov.).

-*Psathyrella jacobssonii* Örstadius (Basidiomycetes, Agaricales) – new to Norway (**Ø. Weholt et al**.): 45-50.

-The genus *Boubovia* (Velen.) Svrcek in Norway (**R. Kristiansen**): 51-65 (Descrizione di *Boubovia luteola*, *vermiphila*, *ovalispora*).

-A comparison of aboveground sporocarps and belowground ectomycorrhizal structures of Agaricales, Boletales and Russulales in a sand dune ecosystem on Lista, Southwestern Norway (**K. Høiland & S. Botnen**): 67-77 (funghi ectomicorrizici di terreni sabbiosi).

## **STERBEECKIA** 34, 2016

-Myrmecophilous Laboulbeniales (Ascomycota) in Belgium (**A. De Kesel, D. Haelewaters & W. Dekoninck**): 3-6 (Descrizione di *Laboulbenia formicarum* e *Rickia wasmannii*).

-Geillustreerd overzicht van *Leccinum* subsectie *Scabra* in Belgie. Somber gekleurde ruigsteelboleten bij berk (**O. Van de Kerchove**): 7-32 (*Leccinum scabrum*, *schistophilum*, *variicolor*, *cyaneobasileucum*, *holopus*, con tavole a colori).

-Het subgenus *Phlegmacium* (*Cortinarius*) in Vlaanderen. 2de Verslag van de workgrope *Cortinarius* (**P. Verstraeten et al**.): 33-42 (Descrizione di *Cortinarius caerulescens*, leonicolor, variicolor, con fotocolor macro/micro).

-About *Lasiosphaeria* s.l. (4). New species in the genus *Echinosphaeria* A.N. Mull. & Huhndorf (**B. Declercq**): 43-46 (*Echinosphaeria curvatispora* sp. nov., *canescens*, *latispora* sp. nov.).

-Myxomyceten op epifytische mossen in Vlaanderen, een opportuniteit (**M. de Haan**): 47-61 (Descrizione di Myxomycetes muscicoli).

-*Dacrymyces olivei* sp. nov., een dubbelganger van *D. stillatus* (**K. Van de Put & A. De Kesel**): 62-64 (*Dacrymyces olivei* sp. nov.).

## **MYKES** 18, 2015

-Macromicetos do monte da Picaraña na parroquia de Arcos (Ponteareas, Pontevedra) (**G. Pérez-Torrón, H. Fernández-Ricón & M.L. Castro**): 7-27 (Check-list commentata con fotocolor).

- Macromicetos do monte da Cotres, parroquia de Arcos (Ponteareas, Pontevedra) (**H. Fernández-Ricón, G. Pérez-Torrón & M.L. Castro**): 29-49 (Check-list commentata con fotocolor).

-Micobiota autóctona e alóctona: micocenoses, micosocioloxía (**M.L. Castro**): 51-71 (Micocenosi, micosociologia).

-Fragmenta Cholorologica Gallaecica, Fungi 268-278 (**J. Rodríguez-Vazquez & M.L. Castro**): 75-80 (Check-list commentata con fotocolor).

-Ilustración científica no campo da micoloxía (A. Skinner): 83-98 (Micologia del passato).

**MYKES** 19, 2016

-Aportacións á micobiota de Trás-os-Montes IV: "Parque Biológico de Vinhais" e soutos da Freguesia de Espinhosela (**Bragança) (M.L. Castr**o): 9-30 (Check-list commentata con fotocolor).

-Catálogo des taxons expostos no VIII Encontro Micológico do Atlántico (Vinhais, Portugal): especies identificadas de "visu" polos partecipantes (**H. Fernández-Ricón & M. Castro**): 31-59 (Check-list commentata con fotocolor).

-Basidiomycota interesantes de Vilar de Ossos (Vinhais, Portugal) (**M.L. Castro**): 61-68 (Descrizione con fotocolor di *Cantharellus melanoxeros*, *Cortinarius rufo-olivaceus*, *Entoloma mougeotii*, *Ramaria flava*, *Tricholoma roseoacerbum*).

