New species of the genus *Entoloma (Basidiomycota, Agaricales)* from Southern Europe

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Accepted 31. August 2021 © Austrian Mycological Society, published online 7. November 2021

VILA, J., NOORDELOOS, M. E., RESCHKE, K., MOREAU, P.-A., BATTISTIN, E., RIBES, M. Á., MARULLI, U., CORRIOL, G., POLEMIS, E., LOIZIDES, M., DIMA B., 2021: New species of the genus *Entoloma (Basidiomycota, Agaricales)* from Southern Europe. – Österr. Z. f. Pilzkunde 29: 123–153.

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Key words: *Cyanula, Entolomataceae, Nolanea.* – ITS barcode, Mediterranean, morphology, taxonomy. – 13 new species.

Abstract: Thirteen new species of *Entoloma*, ten of them belonging to subgenus *Cyanula* from Southern Europe are fully described and illustrated, as a precursor to a completely revised European monograph and phylogenetic studies in subg. *Cyanula*, viz. *Entoloma benedictinum, E. caeruleopinophilum, E. fazziense, E. notabile, E. ortegae, E. pallidostriatum, E. perfidodiscum, E. riparium, E. rivipollense,* and *E. versicolor*. Notes are given on some species of subg. *Nolanea*, including three new species *E. anodinum, E. assiduum*, and *E. sericeoalpinum,* and remarks on the interpretation of *Entoloma nitens*.

Zusammenfassung: Dreizehn neue *Entoloma*-Arten aus Südeuropa, zehn davon aus der Untergattung *Cyanula*, werden vollständig beschrieben und illustriert, als Vorläufer für eine vollständig überarbeitete europäische Monographie und phylogenetische Studien in subg. *Cyanula*, nämlich *Entoloma benedictinum, E. caeruleopinophilum, E. fazziense, E. notabile, E. ortegae, E. pallidostriatum, E. perfidodiscum, E. riparium, E. rivipollense* und *E. versicolor*. Es werden Anmerkungen zu einigen Arten der Untergattung *Nolanea* gegeben, darunter die drei neuen Arten *E. anodinum, E. assiduum* und *E. sericeoalpinum*, und Bemerkungen zur Interpretation von *Entoloma nitens* angefügt.

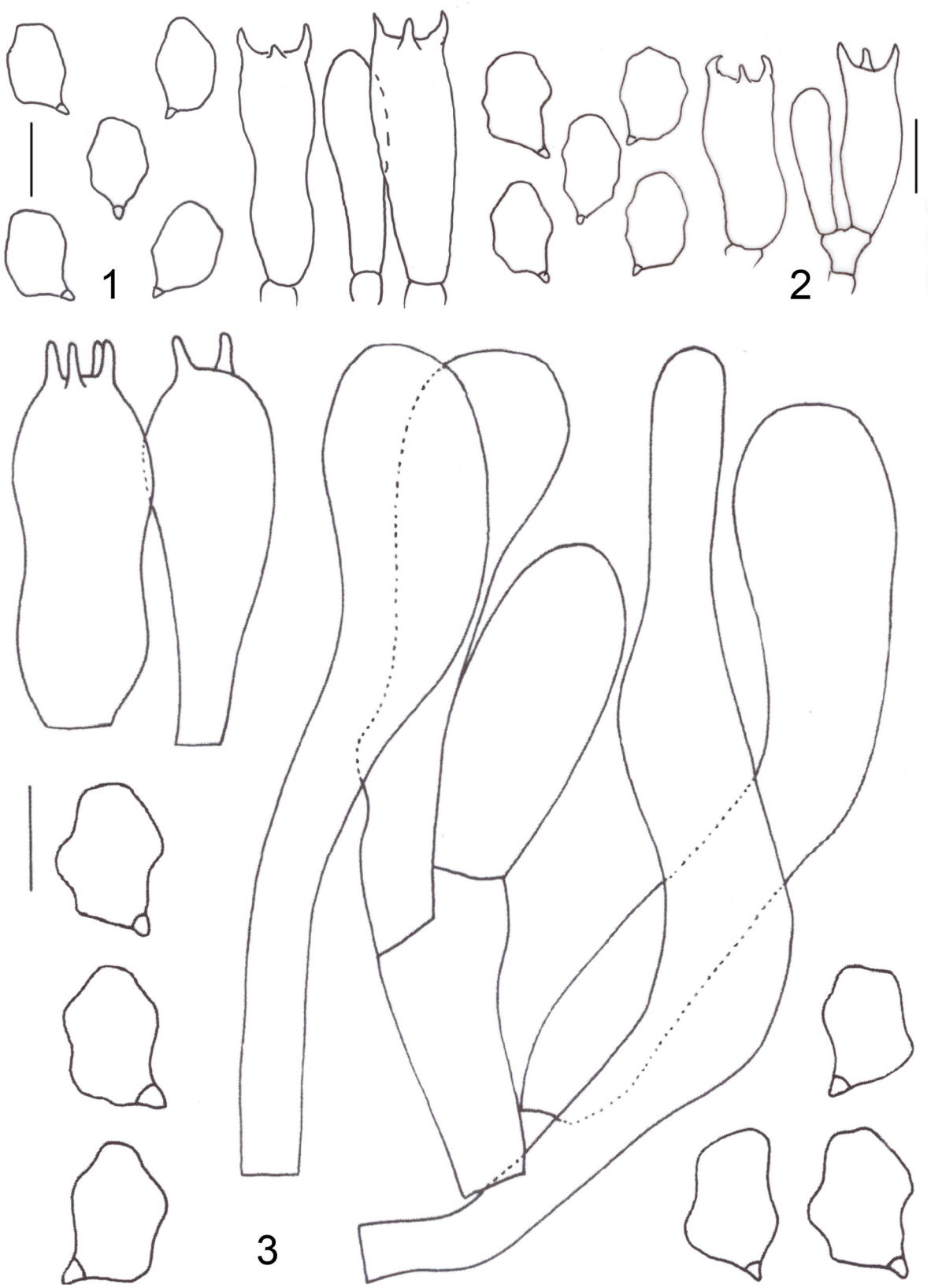
Entoloma (FR.) P. KUMM. *sensu lato* is a species-rich and morphologically diverse genus in the family *Entolomataceae* (*Agaricales, Basidiomycota*), accommodating over 1500 described species (CO-DAVID & al. 2009, MOROZOVA & al. 2014). Taxonomic arrangements in the genus have traditionally been based on morphological concepts, adopting an elaborate infrageneric classification including several subgenera (ROMAGNESI 1974a, 1978; NOORDELOOS 1992, 2004), some of which were considered as distinct genera by some authors (PEGLER 1983, LARGENT 1994). In recent years, phylogenetic studies based on multigene analyses, have nonetheless indicated that most of the segregated genera are not monophyletic (CO-DAVID & al. 2009). Instead, the sequestrate genera *Richoniella* COSTANTIN & L. M. DUFOUR and *Rhodogaster* E. HORAK were shown to nest within the inclusive *Entoloma* clade rendering it monophyletic, with sister-clade relationships to the *Clitopilus/Rhodocybe* clade (BARONI & MATHENY 2011). However, many of the described subgenera appear to be paraphyletic or polyphyletic and warranting further revisions, while the genus remains poorly sampled in several biodiversity hotspots, including the Mediterranean basin (NOORDELOOS & GATES 2012, MOROZOVA & al. 2014).

This study is part of a large-scale molecular phylogenetic and morphological revision of the *Cyanula* clade in genus *Entoloma* in Europe to be published in due course (DIMA & al. 2022) and a new, completely revisited monograph of all European species (NOORDELOOS 2022, 2023). The clade/group *Cyanula* is here defined in a wide sense, including all clampless, often vividly coloured species, formerly included in subgen. *Leptonia*, but shown to be phylogenetically quite distant from the clamped *Leptonia* s. str. taxa (MOROZOVA & al. 2014).

The material in the present study comes from various sources, mainly from the first author (J.V.) and collaborators, who studied the mycobiota of Spain, Catalonia, in depth (CABALLERO & VILA 2013; VILA & CABALLERO 2007, 2009; VILA & LLIMONA 2010; VILA & al. 2013, 2014), as well as material from the Canary Islands (RIBES & VILA 2013), Corsica (MOREAU & al. 2007), The Alps, and Northern Italy.

Material and methods

Morphology. All collections studied were photographed in the field, and attention was paid in observing the surrounding vegetation and putative ecology for each collection based on above-ground obser-



Figs. 1–3. Microcharacters. – Fig. 1. *Entoloma ortegae*, spores and basidia. Bar = 10 µm (all figs from holotype) – Fig. 2. *Entoloma caeruleopinophilum*, spores and basidia. Bar = 10 µm (all figs from holotype) – Fig. 3. *Entoloma pallidostriatum*, spores, basidia, and cheilocystidia. Bar = 10 µm (all figs from holotype).

vations. The material was described straight after collecting to document the ephemeral macroscopical characters, and subsequently dried and stored in the personal herbarium of each collector. Microscopical characters were studied with standard light microscopy methods. Spores, basidia and cystidia were observed in squash preparations of small parts of the lamellae in 5 % KOH or 1 % Congo Red in concentrated NH_4OH. The pileipellis was examined on a radial section of the pileus in water. Basidiospore dimensions are based on observing 40 spores in side view, while cystidia and basidia dimensions are based on observing at least 10 structures per collection. Basidia were measured excluding sterigmata, and the spores excluding hilum. Spore length to width ratios are reported as "Q" and average length to width ratio is reported as "Qav". Unless otherwise stated, all material is deposited in the herbarium of the Naturalis Biodiversity Centre, Leiden, the Netherlands (L). Type sequences are deposited in GenBank with the accession no. OL343529–OL343539.

