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Studies in the genus *Entoloma* (*Basidiomycota*, *Agaricales*) from the Kiklades (C. Aegean, Greece)

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Abstract—An intensive mycological inventory of the Greek Kiklades Islands yielded a number of interesting records, two of them being new to science: *Entoloma leuconitens* and *E. alnicola*. Descriptions are given of another eight taxa new to the Greek mycoflora, among them the extremely rare *Entoloma nigroviolaceum, E. griseopruinatum*, and *E. griseorugulosum*.

Key words—new species and records, agarics, *Entolomataceae*

Introduction

Reports on the macrofungi from the islands of the Aegean archipelagos are scarce in literature (Petrak 1943a,b, Plank 1980). In the frame of an ongoing inventory of the Greek macrofungi (Dimou et al., 2008; Zervakis et al., 2004), the islands of Kiklades (C. Aegean, Greece) Andros, Naxos and Amorgos have been thoroughly investigated. In the recent past, Andros has been visited periodically by P. Lizoň (1993-1997), and from 1995 until present by E. Polemis, who is conducting a year-by-year inventory (mainly from September to March). Some preliminary results of this work, including several records new for Greece, were presented in national check-lists (Zervakis et al., 1998; 1999) and during scientific conferences (Polemis et al., 2002; 2007). Recently, two new species of *Gymnopus* were described from the island of Andros (Polemis & Noordeloos, 2007).

The genus *Entoloma* has been studied by the first author on a worldwide scale (Gates & Noordeloos 2007, Manimohan et al. 2006, Noordeloos 1981, 1987, 1992, 2004, 2006, 2007). However, data are still lacking on occurrence

and distribution of many species in Southern Europe, in particularly from the Eastern Mediterranean region (Balkans, Greece). To date, the biodiversity of this major agaricoid genus, is very basically known in Greece, as only a limited number of taxa (less than 30 in total), if compared with other European countries, are recorded. This paper presents two new species from the Kiklades, and describes another five rare, as well as three more widespread and common European taxa, that so far had not been recorded from Greece.

Taxonomic part

1. New taxa

Entoloma leuconitens Noordel. & Polemis, **sp. nov.** **Fig. 1**

MycoBank mb 512002

Pileus c 20 mm latus, conicus, haud hygrophanus, paulisper translucido-striatus, albus, glaber, sericeus. Lamellae subliberae, roseae. Stipes 20 × 2 mm, albus, politus. Odore saporeque rancidis. Sporae (9–)9.5–12(–15) × (6.5–)7.5–9 µm, 6–8-angulatae. Acies lamellarum sterilis. Cheiloystidia 15–45 × 7–15 µm, utriformia. Pileipellis cutis hyphis cylindraceis, 2–6(–8) µm latis, pigmentis intracellulosis. Fibulae praesentes. Ad terram acidam. Holotypus: Greece, Isl. Andros, Kiklades (C. Aegean), Torna, 29 Oct. 2002, E. Polemis 02-A472 (L)

Etymology—*leucos* = white; *nitens* = shining.

Description—Pileus 20 mm, conical, with slightly inflexed, undulating margin, not hygrophanous, faintly translucently striate at the extreme margin only, white to creamy, ivory, glabrous with a lustrous appearance. Lamellae moderately distant, adnate to almost free (adnexed), white then pinkish, with concolourous edge. Stipe 20 × 4 mm, cylindrical, slightly broadened towards base, curved, white to creamy, smooth, glabrous, polished to faintly fibrillose striate, brittle. Context thin, brittle, white, smell and taste rancid.

Spores (9–)9.5–12(–15) × (6.5–)7.5–9 µm, Q = 1.2–1.5(–1.8), heterodiametrical, with 6–8 rather irregular angles. Basidia 30–40 × 11–13 µm, 4-spored. Lamellae edge sterile. Cheilocystidia 15–45 × 7–15 µm, mostly utriform, to cylindrical-clavate. Pleurocystidia absent. Pileipellis a thin cutis made up of cylindrical, 2–6(–8) µm wide hyphae. Pigment very faint, probably intracellular. Clamps present in hymenium, not seen elsewhere.

Habitat: In acidic soil in mountain heath-land with *Erica arborea*, and *Pteridium aquilinum* and with scattered trees like *Fraxinus* sp., *Crataegus monogyna* and *Pyrus amygdaliformis*, on soil among *P. aquilinum*.

Collection examined: Greece, Isl. Andros, Kiklades (C. Aegean), Torna, 29 Oct. 2002, E. Polemis 02-A472 (L, holotype).