-*Pluteus* recolectados no VIII Encontro Micológico do Atlántico (Vinhais, Portugal) (**P. Lorenzo & O. Requejo**): 69-73 (Descrizione con fotocolor di *Pluteus cervinus*, *ephebeus*, *plautus*, *romellii*).

-Achega ao coñecemento da flora micolóxica do Parque Natural de Montesinho (Trás-os-Montes e Alto Douro, Bragança) (**N. Santamaría Rodríguez**): 75-86 (Descrizione con fotocolor di *Amanita avellanea*, *Entoloma cistophilum*, *Mycena speirea*, *vitilis*).

-Achegas á micobiota do Parque Natural de Montesinho (Portugal) (**F. Rodríguez-Campo, J.A. Rodea Butragueño & A. Díaz Fernández**): 97-101 (Descrizione con fotocolor di *Cantharellus melanoxeros*, *Cortinarius dibaphus*, *Inocybe cookei*, *geophylla* var. *griseosticta*, *glabripes*, *krieglsteineri*, *whitei*, *Russula farinipes*, *odorata*).

-Os fungos na terapéutica (**N.F. Andrés-Rodríguez**): 105-138 (Funghi medicinali).

**YESCA** 28, 2016

-La reputacion de los hóngos a través del tiempo (**R. Álvarez Álvarez**): 15-18 (Micologia del passato).

-Hifas de hongos como material de construcción II (**C. Illana-Esteban**): 19-24 (Etnomicologia).

-*Microporus xanthopus* (Fries) Kuntze (**J.A. Eiroa García-Garabal & E. Eiroa Rosado**): 31-32.

-Cuatro especies del género *Cortinarius* en Cantabria (**A. Pérez Puente**): 33-46 (Descrizione con fotocolor di *Cortinarius joguetii*, *olympianus*, *purpurascens*, *catharinae*).

-*Morchella pulchella*, una especie poco frecuente (**L.J. ALonso, A. Fernández & C. Monedero**): 47-52.

-*Russula camarophylla* Romagnesi, en la peninsula ibérica (**M. Á. Pérez-De-Gregorio**): 53-58.

-*Tylopilus porphyrosporus* (Fr. & Hök) A.H. Sm. & Thiers, 1971 (**J.I. Gárate Larrea**): 59-62.

-*Phaeolus schweinitzii* (Fr.) Pat. (**F.J. Miguel-Pacheco**): 63-70.

-*Amanita curtipes* E.-J. Gilbert (**V. Castañera**): 71-74.

-Algunos *Myxacium* y otros *Cortinarius* interesantes del municipio de Soba (I) (**J.A.**

**Cadiñanos Aguirre**): 75-96 (Brevi descrizioni con fotocolor di numerosi *Cortinarius*).

-*Inocybe ferruginea* Bon, un bello y poco conocido *Inocybe* (**T.I. Ferrezuelo & C.M. Diaz**): 97-102.

-*Hymenoscyphus calyculus* (Sowerby) W. Phillips, A. (**S. Pedraja Lombilla**): 103-108.

-Aportación a la medición esporal sistemática en ayuda de la determinación de especies mediante una herramienta estadistico-matemática: *Cantharellus cibarius* Fr. y especies afines (**A. Meléndez**): 109-138 (*Cantharellus cibarius* s.l., studio delle misure sporali).

-*Genea amici* una especie nueva encontrada en Corcega (**A. Paz Conde, P. Chautrand & C. Lavoise**): 139-150.

**ANNALI MICOLOGICI** A.G.M.T. 9, 2016

-XXXI° Comitato Scientifico Regionale A.G.M.T. (**M. Della Maggiora, R. Trassinelli & U. Pera**): 9-62 (Check-list commentata con fotocolor).

-*Urnula mediterranea* in Toscana (**R. Marziani, V. Caroti & M. Carbone**): 75-84.