DNA extraction and sequencing. DNA was extracted from 15–30 mg of dry material (depending on availability), using E.Z.N.A.® Plant DNA Kit (Omega Bio-Tek) following the manufacturer's instructions. Final elutions were done in a total volume of 100 µl elution buffer. The presence of DNA was checked on an agarose gel. The internal transcribed spacer (ITS) was amplified with primers ITS1F (GARDES & BRUNS 1993) and ITS4 (WHITE & al. 1990). For PCR reactions puReTaq ReadyTo-Go PCR Beads ™ (GE Healthcare) were used following the manufacturer's instructions, adding 1 µl of genomic DNA to a reaction volume of 25 µl. PCR conditions were: 5 min initial denaturation at 94 °C followed by 40 cycles of: 1 min denaturation at 95 °C, primer annealing at 57 °C for 1 min, and extension at 72 °C for 1 min, followed by a final extension of 7 min at 72 °C. PCR products were purified following the protocol of RealClean Spin PCR Clean-up Kit (Durviz, sl). Sequences were obtained in the laboratories of Secugen (Madrid) with the primers used in the amplification reaction.

Taxonomic part

Entoloma ortegae VILA & RIBES, spec. nova (Fig. 1, Colourfig. 1)

Mycobank no.: MB840814

Holotypus: Spain: Canary Islands, Tenerife, Agua García, Lomo de la Jara, alt. 925 m, among mosses, near *Pinus radiata*, *Erica arborea*, *Laurus novocanariensis* and *Cistus symphytifolius*, on acid soil, 23 Dec. 2009, M. Á. RIBES, L-0607574 (isotypus in MAR 231209-30) (GenBank no.: OL343529).

Etymology: to the memory of ANTONIO ORTEGA DÍAZ (1954–2014), for his great contribution to the study of Mediterranean fungi.

Description:

P i l e u s : 25–45 mm in diameter, convex at first then quickly flattened, with or without low umbo, not hygrophanous, not translucently striate when young, but progressively becoming translucently striate in well hydrated specimens particularly at margin, dark blue or blue grey at the centre, paler towards the margin, with brown or blue-brown tinges, finely squamulose, especially at centre, progressively smoother towards the margin.

L a m e l l a e : adnate, ventricose, relatively dense, first whitish or creamy then with pink tinges; with entire, concolorous edge.

S t i p e : 30–60 × 3–4 mm, central, cylindrical, not compressed or with longitudinal grooves, dark blue when young, then uniformly blue grey becoming paler grey when mature, glabrous, polished to finely fibrillose, with white base.

C o n t e x t : Taste and smell indistinct.

B a s i d i o s p o r e s : 8.5–11 × 5.5–7.5 µm, on average 9.7 × 6.6 µm, Q = 1.2–1.7, Qav = 1.5, heterodiametrical, 5–6-angled in side view.

Colourfig. 1. *Entoloma ortegae*, holotype. Photo: M. Á. RIBES.

Colourfig. 2. *Entoloma caeruleopinophilum*, holotype. Photo: M. Á. RIBES.

B a s i d i a : 26–40 × 10–12 µm, 4-spored, subclavate, clampless.

L a m e l l a e d g e : fertile.

C h e i l o c y s t i d i a : absent.

P i l e i p e l l i s : a cutis of cylindrical hyphae, with transitions to a trichoderm at centre and clavate terminal elements, 12.5–18 µm wide.

P i g m e n t : blue-brown, intracellular in pileipellis.

C l a m p c o n n e c t i o n s : absent in all tissues.

Habitat and distribution: in Mediterranean shrub vegetation on acid soil, among mosses, near *Pinus radiata*, *Erica arborea*, *Laurus novocanariensis* and *Cistus symphytifolius* (holotype) and near *Cistus salviifolius* and *Halimium halimifolium* (Catalonia). Known from mainland Spain and the Canary Islands.

Additional collection sequenced: Spain: Catalonia, Baix Llobregat, Gavà, Ca n'Espinós, alt. 80 m, near *Cistus salviifolius* and *Halimium halimifolium*, on acid soil, 26 Nov. 2002, J. VILA & X. LLIMONA, JVG 1021126-3.

Notes: *Entoloma ortegae* is a rather inconspicuous blue *Cyanula*, with relatively small spores. Within the phylogeny, *E. ortegae* nests in the /sarcitulum clade and takes a special position there, as it is one of the very few species in this large clade with dark blue basidiomata. It clusters with *E. griseocoeruleum*, a similarly blue-grey species from Panama (RESCHKE & al. 2021a). In addition, the fertile lamella edge is distinctive for this species. Morphologically it could be confused with *E. chalybaeum* and similar species with dark blue colours, but these all have a sterile lamella edge, and are phylogenetically very distant.

***Entoloma caeruleopinophilum* VILA, RIBES & DIMA, spec. nova** (Fig. 2, Colourfig. 2)

Mycobank no.: MB840815

Holotypus: Spain: Canary Islands, Tenerife, Agua García, Lomo de la Jara, alt. 925 m, among mosses, near *Pinus radiata*, *Erica arborea*, *Laurus novocanariensis* and *Cistus symphytifolius*, on acid soil, 23 Dec. 2009, M.Á. Ribes, L-0607572 (isotypus in MAR 231209-48) (GenBank no.: OL343530).

Etymology: referring to the bluish colour and habitat near *Pinus*.

Description:

P i l e u s : 10–30 mm in diameter, convex when young, then plano-convex to applanate, not hygrophanous, translucently striate up to ⅔ of radius, dark blue to blue-brown or dark brown, with concolorous or darker, sometimes almost blackish centre, densely minutely squamulose all over, except near margin.

L a m e l l a e : adnate, not very crowded, ventricose, relatively thick, whitish with bluish reflections, then with pink creamy tones; with irregular, concolorous edge.

S t i p e : 25–40 × 3–4 mm, central, cylindrical, not compressed, dark blue grey throughout, glabrous, polished or with some fine longitudinal fibrils, base white tomentose.

T a s t e a n d s m e l l : indistinct.

B a s i d i o s p o r e s : 9–11.5 × 6–8.0 µm, on average 9.7 × 6.8 µm, Q = 1.3–1.8, Qav = 1.5, heterodiametrical, 6–7-angled in sideview with rather pronounced angles.

B a s i d i a : 32–45 × 9–12 µm, 4-spored, clavate or narrowly clavate, clampless.

L a m e l l a e d g e : fertile.

Colourfig. 3. *Entoloma pallidostriatum*, holotype. Photo: F. CABALLERO.

Colourfig. 4. *Entoloma benedictinum*, holotype. Photo: U. MARULLI.

C h e i l o c y s t i d i a : absent.

P i l e i p e l l i s : a cutis of cylindrical hyphae with transitions to a trichoderm, with inflated terminal elements, 16–21 µm wide.

P i g m e n t : blue-brown, intracellular in pileipellis.

C l a m p c o n n e c t i o n s : absent in all tissues.

Habitat and distribution: in Mediterranean forest with *Pinus halepensis* or *P. radiata*, *Laurus novocanariensis*, and *Cistus* spp. on acid soil. Known from mainland Spain and the Canary Islands.

Additional collection sequenced: Spain: Catalonia, Baix Llobregat, Gavà, Can Calamot, alt. 65 m, near *Pinus halepensis*, on acid soil, 26 Oct. 2012, J. VILA & X. LLIMONA, JVG 1121026-5.

Notes: *Entoloma caeruleopinophilum* belongs to a well-supported subclade in the /chalybaeum clade, together with *E. benedictinum*, both characterized by dark blue or grey colours, relatively small spores, a fertile lamella edge and the habitat. *Entoloma caeruleopinophilum* has a dark blue pileus, and relatively narrow, sharply angled spores, whereas *E. benedictinum* is more brownish grey tinged with smaller, weakly angled spores.

***Entoloma pallidostriatum* VILA, NOORDEL. & DIMA, spec. nova** (Fig. 3, Colourfig. 3)

Mycobank no.: MB840818

Misapplied name: *Entoloma mutabilipes* NOORDEL. & LIIV s. VILA & CABALLERO, Fungi Non Delineati 45: 32 (2009).

Holotypus: Spain: Catalonia, Val d'Aran, Bossòst, Bòsc d'Aubàs, alt. 1090 m, near a small stream, near *Alnus glutinosa*, *Fraxinus excelsior* and *Populus* sp., among mosses and grasses, 24 Aug. 2008, F. CABALLERO, L-0607566 (isotype JVG 1080824-20) (GenBank no.: OL343531).

Etymology: from Latin *pallidum*, paler and *striatum*, striate, for the pileus aspect.

Description:

P i l e u s : 15–20 mm in diameter, flattened with umbilicate or depressed centre, with straight or somewhat crenulate margin, weakly hygrophanous, entirely translucently striate except at apex, beige to pale brown-grey, darker intense brown at centre, glabrous or minutely squamulose, particularly at centre, becoming finely fibrillose when exposed.