The white, non-hygrophanous, lustrous pileus, elongate, rather irregularly shaped spores, and sterile lamella edge with utriform cheilocystidia are distinctive for this species. *Entoloma pallideradicatum* Hauskn. & Noordel. is

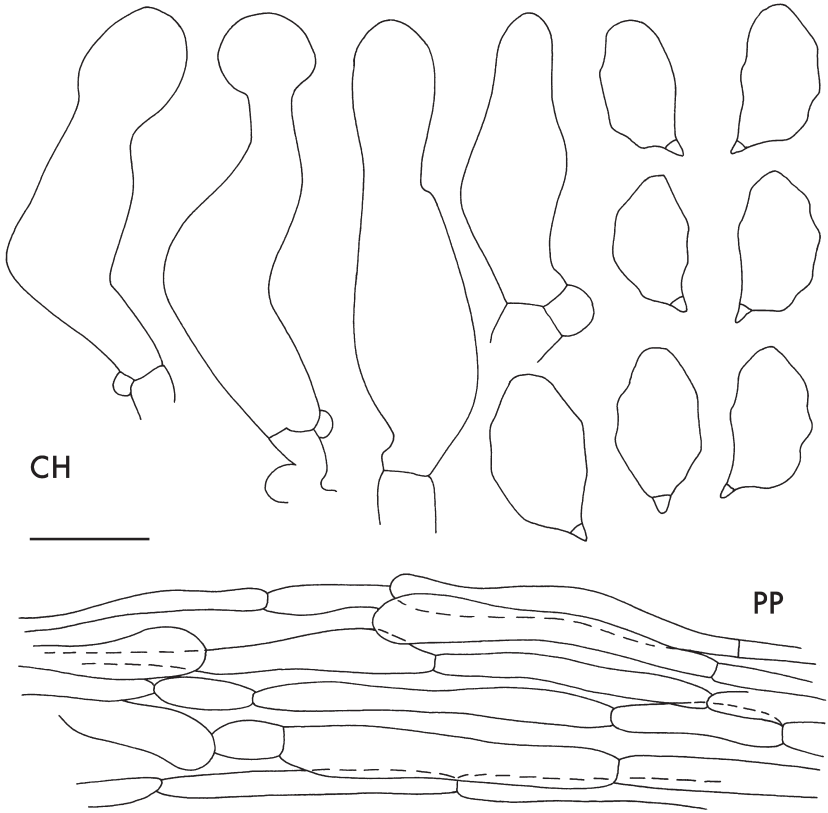

Fig. 1. *Entoloma leuconitens*. Spores, cheilocystidia (CH), and pileipellis (PP). Bar = 10 μm.

close, but differs in slightly smaller spores, heterogeneous lamella edge, and lack of clamp-connections.

Entoloma alnicola Noordel. & Polemis, **sp. nov.** **Fig. 2.**

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Pileus 13–20 mm latus, convexus demum applanatus, hygrophanus, translucido-striatus, obscure griso-brunneus, pallescens, minute fibrillosus. Lamellae adnatae, roseae. Stipes 20–30 × 2 mm, griseo-brunneus, fibrilloso-striatus, ad apicem fibrillosus. Odore saporeque haud notatis. Sporae (7.5–)8.5–10.5(–11.5) × 6.5–8 μm, 5–6(–7) angulatae. Acies lamellarum sterilis. Cheilocystidia 15–45 × 6.5–17 μm, *clavata, cylindracea vel utriformia. Pileipellis trichoderma hyphis inflatis ad 30 μm latis, pigmentis intracellulosis. Fibulae absentes. At terram in alnetum. Holotypus: Greece, Isl. Andros, Kiklades (C. Aegean), Torna, 22 Sep. 2002, E. Polemis 02-A364 (L; isotype LGAM-AUA)*

Etymology: *alnicola* = associated with *Alnus*.

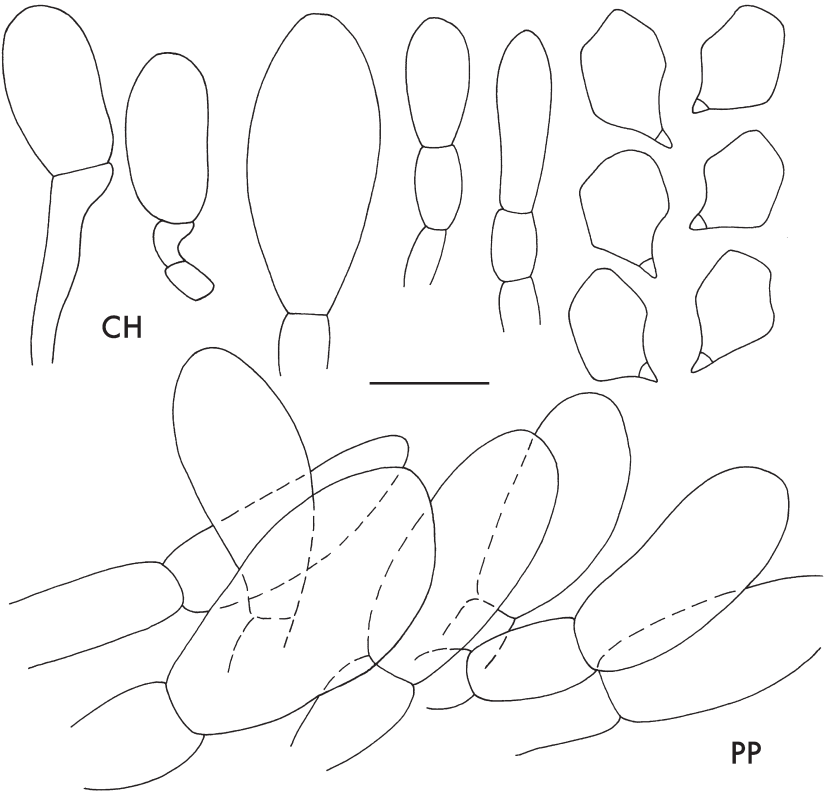


Fig. 2. *Entoloma alnicola*. Spores, cheilocystidia (CH), and pileipellis (PP). Bar = 10 µm.