-*Boletaceae* Chevall. Stato attuale della nomenclatura (**M. Della Maggior**a): 85-116 (Nomenclatura aggiornata delle *Boletaceae* italiane).

-Ritrovamento di *Gliophorus laetus* in Garfagnana, specie poco comune in tutta la Toscana (**F. Giannoni & M. Raumi**): 117-121.

-Sintesi intervento su: Analisi dei caratteri morfologici, ecologici e molecolari di *Russula pectinatoides* Peck e *Russula praetervisa* Sarnari (**C. Ostellari**): 122.

-Ritrovamento di *Microglossum griseoviride* in Toscana, prima segnalazione per il territorio italiano (**M. Carbone & M. Della Maggiora**): 123-133.

-Ritrovamento di *Russula arpalices* Sarnari in Canton Ticino (**S. Melera & C. Ostellari**): 135-144.

**BOLETÍN INFORMATIVO SOCIEDAD MICOLÓGICA EXTREMEÑA** 16, 2016

-*Lepiota latifolia* Contu, una rara especie no citada en España (**A. Mateos & A. Caballero**): 3-9.

-*Mycena xantholeuca* Kuhner, en la Peninsula Ibérica (**M. Á. Pérez-De-Gregorio & A. Palazón**): 10-13.

-*Omphalina mutila*, un infrecuente hongo de las turberas (**E. Rubio & J. Linde**): 14-18.

-Dos especies hipogeas poco frecuentes, nuevas citas para al Catálogo Micológico Extremeño (**M. Romero**): 19-22 (Descrizione con fotocolor macro/micro di *Hysterangium pompholyx* e *Genea compacta*).

-Dos localizaciones de Leratiomyces ceres en Andalucía (**T. Illescas & C. Morente**): 23-30.

-Algunas especies del género *Pluteus* Fr. en Extremadura (**A. Mateos & F. Pla**): 31-47 (Descrizione con fotocolor di *Pluteus cervinus* f. *brunneoradiatus* f. nov., *hiatulus*, *petasatus*, *podospileus* f. *minutissimus*, *thomsonii*).

-Notas on Gomphales VII. Un abordaje taxonómico de *Ramaria* (**P.P. Daniëls**): 48-53 (*Ramaria*, sistematica).

-Gasteromycetes interesantes en el Parque del Príncipe de Cáceres (**F. Duran**): 54-57 (Descrizione con fotocolor di *Phallus rubicundus*, *Myriostoma coliforme*, *Colus hirudinosus*).

**MICOLOGIA NELLE MARCHE** 10 (1) 2016

-Russule per tutti (Sesto contributo) (**F. Benigni, G. Barighelli & M. Petroselli**): 3-8 (Descrizione con fotocolor di *Russula foetens*, *subfoetens*, *illota*).

-La famiglia delle *Hygrophoraceae*: setttimo contributo *Hygrophorus*: terzo atto (**M. Massi**): 9-16 (Descrizione con fotocolor di *Hygrophorus camarophyllus*, *agathosmus*, *fragicolor*, *hypothejus*, *lindtneri*, *roseodiscoideus*).

-Funghi del litorale pesarese (Parte 2°) (**M. Maletti**): 17-24 (Descrizione con fotocolor di *Geopora foliacea*, *Entoloma sarcitum*, *Marasmiellus mesosporus*, *Omphalina pyxidata*, *Arrhenia spathulata*, *Galerina graminea*).

-Gli ambienti di crescita dei funghi: la faggeta (**F. Fabrizi, F. Brutti & M. Lucarini**): 25-27 (Funghi di faggio).

-Andar per funghi (**E. Carassai**): 28-34 (Generico).

**MICOLOGIA NELLE MARCHE** 10 (2) 2016

-Russule per tutti (Settimo contributo) (**F. Benigni, G. Barighelli & M. Petroselli**): 5-10 (Descrizione con fotocolor di *Russula pseudoaeruginea* f. *galochroa*, *medullata*, *subterfurcata*).