L a m e l l a e : unequal, with few lamellulae, almost free, distant, thin, somewhat ventricose, especially in well-developed specimens; white to pale cream, with pink tinge when mature; with entire or somewhat irregular, concolorous edges.

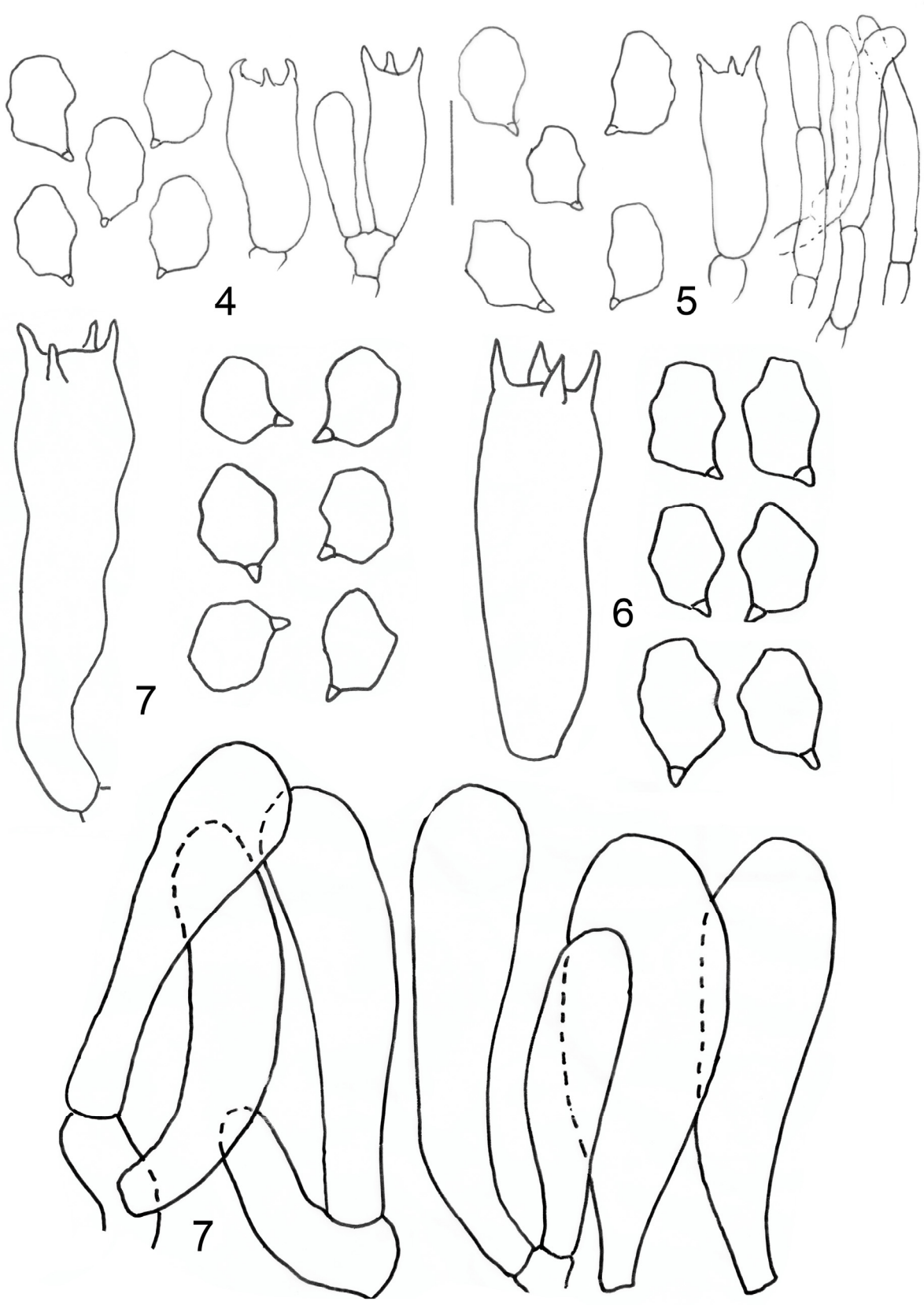
S t i p e : 20–30 × 1.5–2 mm, central or slightly eccentric, cylindrical, straight, with a delicate grey-blue to pale grey colour, darker near the base, polished or with fine, scattered fibrils, white-tomentose at the base.

C o n t e x t : thin, with a waxy colour, somewhat darker at centre of pileus. Taste and smell indistinct.

B a s i d i o s p o r e s : 9.1–10.7 × 6.4–8 µm, on average 10 × 7.1 µm, Q = 1.33–1.58, Qav = 1.4, heterodiametrical, 6–7-angled, with relatively pronounced angles.

B a s i d i a : 28–32 × 9–10.5 µm, 4-spored, rarely 2-spored, clavate or cylindrical and then somewhat constricted in the middle, clampless.

L a m e l l a e d g e : sterile.



Figs. 4–7. Microcharacters. – Fig.4. *Entoloma benedictinum*, spores and basidia. Bar = 10 µm. (all figs from holotype). – Fig. 5. *Entoloma riparium*, spores and basidia (from holotype); cheilocystidia from Kehlet 30-07-2017. – Fig. 6. *Entoloma rivipollense*, spores and basidia. Bar = 10 µm. (all figs from holotype). – Fig. 7. *Entoloma perfidodiscum*, spores, basidia, and cheilocystidia. Bar = 10 µm. (all figs from holotype).

C h e i l o c y s t i d i a : 48–75 × 6–13.5 µm, subcylindrical to clavate, rarely lageniform, hyaline, without or with 1 septum.

P i l e i p e l l i s : a cutis of cylindrical hyphae 9.5–14.5 µm wide, with subclavate terminal elements (up to 17.5 µm wide), with transitions to a trichoderm only at centre.

P i g m e n t : brown, intracellular in pileipellis.

C l a m p c o n n e c t i o n s : absent in all tissues.

Habitat and distribution: terrestrial along a stream, among herbs, mosses and vegetable debris, in a forests of *Alnus glutinosa*, *Fraxinus excelsior* and *Populus* sp. Known only from Spain.

Notes: *Entoloma pallidostriatum* is a rather modest and tiny *Cyanula*, with a pale brown pileus, and initially bluish stipe, which fades quickly to grey. Together with *E. dislocatum* it forms a well-supported clade with some extralimital species, phylogenetically distant from the similar *E. mutabilipes* (/poliopus clade) and *E. timidum* (/asprellum clade).

***Entoloma benedictinum* VILA, MARULLI, BATTISTIN & DIMA, spec. nova** (Fig. 4, Colourfig. 4).

Mycobank no.: MB840816

Holotypus: Italy: Abruzzo, Aquila, San Benedetto in Perillis, among mosses near *Juniperus oxycedrus* and *Pinus nigra*, 3 May 2014, U. MARULLI, L-0607571 (isotypus in UB20140503) (GenBank no.: OL343532).

Etymology: in reference to the type locality, San Benedetto in Perillis.

Description:

P i l e u s : 20–30 mm in diameter, convex to flattened, or sometimes umbilicate, not or weakly hygrophanous, not translucently striate, grey to brown grey (SEGUY 1936: 132–133) darker in young specimens (SEGUY 117–118), with weak blue tones near the margin, surface fibrillose-subtomentose when young, then fibrillose-squamulose and frequently cracked or with rimose aspect; with slightly involute margin.

L a m e l l a e : unequal, with numerous lamellulae, not very crowded, adnate with decurrent tooth to subdecurrent, relatively thick, ventricose, rarely with anastomoses, whitish then pale pinkish with entire, concolorous edges.

S t i p e : 25–40 × 3–4 mm, central, cylindrical, straight to curved, blue to grey-blue (SEGUY 599–590), glabrous, polished or finely fibrillose lengthwise; base white tomentose.

C o n t e x t : taste and smell not noted.

B a s i d i o s p o r e s : 8–9.5 × 6–7.5 µm, on average 8.7 × 6.8 µm, Q = 1.2–1.5, Qav = 1.3, heterodiametrical to subisodiametrical, 6–7-angled, with weakly marked angles.

B a s i d i a : 28–36 × 9–11 µm, 4-spored, narrowly clavate, clampless.

L a m e l l a e d g e : fertile.

C h e i l o c y s t i d i a : absent.

P i l e i p e l l i s : a cutis of cylindrical hyphae with transitions to a trichoderm, made up of cylindrical hyphae with subclavate terminal elements, 8–17 µm wide.

P i g m e n t : brown intracellular in pileipellis.

Colourfig. 5. *Entoloma riparium,* holotype. Photo: U. MARULLI.

Colourfig. 6. *Entoloma perfidodiscum,* holotype. Photo: J. VILA.

Clamp connections: absent in all tissues.

Habitat and distribution: among mosses in a mountain pasture near *Juniperus oxycedrus* and scattered *Pinus nigra* at an altitude of about 1030 m (Abruzzo region, central Italy). Known only from Italy.

Additional collection examined: Italy: Abruzzo, Aquila, San Benedetto in Perillis, near *Juniperus oxycedrus*, among mosses, 22 Oct. 2013, U. MARULLI, L-0607570; UB20131022.

Notes: see comments with *E. caeruleopinophilum.*

***Entoloma riparium* VILA, MARULLI & BATTISTIN, spec. nova** (Fig. 5, Colourfig. 5)

Mycobank no.: MB840820

Holotypus: Italy: Pescara, Popoli, Riserva Naturale delle sorgenti di Capo Pescara, sentiero Canapine, near *Populus* sp., in riparian woodland, 18 Oct. 2013, U. MARULLI, L-0607563 (isotypus in UB20131018) (GenBank no.: OL343533).

Etymology: referring to the habitat in riparian woodland.

Description:

Pileus: 20–25 mm in diameter, conico-convex to campanulate when young, then applanate and sometimes weakly umbilicate, not hygrophanous, not striate (or indistinctly so at the margin), brown (SEGUY 113–114), dark brown to almost blackish at centre, tomentose to squamulose, smoother near the margin, breaking up in coarse, radially arranged or irregular squamules, revealing the pale pileal context when exposed.

Lamellae: adnate to emarginate, very crowded and thin, whitish when young then flesh-coloured (SEGUY 205); with entire, concolorous edges.

Stipe: 40–55 × 3–4 mm, central, cylindrical, straight to curved, fistulose, brown, paler than the pileus, polished to finely and weakly fibrillose-striate lengthwise, white-tomentose at the base.

Context: thin, paler than surface. Taste and smell indistinct.

Basidiospores: 9.5–11.2 × 6.1–7.9 µm, on average 10.4 × 7 µm, Q = 1.3–1.7, Qav = 1.5, heterodiametrical, 6–7(–8)-angled in side view.

Basidia: 35–40 × 8–10 µm, 4-spored, narrowly clavate, clampless.

Lamella edge: fertile or sterile, and brown pigmented (see notes).

Cheilocystidia: absent or present, cylindrical to flexuous, 4–12 µm wide, with brown, intracellular pigment.

Pileipellis: a cutis of cylindrical hyphae, with transitions to a trichoderm or subhymeniderm of clavate elements, particularly at the centre of the pileus, elements 12–18 µm wide.

Pigment: brown, intracellular in pileipellis.

Clamp connections: absent in all tissues.

Habitat and distribution: near *Populus*, in riparian woodland. Known from Italy, Denmark and Estonia.

Notes: *Entoloma riparium* is morphologically very similar to *E. poliopus*, therefore it is not surprising that it has often been misinterpreted as the latter, a widely misapplied species name. It occupies, however, a somewhat isolated position in the /poliopus clade, most closely related to species from Tasmania and Vietnam. The dark brown basidio-

Colourfig. 7. *Entoloma rivipollense,* holotype. Photo: J. VILA.

Colourfig. 8. *Entoloma fazziense,* holotype. Photo: P.-A. MOREAU.

mata, polished to finely striate stipe, and fertile lamella edges are distinctive. The holotype sequence of *Entoloma riparium* matches one in UNITE (UDB024650) formerly identified as "*E. poliopus*", Estonia, Saare Makond, Karja Parish, Triigi, 58.59086670 2.71508330, 12-11-2015, VELLO LIIV, accompanied by a good photograph of somewhat older basidiomata. Unfortunately, we do not have microscopic details of this finding. A third collection from Denmark (Julland, Klim Bjerg, 30-07-2017, T. KEHLET, https://svampe.databasen.org/observations/9202106) differs from the holotype in having a fimbriate, brown lamella edge, made up of densely packed cylindrical cystidia with brown intracellular pigment, as well as in six nucleotide and indel positions in the ITS region. Whether these warrant a taxonomic conclusion, needs to be investigated when more collections of this species become available.

***Entoloma perfidodiscum* VILA, spec. nova** (Fig. 7, Colourfig. 6)

Mycobank no.: MB840821

Misapplied name: *Entoloma pseudocyanulum* WÖLFEL, S. CABALLERO & VILA, Fungi non Delineati 66: 79 (2013).

Holotypus: Spain: Catalonia, Vallès Oriental, Santa Maria de Martorelles, Serra de Marina, alt. 360 m, near *Quercus ilex*, on acid soil, 16 Nov. 2008, J. VILA & F. CABALLERO, L-0607586 (isotypus in JVG 1081116-1) (GenBank no.: OL343534).

Etymology: from Latin *perfidum*, misleading, deceitful, and *discum*, in reference to *Entoloma phaeodiscum*, because of the very similar macromorphological aspect in both species.

Description:

P i l e u s : 14–30 mm in diameter, conico-convex when young, then more applanate and sometimes with a slight central depression; not hygrophanous, translucently striate up to ⅔ of the radius in well hydrated basidiomata, grey to brown grey, almost black at the centre, rarely with dull bluish reflections towards the margin, densely and finely squamulose, forming a compact, almost tomentose plate at centre, smoother towards the margin.

L a m e l l a e : unequal, with abundant lamellulae, adnate, sometimes with a small decurrent tooth, relatively crowded, thin, somewhat ventricose, pale greyish or bluish-grey, turning whitish-pink, with concolorous or somewhat paler, entire or irregular edges, rarely with grey-black tinges.

S t i p e : 25–40 × 3–5 mm, central, cylindrical, straight or slightly curved, grey with bluish reflections, sometimes much paler, not truly polished but with fine, scattered, appressed fibrils, white tomentose at the base.

C o n t e x t : thin, pale grey to whitish, somewhat darker under the surface of the pileus or in the cortex of the stipe. Taste and smell indistinct.

B a s i d i o s p o r e s : 8.2–11.9 × 6.2–8.4 µm, on average 9.4 × 7.6 µm, Q = 1.09–1.56, Qav = 1.24, heterodiametrical, 5–6(–7)-angled in side view.

B a s i d i a : 36–45 × 11–13 µm, 4-spored, clavate, clampless.

L a m e l l a e d g e : heterogeneous.

C h e i l o c y s t i d i a : forming dense clusters among basidia, 37–48 × 8–12 µm, cylindrical, subclavate to clavate, hyaline.

Fig. 8. *Entoloma fazziense*. Spores, basidia, cheilocystidia, and stipitipellis. Bar = 10 µm (all figs from holotype).

P i l e i p e l l i s : a cutis of long cylindrical hyphae, with transitions to a trichoderm with subclavate to clavate terminal elements, up to 22 µm wide.

P i g m e n t : abundant, intracellular, dark brown in pileipellis.

C l a m p c o n n e c t i o n s : absent in all tissues.

Habitat and distribution: in Mediterranean forests and shrub (*Quercus ilex*, *Arbutus unedo*, *Corylus avellana*, *Alnus glutinosa*, *Cistus*), on acid soil. Known only from Spain.

Additional collections sequenced: Spain: Catalonia, Vallès Oriental, Santa Maria de Martorelles, Serra de Marina, alt. 360 m, near *Corylus avellana*, *Alnus glutinosa* and *Quercus ilex*, on acid soil, 26 Oct. 2006, J. VILA & F. CABALLERO, JVG 1061026-1, L-0607588; *ibid.*, 20 Oct. 2007, J. VILA & F. CABALLERO, JVG 1071020-12, L-0607577; *ibid.*, 1 Nov. 2007, J. VILA & F. CABALLERO, JVG 1071101-13, L-0607576; *ibid.*, near *Arbutus unedo*, *Cistus salviifolius* and *Erica* sp., 19 Nov. 2011, J. VILA, S. CATALÀ, I. GARRIDO & F. CABALLERO, JVG 1111119-7, L-0607575.

Notes: *Entoloma perfidodiscum* belongs to the /asprellum clade, where it takes a rather isolated position (DIMA & al. 2022). Originally this *E. perfidodiscum* was identified as *E. pseudocyanulum*, but that species is phylogenetically very distant in the /poliopus clade, and has larger spores [10.5–13(–15.5) × 7–9.2(–10)] µm, on average 12 × 8 µm, and a completely sterile lamella edge. *Entoloma phaeodiscum* (clade /phaeodiscum) looks very similar as well, but has sometimes a more intense bluish tinges on the stipe. Microscopically, the differences are obvious, especially in the smaller spores in *E. phaeodiscum* (7.5–9.1 × 5.9–7.5 µm).

***Entoloma rivipollense* VILA, spec. nov.** (Fig. 6, Colourfig. 7)

Mycobank no.: MB840822

Misapplied name: *Entoloma viaregale* s. VILA & CABALLERO, Fungi Non Delineati 38: 24. 2007; *E. pseudocoelestinum* s. VILA & CABALLERO, Fungi Non Delineati 38: 46. 2007.

Holotypus: Spain: Catalonia, Ripollès, Campelles, Baga de Campelles, alt. 1280 m, near *Sorbus aria*, *Salix caprea*, *Corylus avellana* and *Buxus sempervirens*, on basic soil, 30 Sept. 2006, J. VILA & F. CABALLERO, L-0607585 (isotypus in JVG 1060930-8) (GenBank no.: OL343535).

Etymology: in reference to the region of the Ripollès (Girona province), in Catalonia (Iberian Peninsula), a hotspot of alpine/subalpine *Entoloma*.

Description:

P i l e u s : 20–30 mm in diameter, convex, then applanate, depressed at the centre, rarely with a small umbo with deflexed then straight margin, grey when young, then deep blue to blue-brown, almost black at the centre, finally brown, not hygrophanous, translucently striate to half the radius in well-developed specimens, densely fibrillose to minutely squamulose.