-Due *Macrolepiota* spostate nel genere *Chlorophyllum* (**M. Maletti**): 11-15 (Descrizione con fotocolor di *Chlorophyllum venenatum*, *rachodes*).

-Un ritrovamento interessante nella città di Fano (**L. Polidori**): 16-20 (Descrizione con fotocolor di *Panus neostrigosus*).

-Gli ambienti di crescita dei funghi: la cerreta (F**. Fabrizi, F. Brutti & M. Lucarini**): 21-23 (Funghi di cerro).

-Autunno, tempo di funghi! (**E. Carassai**): 25-30 (Generico).

**FIELD MYCOLOGY** 17 (2) 2016

-Fungal Portraits N°. 66 *Lindtneria panphyliensis* (**A. Henrici**): 39-40.

-*Phellinus conchatus* in Britain is host to Europe's smallest beetle, *Baranowskiella ehnstromi* (**A.G. Duff, N.B. Mahler & T. Leech**): 41-43.

-Fungi Royale: from Regent's Park to Primrose Hill (**A. Overall**): 44-50 (Descrizione con fotocolor di *Russula carpini*, *odorata*, *carminipes*, *Cortinarius infractus*, *Coltricia confluens*, *Galerina clavata*).

-An exceptional *Taphrina* year in North-west Wales (**D. Evans**): 51-54 (Fotocolor di *Taphrina pruni*, *deformans*, *alni*, *padi*, *betulinum*).

-A biographical note on a little-known member of the British Mycological Society (**S. Buczacki**): 55-57 (Micologia del passato).-*Xeromphalina cauticinalis* (**J. Weightman**): 58-59.

-*Chamonixia caespitosa*: first record for Britain of a rarely found fungus (**C. Hobart**): 60-63.

-Gastón Guzmán 1932-2016 (**A. Overall**): 63-64 (Necrologio).

-Two remarkable Japanese microfungi new to Britain (**B.M. Spooner & E. Punithalingam**): 65-69 (Descrizione con fotocolor di *Polyplosphaeria* cf. *fusca*, *Olpitrichum sphaerosporum*).

-Notes and Records (**A. Henrici**): 70-72 (Descrizione con fotocolor di *Marasmiellus tricolor*, *Crepidotus calolepis*).

**FIELD MYCOLOGY** 17 (3) 2016

-Fungal Portraits N° 67 *Cystoderma simulatum* (**G. Kibby & S. Harding**): 75-77.

-*Hohenbuehelia bonii* sp. nov. and *H. culmicola*: two pearls within the Marram Oyster (**A.M. Ainsworth, L.M. Suz & B.T.M. Dentinger**): 78-86 (Descrizione con fotocolor di *Hohenbuehelia bonii* sp. nov. e *H. culmicola*).

-*Volvariella surrecta*: first record for the Republic of Ireland **(I. Abbott**): 87-88.

-In memoriam: *Pleurotellus* (**A. Henrici**): 89-94 (Descrizione con fotocolor di *Marasmiellus lateralis*, *Cheimonophyllum candidissimum*).

-*Melanoleuca castaneofusca* new to Britain (**G. Kibby**): 95-97.

-*Entoloma moserianum* new to Britain (**G. Kibby & S. Harding**): 98-99.

-*Cortinarius alboamarescens* new to Britain (**G. Kibby, A.M. Ainsworth & T. Niskanen**): 100.

-Readers' Finds (**G. Kibby**): 101-102 (Descrizione con fotocolor di *Clitopilus scyphoides* f. *reductus*, *Dumontinia tuberosa*, *Entoloma chlorophyllum*).

-Notes and Records (**A. Henrici**): 103-105 (Descrizione con fotocolor di *Lindtneria panphyliensis*, *Marasmius buxi*).

**FIELD MYCOLOGY** 17 (4) 2016

-Fungal Portraits N° 68: *Mycena rhenana* (**A. Henrici, A. Lucas & S. Rogerson**): 111-113.

-Micological Microscopy part 1: choosing your equipment (**M. Storey**): 114-123 (Microscopia).

-Southern Bracket or Artist's Conk? (**A. Overall**): 124-128 (*Ganoderma australe*, *applanatum*).

-E.C. Large. Mycologist, engineer, artist & novelist (**G. Kibby**): 129-132 (Micologia del passato).

-Readers' Finds (Redazionale): 133-138 (Breve descrizione con fotocolor di *Lactarius pilatii*, *Lepidotia hispida*, *Cudonia circinans*, *Mycena stipata*, *Imperator rhodopurpureus*, *Rugosomyces chrysenteron*, *Pluteus petasatus*, *Gymnopilus dilepis*, *Russula melliolens*).

-Notes and Records (**A. Henrici**): 139-142 (Descrizione con fotocolor di *Ceratiomyxa porioides*, *Marasmiellus candidus*).

**FIELD MYCOLOGY** 18 (1) 2017

-Fungal Portraits N° 69: *Scleroderma meridionale*. First British Record (**G. Kibby**): 3-4.

-Having a LAFF with *Anthracoidea* (**S. Taylor & P.A. Smith**): 5-13 (*Anthracoidea*, brevi descrizioni e fotocolor di molti taxa).

-3rd international Russulales Conference. November 2016, Piombino, Italy (**G. Kibby & M. Tortelli**): 14-19 (Brevi descrizioni con fotocolor di *Lactarius atlanticus*, *acerrimus*, *luridus*, *Russula galochroides*, *prinophila*, *pseudoaeruginea*, *rutila*, *Cortinarius caroviolaceus*).

-DNA and the field mycologist: part 1 (**D. Harries**): 20-23 (Studi molecolari).

-From and Ashtead garden: the fungus paintings of A.W.G. Lowther (**B. Spooner**): 23-29 (Micologia del passato).

-Some 2016 New Forest highlights (**A. Henrici**): 30-33 (Fotocolor di *Mycena tenuispinosa*, *Rhodocollybia* cfr. *fodiens*, *Erastia salmonicolor*, *Spongipellis pachyodon*, *Chlorociboria* cfr. *aeruginella*).

-Notes and Records (**A. Henrici**): 34-37. (Descrizione con fotocolor di *Coprinopsis spelaiophilus*, *Entoloma callirhodon*, *Flaviporus brownii*).

**ACTA MYCOLOGICA** 52 (1) 2017

-Contribution to the knowledge of fungi of the Kampinos National Park (Poland) with particular emphasis on the species occurring in burnt places (**B. Gierczyk et al.**): 18 pagine (Check-list commentata con fotocolor).

-Genetic diversity of natural psammophilous populations of *Hypogymnia physodes* (L.) Nyl. on Polish seacost dunes (**A. Wieczorek et al.**): 6 pagine (Licheni).

-Macromycetes of Central European lichen Scots pine forests of the Cladonio-Pinetum Juraszek 1927 type in the "Bory Tucholskie" National Park (NW Poland) (**B. Grzesiak, M. Kochanowska & J. Kochanowski**): 18 pagine (Licheni).

-New and interesting species of lichens from xerothermic habitats in NW Poland (**A. Wieczorek, A. Lysko & J. Motiejunaite**): 12 pagine (Licheni).

-New localities of *Sarcodontia crocea* (Polyporales, Basidiomycota) in Poland (**A. Szszepkowski et al.**): 6 pagine.

-Two species of true morels (the genus *Morchella*, Ascomycota) recorded in the Ojcow National park (south Poland) (**J. Barán & P. Borón**): 9 pagine (*Morchella deliciosa*, *esculenta*).

-Basaltic stones with epilithic lichens as a novel substrate for an osmotolerant fungus, *Aspergillus glaucus* (**I. Grishkan & M. Temina**): ): 5 pagine (Licheni, *Aspergillus glaucus*).

-First record of a cold-period myxomycete species *Dianema depressum* (Lister) Lister in Poland (**P. Chachula, M. Fiedor & A. Ronikier)**: 3 pagine (Myxomycetes).