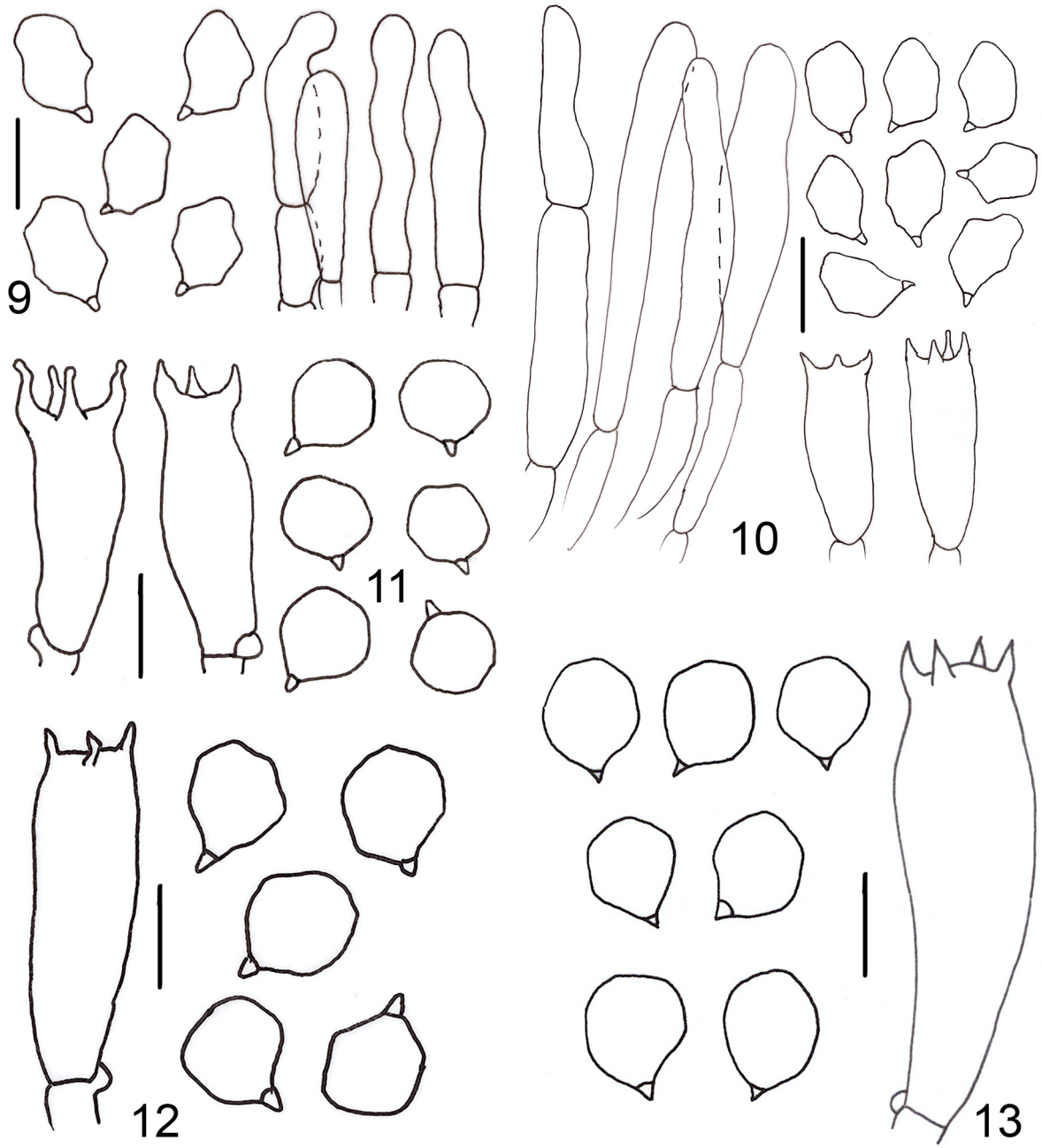
L a m e l l a e : adnate, sometimes with short decurrent tooth, relatively distant and somewhat thick, broad, whitish or pale greyish, sometimes with blue tinge, later greyish pink; with entire to slightly irregular, concolorous edges.

S t i p e : central, cylindrical, 20–35 × 3–4 mm, straight, dark greyish blue to blue, with fine pruina and adnate fibrils all over, sometimes glabrescent with age; base with white tomentum.

C o n t e x t : thin, paler than surface. Taste and smell indistinct.

B a s i d i o s p o r e s : 8.5–10.4 × 6.1–7.5 µm, on average 9–9.2 × 6.5–7 µm, Q = 1.2–1.57, Qav = 1.3–1.4, heterodiametrical, 5–6-angled in side view.

B a s i d i a : 32–40 × 10–12 µm, 4-spored, clavate to narrowly clavate, clampless.



Figs. 9–13. Microcharacters. – Fig. 9. *Entoloma notabile*, spores, and cheilocystidia. Bar = 10 µm. (all figs from holotype). – Fig. 10. *Entoloma versicolor*, spores, basidia, and cheilocystidia. Bar = 10 µm. (all figs from holotype). – Fig. 11. *Entoloma anodinum*, spores and basidia. Bar = 10 µm. (all figs from holotype). – Fig. 12. *Entoloma sericeoalpinum,* spores and basidia. Bar = 10 µm. (all figs from GC 06081607). – Fig. 13. *Entoloma assiduum*, spores and basidia. Bar = 10 µm. (all figs from holotype).

L a m e l l a e d g e : fertile.

C h e i l o c y s t i d i a : absent.

P i l e i p e l l i s : a cutis of 2.5–12 µm wide hyphae, with transitions to a trichoderm at centre.

P i g m e n t : intracellular, greyish to bluish in pileipellis.

C l a m p c o n n e c t i o n s : absent in all tissues.

Habitat and distribution: saprotrophic in forests, near *Sorbus aria*, *Salix caprea*, *Corylus avellana* and *Buxus sempervirens,* on basic soil. Known only from Spain.

Additional collection sequenced: Spain: Catalonia, Ripollès, Campelles, Baga de Campelles, alt. 1280 m, near *Sorbus aria*, *Salix caprea*, *Corylus avellana* and *Buxus sempervirens*, on basic soil, 30 Sept. 2006, J. VILA & F. CABALLERO, JVG 1060930-5.

Notes: *Entoloma rivipollense* nests in the /asprellum clade, which harbours a number of species with a fertile lamella edge. It is distinctive because of the pruinose-fibrillose stipe and very dark pileus. The greyish colour of the pileus of the specimens disappears quickly when the basidioma matures, making it a difficult character to observe. Mature specimens of *E. rivipollense* may be confused with, for example, *E. chalybaeum*, a genetically distant species, with a sterile lamella edge (DIMA & al. 2022). *Entoloma pseudocruentatum* has a more lilac-blue overall colour, a deeply striate pileus, and a polished stipe.

***Entoloma fazziense* P.-A. MOREAU, VILA, NOORDEL. & DIMA, spec. nova** (Fig. 8, Colourfig. 8)

Mycobank no.: MB840826

Holotypus: France: Corse du Sud, Bonifacio, îlot Fazzio, terrestrial in small group under *Calycotome spinosa* and *Cistus creticus* in a calcareous shrubland with *Beenakia mediterranea*, 21 Nov. 2005, P. AUBEL, D. BORGARINO, C. LAVOISE, P.-A. MOREAU and F. RICHARD, LIP PAM05112114 (GenBank no.: OL343536).

Etymology: in reference to the type locality, îlot Fazzio (Corsica).

Description:

P i l e u s : 15–42 mm in diameter, hemispherical at first then convex-flexuose, slightly depressed at the disc, with a long-incurved margin, later becoming straight to revolute, slightly exceeding the pileus, not hygrophanous, not translucently striate, dark steel-grey at first, shiny, densely fibrillose-silky, velvety-tomentose at disc and towards the margin, becoming paler to honey-ochre at mid-radius with age, margin and disc remaining dark at all stages of growth.

L a m e l l a e : L = 24–36, l = 3, rather distant, adnexed, yellowish cream, blue-tinged or spotted around stipe when young, dirty ochre when drying, with faintly serrulate edges, concolorous or pale blue punctuate near stipe, yellow-brown towards the margin when drying.

S t i p e : 35–65 × 3–4 mm, cylindrical, rigid, coarsely fibrillose ±twisted across ½ to ⅔ of the length, with small dark brown scales on the upper part; white-pruinose at the apex; white-tomentose over 10–20 mm at the base.

C o n t e x t : white, fibrous. Taste herbaceous, not characteristic. Smell unpleasant, reminiscent of rotten meat.

B a s i d i o s p o r e s : 9.5–11.5 × 7.8–8.2 µm, ellipsoid with 5–6 well-marked angles in profile.

B a s i d i a : 28–30 × 11 µm, clavate, mostly 2-spored (partly 3- and 4-spored).

L a m e l l a e d g e : sterile.

C h e i l o c y s t i d i a : cylindrical to narrowly clavate, 20–35 × 6–9 µm.

P i l e i p e l l i s : a cutis of slender repent hyphae, 3–4.5 µm wide, with transitions to a trichoderm, with terminal elements 40–120 × 10–25 µm, terminal or laterally arising from subterminal elements, all with dark vacuolar pigment; subpellis hyphae 8–22 µm wide, cylindrical-inflate, with abundant brilliant granules.

Colourfig. 9. *Entoloma notabile,* holotype. Photo: M. LOIZIDES.

Colourfig. 10a. *Entoloma versicolor*, blue form, holotype. Photo: P.-A. MOREAU.