**ASIAN JOURNAL OF BIODIVERSITY** 7 (1) 2016

-Basidiomycetous Fungi in Mt. Palay-Palay Protected Landscape, Luzon Island, Philippines (**L.P. Angeles et al.**): 79-94 (Check-list commentata con fotocolor).

**DARWINIANA** (nueva serie) 5 (1) 2017

-La investigacion micologica en la Argentina: Periodo 1978-2016 (**I.J. Gamundí, A.M. Godeas & M.N. Cabello**): 98-108 (Storia della micologia moderna in Argentina).

-Especies de *Trichoderma asociadas* con nidos de hormigas del género Acromyrmex en Argentina y primer registro de *Trichoderma lentiforme* para el pais (**N.G. Armando, J.A. Marfetan & P.J. Folgarait**): 72-82 (*Trichoderma lentiforme*).

**ZIZAK** 12, 2016

-Patrones fenológicos de fructificación de los macromicetos del País Vasco (**L. Aiartzaguena et al.**): 9-21 (Fenologia).

-Primera cita en España de *Russula* littoralis Romagn. (**M. Gonzalez, R. Garcia Blanco & A. Monedero Garcia**): 23-28.

-Especies raras o poco conocidas de hongos macromicetos VII (**P. Arrillaga**): 29-40 (Descrizione con fotocolor di *Hemileccinum depilatum*, *Entoloma henrici*, *percuboideum*, *Agrocybe firma*).

-Primeros registros de *Tricholomopsis sulfureoides* en la Península Ibérica (**I. Olariaga & L. Sánchez**): 41-50.

-Diversidad endomicorrícica asociada al sistema dunar de Gorliz (**E. Sarrionandia, G. Merchán & I. Salcedo**): 51-65 (Glomus).

-Adiciones al catálogo fungico de la CAPV (**R.M. Picón**): 67-84 (Check-list commentata con fotocolor).

-Hongos singulares (Redazionale): 85-92 (Fotocolor).

**IL MICOLOGO** 52, 2016

-Funghi rari del Pinerolese pedemontano (Alpi Cozie): *Boletus dupainii* Boud. e *Tricholoma apium* Jul. Schäff. (**M. Manavella & M. Maurino**): 5-9.

-*Tuber bellonae* Quélet 1888. Un fungo ipogeo raro e poco conosciuto (**V. Somà**): 11-14.

**IL MICOLOGO** 53, 2016

-I Boleti così detti "fré" o "cambia colore" nelle Valli del Monviso (Alpi Cozie) (**M. Manavella**): 3-26 (Descrizione con fotocolor di *Boletus calopus*, *erythropus*, *luridus*, *appendiculatus*, *subappendiculatus*, *Xerocomus badius*, *Tylopilus felleus*).

**IL MICOLOGO** 54, 2016

-Insolita collaborazione tra *Pilobolus* sp. e *Dictyocaulis viviparus* (**A. De Vito**): 5-10.

-*Helvella costifera* (Nannf.). Una sorprendente... ruota di carro (**P. Apicella**): 11-12.

-*Discina parma* J. Breitenb. & Maas Geest. 1973. Un raro ascomicete primaverile (**V. Somà**): 13-16.

**ÖSTERREICHISCHE ZEITSCHRIFT FÜR PILZKUNDE** 25, 2016

-Nomenclatural novelties in *Boletaceae* (**W. Klofac & I. Krisai-Greilhuber**): 1-3 (*Hemileccinum depilatum* f. *sanguineomaculatum* comb. et stat. nov., *Leccinum pseudoscabrum* f. *isabellinum* comb. nov., *cyaneobasileucum* var. *brunneogriseolum* f. *chlorinum* comb. nov. , c. var. b. f. *pubescentium* comb. & stat. nov., *Imleria badia* f. *vaccinus* comb. & stat. nov., *Butyriboletus regius* f. *aureus* comb. nov., *Rheubarbariboletus armeniacus* f. *luteolus* comb. nov., a. var. *venosipes* comb. nov., *Suillellus queletii* var. *rubicundus* comb. nov.).

-Chemistry of the earthy odour of basidiomata of *Cortinarius hinnuleus* (Basidiomycota, Agaricales) (**N. Arnold et al.**): 5-10.

-*Mycena pilosostipitata*, a new species of section Filipedes from Lower Saxony (Germany) (**J. Miersch & G. Robich**): 11-17. (*Mycena pilosostipitata* sp. nov.).

-*Abortiporus biennis*: the third record of this fungus and a new genus name for the Pakistan funga (**J. Khan, H. Sher & A.N. Khalid**): 19-22.

-Morphological and molecular identification of newly recovered *Pythium species*, *P. sylvaticum* and *P. glomeratum* from Iran, and evaluation of their pathogenicity on cucumber seedlings (***A.C. Boukhey et al.***): 23-38.

-Morphological and molecular identification of newly recovered *Pythium species*, *P. abappressorium* and *P. spinosum* from Iran, and evaluation of their pathogenicity on cucumber seedlings (**A.C. Boukhey et al.**): 39-50.

-Some *Conocybe* species rare or new for Ukraine. 2. Sections *Mixtae* and *Pilosellae* (**M.P. Prydiuk**): 51-67 (Descrizione di *Conocybe lobauensis*, *macrospora*, *subpubescens*, *ochrostriata*, *rostellata*, *velutipes*, *fimetaria*, *farinacea*, *hexagonospora*).

-Diversity of mycobiota isolated from tissues of four cultivars of *Pistacia vera* (**H.K. Dolatabad et al.**): 69-78 (Check-list).

-*Lyophyllum decastes,* a new mushroom species for India and its extracellular enzymes (**S. Sood, K.K. Koul & R.C Upadhyay**): 79-89.

-Ein erstfund von *Galerella plicatella* in Kärnten, Österreich (**M. Koncilia & E. Brodegger**): 91-94.

-Key to the *Byssoloma* species (lichenised Ascomycota, *Pilocarpaceae*) known from Macaronesia (**O. Breuss**): 95-99 (*Byssoloma*, chiave).

-Bemerkenswerte *Russula*-funde aus Ostösterreich 15: Subgenus *Incrustatula* (**H. Pidlich-Aigner**): 101-189 (Descrizione macro/micro e fotocolor di *Russula olivacea*, *alutacea*, a. var. *citrinicolor*, *vinosobrunnea* var. *perplexa*, *minutula*, *lepidicolor*, *roseoaurantia*, *zvarae*, *emeticicolor*, *azurea*, *lilacea*, *vinosa*, *claroflava*, *pseudointegra*, *caerulea*, *risigallina*, *ochracea*, *roseicolor*, *roseipes*, *turci*, *amethystina*).

-*Conocybe volvicystidiata*, une nouvelle espèce de la section Singerella (**A. Hausknecht & M. Broussal**): 191-199 (*Conocybe volvicystidiata* sp. nov.).

-*Psilocybe serbica* var. *bohemica* – ein österreichischer Nachweis (**I. Krisai-Greilhuber et al.**): 201-208.

-Eine ethnomykologische studie über das Pilzwissen in der Bevölkerung des Waldviertels (**L. Aigner & I. Krisai-Greilhuber**): 209-224 (Etnomicologia).

-Erstfund des kastanienbraun kugelschwamms, *Camarops petersii*, im Naturwaldreservat Johannserkigel, Wine, Österreich (**A. Urban**): 225-229.

**IMA FUNGUS** 8 (1) 2017

-A plant pathology perspective of fungal genome sequencing (**J. Alyward et al**.): 1-15 (Patologia vegetale, genoma).

-Functional diversity in *Dichomitus squalens* monokaryons (**S. Casado Lope**z et al.): 17-25.

-New species of *Tulasnella* associated with terrestrial orchids in Australia (**C.C. Linde et al.**): 27-42 (*Tulasnella prima* sp. nov., *T. secunda* sp. nov., *T. warcupii* sp. nov., *T. sphagneti* sp. nov.).