Clamp connections: not observed.

Habitat and distribution: terrestrial in small groups near *Calycotome* and *Cistus creticus* in a xerophilic calcareous shrubland. So far only known from the type-locality in Corsica.

Notes: For the collectors, *E. fazziense* is an unusual-looking species, fleshier than usual *Cyanula* species, with strongly fibrillose pileus and stipe, and light blue lamellae at first, turning creamy with age. It reminds somewhat of *E. turci*, which differs by having a more distinctly squamulose pileus, lamella with occasionally brown edge, and a polished stipe that often turns orange at the base. Both species are phylogenetically quite distant.

***Entoloma notabile* LOIZIDES, VILA, P.-A. MOREAU, NOORDEL. & DIMA, spec. nova**
(Fig. 9, Colourfig. 9)

Mycobank no.: MB840855

Misapplied name: *Entoloma floccipes* s. MOREAU & al. (2007).

Holotypus: Cyprus: Plátres, alt. 1050 m, on loamy bank in a mixed Mediterranean forest, near *Pinus brutia*, *Arbutus andrachne*, and *Crataegus azarolus* on neutral soil, 12 Apr. 2019, M. LOIZIDES, L-0607514 (isotypus ML91421ES in M. LOIZIDES pers. herb.) (GenBank no.: OL343537).

Etymology: from Latin *notabĭlis*, noteworthy, notable, remarkable, for the appearance and habitat of the species.

Description:

Pileus: 25–35 mm in diameter, dark sepia-brown to charcoal grey or dark purple-grey, glabrous, at first convex with an incurved margin and a slight depression in the middle, striate up to ⅓ or ½ to the centre, progressively expanding to umbilicate or ± applanate but always maintaining a deep depression in the centre, becoming paler and more distinctly translucently striate all the way to the middle of the pileus; centre remaining darker to nearly black at all times; margin often tearing radially in full maturity.

Lamellae: ventricose with a deeply decurrent tooth, rather distant, intercepted by numerous lamellulae, initially white, then slowly turning pinkish white to spotted pale pink; with entire, concolorous or faintly grey tinged (lens) edges, especially towards the margin.

Stipe: 20–60 × 3–4 mm, usually central, occasionally somewhat eccentric, cylindrical or slightly inflated at the apex, polished, steel-grey to warm grey or olivaceous grey, base slightly enlarged, engulfed in white-tomentose mycelium.

Context: taste and smell indistinct or vaguely fungoid.

Basidiospores: (9–)10–12(–13) × (6–)6.5–7.5(–8.5) µm, on average 11 × 7.2 µm, Q = 1.3–1.8, Qav = 1.5, heterodiametrical, 6–9-angled in side view, with an oblique 1–2 µm long hilar appendage.

Basidia: 25.5–36 × 10–11.5 µm, 2–4-spored, subclavate to clavate or obpyriform, thick-walled, clampless.

Lamella edge: heterogeneous.

Colourfig. 10b. *Entoloma versicolor*, pink form, PAM 07082603. Photo: P.-A. MOREAU.

Colourfig. 11. *Entoloma anodinum*, holotype. Photo: J. CARBÓ.

C h e i l o c y s t i d i a : scattered or uncommon, 25.5–41 × 6.5–14 µm, polymorphic, clavate, subcylindrical, subfusiform or lageniform, thick-walled, some with a slightly flexuous neck.

P i l e i p e l l i s : a cutis of tightly packed, thick-walled, parallel, cylindrical or slightly inflated hyphae 5–12 µm wide; not or only slightly constricted at the septa.

C l a m p c o n n e c t i o n s : absent from all tissues.

Habitat and distribution: in Mesomediterranean woodland on neutral soil, among *Pinus brutia*, *Arbutus andrachne* and *Crataegus azarolus* (holotype) and on xerophytic grasslands (Corse collection). Known from France (Corsica) and Cyprus.

Additional collection sequenced: France: Corse-du-Sud, Bonifacio, île Lavezzi, xerophytic meadow with *Brachypodium retusum*, 21 Nov. 2005, C. LAVOISE, PAM 05112116 (LIP).

Notes: The ITS of the type collection matched with a sequence of a Corsican collection identified as *Entoloma floccipes* by MOREAU & al. (2007). In this publication the authors assumed to have found on the island of Corsica (France) a species originally described from Morocco as *Rhodophyllus floccipes ad interim* (MALENÇON & BERTAULT 1970: 579), and validated the name designating MALENÇON'S original collection MPU 3535 as holotype. The remarkable species according to G. MALENÇON'S notes, displaying a greyish umbilicate pileus and grey floccose stipe, was described with cutis-like pileipellis, clamped basidia, and long, lageniform to fusiform caulocystidia. It was provisionally placed in the subgenus *Nolanea*, probably because of the cutis-like pileipellis and clamped basidia. VILA (2009: 347) expressed his doubts about the conspecificity between Moroccan and Corsican collections. An ITS barcode of the Corsican material, however, places this material in the /serrulatum clade of subgenus *Cyanula*, which would fit well with the microscopic characters as described in MOREAU & al. (2007), except for clamped basidia. A new study of the exsiccatae brought to light that the Corse collection indeed had clampless hyphae and, furthermore, a second collection obtained from the island of Cyprus, fitted perfectly microscopically with the Corsican material confirming the absence of clamps. Unfortunately, the collection of MALENÇON & BERTAULT (1970) from Morocco could not successfully be sequenced. Considering nonetheless the above-mentioned differences with the original description, we conclude that the Corse and Cyprus collections belong to an as yet undescribed species and place the original "*Entoloma floccipes*" s. MALENÇON & BERTAULT (1970) for the time being on the list of poorly known species.

***Entoloma versicolor* P.-A. MOREAU, VILA, NOORDEL. & DIMA, spec. nova** (Fig. 10, Colourfig. 10a, b)

Mycobank no.: MB840825

Holotypus: France: Savoie, Landry, alt. 920 m, *Corylus*-dominated riparian thickets, on ground and on rotten branches, 26 Aug. 2007, P.-A. MOREAU, LIP PAM07082601 (isotype L-0607563) (GenBank no.: OL343538).

Etymology: referring to the versatility of the colour of the basidiomata, being either deep blue or pink.

Description of the blue form:

P i l e u s : 20–45 mm, plano-convex, deeply umbilicate, with deflexed then straight margin, not hygrophanous, not translucently striate, dark blue, densely fibrillose all over, with age minutely velvety-squamulose at centre, breaking up in appressed squamules with age, displaying the pale steel-blue context.

L a m e l l a e : L = 25–34, l = 2–3, moderately distant, adnate-decurrent at first then distinctly decurrent, white then cream-pink, distinctly pink only when old with distinctly serrulate-denticulate concolorous edges, slightly turning pinkish brown with age in some specimens.

S t i p e : 40–70 × 2–3 mm, cylindrical, sometimes with an enlarged base up to 5 mm, sometimes subbulbous, enlarged at the lamella insertion when old, concolorous with the pileus at first then fading to ochraceous-grey, fibrillose-striate and somewhat twisted, covered by dense blackish blue fibrils, never pruinose; with abundant white basal mycelium, spotted orange-yellow when damaged.

C o n t e x t : fibrous, brittle, bluish in pileus, white in stipe then ochraceous tinged towards base. Taste herbaceous. Smell strong, of rotten meat.

B a s i d i o s p o r e s : (9.8–)10.3–11.6(–12.2) × 7.3–8.8(–9) µm, on average 11 × 8 µm, Q = 1.3–1.5, Qav = 1.4, with (4–)5 acute angles in side view and strongly projecting apiculus.

B a s i d i a : 4-spored, clavate, clampless.

L a m e l l a e d g e : sterile of serrulatum type with clusters of shortly cylindrical cheilocystidia, 10–20 µm broad, with colourless or slightly thickened (0.5–1 µm) yellowish walls, in places with fascicules of cylindro-clavate elements (hyphal pegs) × 6.5–12 µm wide arising from the trama, with distinctly serrulate-denticulate edge, concolorous then often turning brown with age.

H y m e n o p h o r a l t r a m a : made of parallel cylindrical hyphae 4–5.5 µm wide, smooth, colourless.

P i l e i p e l l i s : a cutis with transitions to trichodermium towards the centre, made of repent cylindrical hyphae 10–30 µm wide, with short fascicles of short catenulate hyphae especially at the centre, mostly colourless; subpellis made of long inflated hyphae 22–30 µm wide.

P i g m e n t : intracellular in pileipellis, deep brown and with reddish tones in KOH 5%.

S t i p i t i p e l l i s : a cutis with trichodermal fascicles of 0–2-septate hyphae, terminal elements 20–30 × 5.5–10.5 µm, subfusiform to clavate, with dark intracellular pigment.

C l a m p c o n n e c t i o n s : absent in all tissues.

Description of the pink form:

P i l e u s : 20–45 mm, deeply umbilicate, with slightly enrolled margin which remains so for a long time, not hygrophanous, not translucently striate, pink, densely fibrillose all over, then minutely velvety-squamulose at the centre, breaking up in suberect squamules with age, displaying the pale pink context.

L a m e l l a e : L = 30–34, l = 1–3, moderately distant, arcuate-decurrent at first then distinctly decurrent, white then cream pink, distinctly pink only when old, with distinctly serrulate-denticulate edge, concolorous then often turning brown with age.