-*Elaphomyces species* (*Elaphomycetaceae*, Eurotiales) from Bartlett Experimental Forest, New Hampshire, USA (**M.A. Castellano & R.B. Stephens**): 49-63 (*Elaphomyces americanus* sp. nov., *E. bartlettii* sp. nov., *E. macrosporus* sp. nov., *E. oreoides* sp. nov., *E. remickii* sp. nov.).

-*Pleiocarpon* gen. nov. and a new species of *Ilyonectria* causing basal rot of *Strelitzia reginae* in Italy (**D. Aiello** et al.): 65-76. (*Pleiocarpon strelitziae* sp. nov., *Ilyonectria strelitziae* sp. nov.).

-New endophytic *Toxicocladosporium* species from cacti in Brazil, and description of *Neocladosporium* gen. nov. (**J.D.P. Bezerra** et al.): 77-97 (*Toxicocladosporium cacti* sp. nov., *T. immaculatum* sp. nov., *Neocladosporium leucadendri* comb. nov.).

-Asexual-sexual morph connection in the type species of *Berkleasmium* (**J. Tanney & A.N. Miller**): 00-105 (*Berkleasmium*).

-Anther smuts of *Silene acaulis* and *S. uniflora* in the Outer Hebrides, including an assessment of ITS genotypes of *Microbotryum silenes-acaulis* (**P.A. Smith et al**.): 107-116 (*Microbotryum silenes-acaulis*, *M. silense-inflatae*).

-Asexual and sexual morphs of *Moesziomyces* revisited (**J. Kruse et al.**): 117-129 (Moesziomyces).

-The Genera of Fungi – G 4: *Camarosporium* and *Dothiora* (**P.W. Crous & J.Z. Groenewald**): 131-152 (*Camarosporium flavigenus* comb. nov., *Foliophoma fallens* comb. nov., *Hazslinskyomyces aloes* comb. nov., *H. aptrootii* sp. nov., *H. chersinae* sp. nov., *Libertasomyces quercus* sp. nov., *Querciphoma carteri* comb. nov., *Dothiora cactacearum* sp. nov.).

-*Diaporthe* is paraphyletic (**Y. Gao et al**.): 153-187 (*Diaporthe acutispora* sp. nov., *D. elaeagni-glabrae* sp. nov., *D. incompleta* sp. nov., *D. podocarpi-macrophylli* sp. nov., *D. undulata* sp. nov., *D. xishuansbanica* sp. nov., *D. yunnanensis* sp. nov., *D. averrhoae* comb. nov., *D. camptothecae* comb. nov., *D. chimonanthi* comb. nov., *D. eucommiae* comb. nov., *D. eucommiicola* comb. nov., *D. glabrae* comb. nov., *D. lagerstroemiae* comb. nov., *D. liquidambaris* comb. nov., *D. loropetali* comb. nov., *D. magnoliicola* comb. nov., *D. michelina* comb. nov., *D. phyllanthicola* comb. nov.).

-Report of the Nomenclature Committee for Fungi – 20 (**T.W. May**): 189-203 (Nomenclatura).

-Report of the Nomenclature Committee for Fungi – 21 (**T.W. May**): 205-210 (Nomenclatura).

Gabriele Cacialli

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Manuscripts must be divided into sections, arranged in the following order: Title page, Abstract, Introduction, Materials and Methods, Results, Discussion, Acknowledgments, References, Figure legends, Tables, and Figures.

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Vellinga EC., 2004. Ecology and distribution of lepiotaceous fungi (Agaricaceae). Nova Hedwigia 78: 273-299. (paper in journal)

Papetti C., Consiglio G. & G. Simonini, 2000. Atlante fotografico dei fungi d'Italia. Volume I. Centro studi micologici dell' A.M.B. Vicenza. 511 p. /book by author(s)/

Wood M., Stevens F., 1996–2009. The fungi of California. www.mykoweb.com/CAF/ [accessed 1 Jun 2009] (web pages)

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