S t i p e : 50–80 × 2–3 mm, cylindrical, sometimes with an enlarged apex when old, minutely pruinose at the apex, polished to fibrillose-striate with white fibrils on pinkish brown background, somewhat paler at the apex, darkening with age, with scant basal mycelium.

C o n t e x t : fibrous, brittle, white to pinkish in pileus, white in stipe. Taste herbaceous. Smell strong, of rotten meat in some specimens, otherwise odourless.

Habitat and distribution: *Corylus* dominated riparian thickets, on ground and on rotten branches. Known only from France.

Additional collections sequenced: France: Savoie, Landry, *Corylus*-dominated riparian thickets, on ground and on rotten branches, alt. 920 m, 26 Aug. 2001, P.-A. MOREAU, LIP PAM01082601 (pink form, not sequenced); *ibid.*, 26 Aug. 2007, P.-A. MOREAU, LIP PAM07082603 (pink form: sequenced).

Notes: *Entoloma versicolor* is one of about a dozen species in subgenus *Cyanula* with both a blue and a pink form. This phenomenon widely occurs in *Cyanula*, spread all over the phylogenetic tree, and seems to be of minor taxonomic importance (DIMA & al. 2022). In several widespread species, pink forms occur scattered among the blue forms, and there seems to be no reason to distinguish them as separate taxonomic entities. We therefore regard all these colour phenotypes as forms, and refrain from distinguishing them on varietal level.

Entoloma versicolor forms macroscopically distinctly clitocyboid basidiomata, with deeply umbilicate pileus and decurrent lamellae, especially in pink forms, with edges irregularly denticulate and turning brown with age in the two forms. It belongs to the /coracis-serrulatum clade, and nests very close to several other *E. corvinum* look-alikes, such as *E. coracis*, and *E. porphyrogriseum* (CROUS & al. 2021). It differs from both in having a more distinctly developed serrulatum type lamella edge, with clusters of tramal hyphae protruding through the hymenium, whereas *E. porphyrogriseum*, and *E. coracis* have a more regular hymenial lamella edge, with fusiform to lageniform cheilocystidia. *Entoloma porphyrogriseum* is more a grassland species, whereas *E. versicolor* seems to prefer damp forest types. *Entoloma coracis* is a larger species, widespread in Europe in thermophilic calcareous habitats. Both *E. versicolor* and *E. porphyrogriseum* have both blue as well as pink variants, and possibly also *E. coracis*.

Notes on some species of *Entoloma* subgenus *Nolanea*

***Entoloma anodinum* VILA, J. CARBÓ, VALERO, RESCHKE & NOORDEL., spec. nova**
(Fig. 11, Colourfig. 11)

Mycobank no.: MB840831

Holotypus: Spain: Catalonia, Alt Empordà, Palau-saverdera, alt. 130 m, near *Olea europaea* and *Cistus*, among mosses and lichens, on acid soil, 21 Jan. 1996, J. CARBÓ, L-0607520 (isotypus in JC-19960121.3) (GenBank no.: OL343539).

Etymology: from Latin *anodȳnus*, insignificant, insubstantial, due to the unremarkable aspect of the species, reminiscent of many other *Nolanea*, both in the macro and microscopic characters.

Description:
P i l e u s : 10–25 mm in diameter, convex to hemispherical when young, then applanate and somewhat depressed in old specimens, not or slightly hygrophanous, not translucently striate, brown to dark brown, sometimes almost blackish at the apex; surface finely pruinose or rugulose-tomentose, with scarce fibrils, in some basidiomata with a micaceous aspect.

L a m e l l a e : with abundant lamellulae, adnate-emarginate to adnexed, sometimes almost free, moderately crowded, relatively thick, ventricose; whitish or with pale brown tones, then pink-brown; with concolorous, entire or slightly irregular edge.

S t i p e : 15–30 × 2–3 mm, cylindrical, straight, brown to dark brown colour, very similar to that of the pileus, not polished but covered with sometimes inconspicuous whitish fibrils, finely pruinose at apex; white-tomentose at the base.

C o n t e x t : thin, pale brown. Taste not noted. Smell indistinct or slightly herbaceous.

B a s i d i o s p o r e s : 8.1–10.8 × 7.9–9.4 µm, on average. 9.5 × 8.6 µm, Q = 1–1.2, Qav = 1.1, isodiametrical, very rounded-angular in side-view with 5–6(–7)-angles.

B a s i d i a : 25–30 × 10–12 µm, 4-spored, narrowly clavate to subcylindrical, clamped.

L a m e l l a e d g e : fertile, cystidia absent.

H y m e n o p h o r a l t r a m a : made of parallel cylindrical hyphae.

P i l e i p e l l i s : a cutis with cylindrical hyphae, 6–12 µm broad, with slight transitions to a trichoderm at centre of the pileus.

P i g m e n t : brown, finely incrusting, not abundant, in addition intraparietal, and also intracellular in some hyphae of the suprapellis.

C l a m p c o n n e c t i o n s : present, especially in the hymenium, but rare in the the pileus.

Habitat and distribution: in Mediterranean vegetation, especially near various *Cistus* species. Known only from Spain.

Additional collections sequenced: Spain: in mountainous area near Madrid, alt. 800 m, near *Cistus laurifolius* and *Quercus rotundifolia*, on granitic sandy soil, 12 Mar. 2014, A. VALERO, JVG 1140312-1.

Notes: *Entoloma anodinum* belongs to section *Cosmeoexonema*, and fits well in the species-rich *E. sericeum* group. It fits into a group of species with a predominantly Mediterranean distribution, like *E. minutisporum*, which has smaller spores (7.3–8.4 × 6.3–7.2 µm) and produces fleshier basidiomata, in addition to *E. llimonae*, with a deeply translucently striate pileus in well hydrated specimens and a subspermatic smell, and *E. assiduum*, described below, which has a larger, brown-grey to dark-grey pileus up to 60 mm in diameter.

***Entoloma sericeoalpinum* VILA, P.-A. MOREAU, CORRIOL & RESCHKE, spec. nova** (Fig. 12, Colourfig. 12)

Mycobank no.: MB840827

Misapplied names: *Entoloma atrosericeum* s. VILA & al., Fungi Non Delineati 66: 23–25, 104 (iconography) (2013). *Entoloma sericeum* f. *nolaniforme* s. CORRIOL, Sommerfeltia 31: 64 (2008).

Holotypus: Spain: Catalonia, Ripollès, Queralbs, Vall de Núria, alt. 2220 m, among *Salix retusa*, *Vaccinum uliginosum* and *Dryas octopetala*, in basic soil, 17 Aug. 2011, J. VILA, L-0607519 (isotypus in JVG 1110817-1) (GenBank no.: ITS: JX454874).

Etymology: the epithet refers to the morphological similarity with *Entoloma sericeum* and the habitat in alpine vegetation (e.g. *Dryas octopetala*, *Salix*).

Description:

P i l e u s : 10–30 mm in diameter, convex or hemispherical when young, then quickly applanate or undulating, hygrophanous, not translucently striate, finely pruinose, especially when immature; brown, grey-brown, with lighter and also some dark blackish areas.

L a m e l l a e : emarginate, rarely adnate, scarcely to moderately crowded; creamy brown or light brown, rarely greyish then pink; edges concolorous, entire or slightly irregular; lamellulae abundant.

S t i p e : 15–25 × 3–5 mm, cylindrical, straight to bent, brown or brownish-grey, covered in dense whitish fibrils, pruinose at apex, inconspicuously white tomentose at the base.

C o n t e x t : taste not noted; smell strongly farinaceous.

B a s i d i o s p o r e s : 7.6–11.6 × 6.7–9.7 µm, on average 9.3 × 8.1 µm, Q = 1.01–1.33, Qav = 1.15, isodiametrical to subisodiametrical, 5–6-angled in sideview.

L a m e l l a e d g e : fertile, cystidia absent.

P i l e i p e l l i s : a cutis of narrow, 3.3–4.6 µm wide, cylindrical hyphae, mixed with longer and broader hyphae, constricted at the septum, 60–300 × 17–34 µm.

P i g m e n t : finely incrusted, not abundant, and intraparietal pigment brown.

C l a m p c o n n e c t i o n s : present, especially in the hymenium, but rare in the hyphae forming the structure of the pileus.

Habitat and distribution: in alpine vegetation (*Dryas octopetala*, *Salix herbacea*, *S. retusa*, *S. reticulata*, *Alchemilla pentaphyllea*), both in basic or acid soil. Known from Spain and France (Pyrenees), Italy (Alps) and Greenland.

Additional collections sequenced: Italy: alt. 2600 m, near *Salix herbacea* and *Alchemilla pentaphyllea*, 31 Aug. 1990, P. G. JAMONI, GMFN 2062. Spain: Catalonia, Ripollès, Setcases, Ulldeter, alt. 2350 m, among *Salix herbacea*, in acid soil, 14 Aug. 1997, J. VILA, JVG 970814-15. Catalonia, Pallars Jussà, la Torre de Cabdella, estany de Filià, alt. 2210 m, among *Salix reticulata* and *S. herbacea*, in basic soil, 28 Sep. 1999, J. VILA & X. LLIMONA, JVG 990928-8. France: Hautes-Pyrénées, Bagnères-de-Bigorre, Coume du Pic du Midi de Bigorre, alt. 2300 m, *Arabidion caeruleae*, 16 Aug. 2006, G. CORRIOL, C. HANNOIRE & E. TROUILLARD, GC 06081607. Greenland: Kangerlussuaq, Ice Cape, cold Arctic zone with *Salix herbacea*, Aug. 2000, P.-A. MOREAU, LIP PAM GR00-07.

Notes: VILA & al. (2013) attributed the name *Entoloma atrosericeum* to collections listed above, however, without DNA evidence of original material. KOKKONEN (2015) studied the lectotype of *E. atrosericeum*, and demonstrated that this species fit well in the /Rhodopolia clade, rather than the sericeum group in the /Nolanea clade. So it became apparent that VILA & al. (2013) described under that name a so far unknown species that is given formal status here. For a full, amended description see VILA & al. (2013) and NOORDELOOS (2022).

Colourfig. 12. *Entoloma sericeoalpinum*, holotype. Photo: J. VILA.

Colourfig. 13. *Entoloma assiduum*, holotype. Photo: J. VILA.

The various interpretations of *Entoloma nitens* (VELEN.) NOORDEL.

Nolanea nitens was described by VELENOVSKÝ (1921) as a vernal *Nolanea* with a rather lustrous, greyish brown pileus, and a paler stipe. The diagnosis leaves room for various interpretations, and the type material is lacking. ROMAGNESI (1974b) and NOORDELOOS

(1992, 2004) interpreted this species as a *Nolanea* species close to *Entoloma juncinum*, mainly differing by a lustrous surface of the pileus, and a raphanoid smell. RESCHKE & al. (2021b), however, who studied *Nolanea* in depth using a multi-gene phylogeny, demonstrated that the interpretation of ROMAGNESI fits rather well in the current concept of *E. minutum*, which also includes *E. juncinum.* VILA & al. (2013), on the other hand, interpreted *E. nitens* in a different way, describing a *Nolanea* species with a Mediterranean distribution, differing from the concept of ROMAGNESI and NOORDELOOS in a number of characters, mainly on average larger, darker, with a less translucently striate pileus and restricted to Mediterranean habitats, often found together with e.g. *Quercus ilex*, *Cistus*, *Pinus pinea*. The original diagnosis of *E. nitens*, however, differs in a set of characters, first of all the phenology which is rather early in the season, from April to June, the lack of a distinct smell, and the habitat in Central-European montane coniferous forests. This fits much better the concept of *Nolanea cuneata* BRES. rather than *E. minutum*, which appears later in season, has a farinaceous to raphanoid smell, and grows in deciduous or mixed forests. RESCHKE & al. (2021b) therefore designated a neotype fitting *E. cuneatum*, and consequently the name *E. nitens* became a later synonym of that species. Since no name is available for *E. nitens* sensu Vila & al. we describe it here as a new species:

***Entoloma assiduum* VILA, RESCHKE, CORRIOL, POLEMIS & LOIZIDES, spec. nova**
(Fig. 13, Colourfig. 13)

Mycobank no.: MB840830

Misapplied name: *Entoloma nitens* s. VILA & al. (2013) Fungi non Delineati 66: 26–27, 105–107 (iconography).

Holotypus: Spain: Catalonia, Vallès Oriental, Sant Fost de Campsentelles, Can Romegosa, alt. 140 m, near *Pinus pinea*, among mosses and lichens, in acid soil, 19 Nov. 2011, S. CATALÀ, J. VILA & F. CABALLERO, L-0607518 (isotypus in JVG 1111119-8) (GenBank no.: JX454873).

Etymology: from Latin *assid(eō)* + *-uus* in reference to its abundance in Mediterranean habitats.

Description:

P i l e u s : 25–65 mm broad, conical to campanulate when young, then conico-convex to flattened, but usually maintaining a broad umbo, strongly hygrophanous, striate up to half of the radius in well-hydrated specimens, dark grey, brown-grey, sometimes almost blackish or faded at apex; covered in fine aeriferous fibrils or pruina, occasionally forming concentric zones.

L a m e l l a e : unequal with numerous lamellulae, emarginate, distant to moderately distant, with pale grey tones when young, then pink greyish; with entire or slightly irregular edge.

S t i p e : 25–80(–100) × 4–10 mm, cylindrical, dark brown-grey to grey, with a dense layer of whitish fibrils, often longitudinally grooved, white tomentose at the base.

C o n t e x t : very thin, grey-brown. Taste not noted. Smell herbaceous, to freshly cut grass, or to radish, sometimes indistinct.

B a s i d i o s p o r e s : (7.1–)8.3–9.4(–10.2) × (7.1–)7.6–8.5(–9.1) µm, on average 8.9 × 8 µm, Q = 1.05–1.16, Qav = 1.1, isodiametrical, with 5–7(–8) sometimes indistinct angles.

B a s i d i a : 4-spored, 24–38 × 10–14 µm, narrowly clavate, clamped.

L a m e l l a e d g e : fertile, cystidia absent.

P i l e i p e l l i s : a cutis of narrow, cylindrical hyphae, 4.5–7.2 µm wide, mixed with longer and broader hyphae.

P i g m e n t : abundant, incrusting, brown.

C l a m p c o n n e c t i o n s : abundant in hymenium, rare elsewhere.

Habitat and distribution: in Mediterranean vegetation (e.g., *Quercus ilex*, *Pinus brutia*, *P. pinea*, *P. halepensis*, *Cistus*), preferably on acidic soil. Known from Spain, France, Cyprus and Greece.

Additional collections sequenced: Spain: Catalonia, Priorat, Gratallops, road to Falset, alt. 550 m, near *Pinus halepensis* and *Quercus ilex*, among mosses, in acid soil, 16 Nov. 2012, J. VILA and X. LLIMONA, JVG 1121116-1. Catalonia, Barcelonès, Barcelona, Can Ferrer, alt. 240 m, near *Cistus ladanifer*, in acid soil, 21 Oct. 2005, X. LLIMONA, J. VILA & T. JIMÉNEZ, JVG 1051021-3. Catalonia, Baix Camp, Montclar, Les Pedreres, alt. 270 m, near *Cistus monspeliensis*, in acid soil, 17 Nov. 2005, X. LLIMONA & J. VILA, JVG 1051117-6. Catalonia, Baix Camp, Cambrils, Lo Revellar, alt. 60 m, near *Cistus monspeliensis*, in acid soil, 17 Nov. 2005, X. LLIMONA & J. VILA, JVG 1051117-3. Catalonia, Vallès Oriental, Santa Maria de Martorelles, Serra de Marina, alt. 345 m, near *Quercus ilex*, in acid soil, 16 Nov. 2008, J. VILA & F. CABALLERO, JVG 1081116-7. Catalonia, Vallès Oriental, Sant Fost de Campsentelles, Font de la Dinamita, alt. 315 m, near *Quercus ilex*, in acid soil, 15 Oct. 2006, J. VILA & F. CABALLERO, JVG 1061015-4. Catalonia, Baix Camp, Alforja, Coll d'Alforja, alt. 660 m, in mossy soil, near *Quercus ilex* and *Hedera helix*, 28 Oct. 2006, J. VILA & F. CABALLERO, JVG 1061028-5. France: Corsica, Sainte-Lucie, edge of *Quercus ilex* forest, 28 Oct. 2013, G. CORRIOL, GC13102801. Cyprus: Akamas Forest, *Juniperus phoenicea*-dominated, open vegetation, 14 Dec. 2017, K. RESCHKE, KaiR1143, KaiR1146. Kelláki, Limassol district, alt. 650 m, near *Pinus brutia* and *Cistus salviifolius*, on calcareous soil, 25 Jan. 2011, M. LOIZIDES, ML11152EC. Greece: Cyclades, Andros island, Mesa Vouni Village, alt. 570 m, pure *Quercus ilex* stand with scattered *Acer sempervirens* trees at margins, on acid soil, 12 Dec. 2017, E. POLEMIS, EP.17-A1488, EP.17-A1489.

Notes: *Entoloma assiduum* belongs to the *E. sericeum* complex and resembles strongly *E. ortonii* (*E. sericeum* var. *cinereoopacum*, *E. terreum*) in the somewhat pruinose-aeriferous to lustrous pileus. So far *E. assiduum* has only been recorded from Mediterranean areas in typically Mediterranean vegetation.

This work has received financial support from the project “Biodiversitat dels Fongs i Líquens dels Països Catalans (PT2008-S0206-LLIMONA01)” of the Institut d’Estudis Catalans (Barcelona), and from the “Fons Memorial SALVADOR LLIMONA (Barcelona)” and the “Fons Memorial RAMON VILA (Barcelona)”. THOMAS KUYPER (Wageningen, the Netherlands) is thanked for his advice in nomenclatoral matters. The KITS VAN WAVEREN Foundation (Naturalis, Leiden, The Netherlands) provided funding for some of the sequencing. The sequencing of the Greek specimens was done by VASSILIKI FRYSSULI. Thanks are due to to LAETITIA HUGOT (Office de l’Environnement de la Corse) for having arranged the expedition to the Fazzio and Lavezzi islands in 2005. BÁLINT DIMA was supported by the New National Excellence Program (ÚNKP-20-4) of the Hungarian Ministry for Innovation and Technology and by the ELTE Thematic Excellence Programme 2020 (TKP2020-IKA-05), both supported by the National Research, Development and Innovation Office.

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