Description—Pileus 13–20 mm, finally planocovex to aplanate, hygrophanous, translucently striate, dark grey-brown at disk and striae, fading to sordid brown towards the margin, which is finally straight and slightly undulating, minutely fibrillose-squamulose. Lamellae moderately distant, adnate, white to pinkish, with concolorous edge. Stipe up to 20–30 × 2 mm, cylindrical, greyish-beige at apex, darker grey-brown at base, fibrillose striate, pruinose at apex. Smell and taste not recorded.

Spores (7.5–)8.5–10.5(–11.5) × 6.5–8 µm, Q = 1.2–1.4(–1.5), heterodiametrical, with 5–6(–7) pronounced angles, relatively thick-walled. Basidia (1)2-spored. Lamellae edge sterile. Cheilocystidia 15–45 × 6.5–17 µm, broadly clavate to cylindrical, utriform. Pileipellis a trichoderm with inflated, clavate terminal elements, up to 30 µm broad. Brilliant granules present. Pigment brown, intracellular. Clamps absent.

Habitat: Saprotrophic on wet mossy soil with woody residues of *Alnus glutinosa* along a stream with *Platanus orientalis*, and *Alnus glutinosa*.

Collection examined: Greece, Isl. Andros, Kiklades (C. Aegean), Torna, 22 Sept. 2002, E. Polemis 02-A364 (L, holotype).

Entoloma alnicola belongs to subgenus *Cyanula*, stirps *Longistriatum*, close to *E. longistriatum* (Peck) Noordel., from which it differs, however, by the rather dark grey-brown tinges in pileus and stipe, a fibrillose-striate stipe surface, the 2-spored basidia and the predominantly utriform or broadly clavate cheilocystidia. *Entoloma turci* (Bres.) M.M. Moser, which is similarly grey-brown, has a less distinct, non-translucently striate pileus, polished stipe, which frequently turns reddish at the base, 4-spored basidia and differently shaped cheilocystidia. *Entoloma scabropelle* Noordel. has a fertile lamella edge, and 4-spored basidia.

2. New Greek records

Entoloma nigroviolaceum (P.D. Orton) Hesler, Persoonia 11(4): 471 (1967)

Description—Pileus 10–35 mm, hemispherical to convex, irregularly convex, flat at centre, margin involute and often undulate, not translucently striate, not hygrophanous, initially dark violaceous-black, then vinaceous-grey, at first, innately fibrillose-tomentose to rugulose at centre, then entirely tomentose, radially fibrillose to squamulose at centre. Lamellae moderately distant, adnate, whitish to grey-bluish (lead-grey), then pinkish with concolorous edge. Stipe 30–50 × 2–6 mm, cylindrical to compressed, grey-blue to violaceous-grey, fibrillose-striate, initially whitish tomentose towards the base, pruinose at apex, becoming smooth with age. Context pale blue-violaceous, Smell absent, weak.

Spores (9–)9.5–13 × 7–9 μm, Q = 1.2–1.5, irregularly 5–8 angled in side view. Basidia (2)4-spored. Lamellae edge fertile. Cystidia absent. Pilepellis a transition between a cutis at margin and a trichoderm towards the centre, made up of inflated terminal elements up to 25 μm broad, some apically or laterally rostrate, pigment grey to violaceous-brown, intracellular. Clamps absent.

Habitat: Mountain acidic heath land with *Erica arborea*, *Genista acanthoclada*, *Crataegus monogyna*, and *Pteridium aquilinum*, on wet mossy soil.

Collection examined. Greece, Isl. Andros, Kiklades (C. Aegean), Vourkoti, 8 Oct. 2002, E. Polemis 02-A414.

Entoloma nigroviolaceum is a striking species with dark violaceous-black basidiocarps, and large, many-angled spores. It is a very rare species, known from only few records in Northwestern Europe (Noordeloos 2004). In all cases it has been found on fairly poor, acid peaty soil with mosses and *Sphagnum*. It has never been recorded so far from Greece. *Entoloma nigroviolaceum* belongs

to a small group of closely related species, all of them being rare and indicative of very special habitat conditions.

Entoloma griseopruinatum Noordel. & Cheype, Fungi Europaei, 5a: 876 (2004)

Description—Pileus 40–60 mm, planoconvex, finally somewhat depressed at centre, with a small umbo and deflexed, straight to undulating margin, not hygrophanous, not or slightly translucently striate, dark grey-brown, radially innately fibrillose, with a greyish pruina left at the centre of pileus. Lamellae moderately distant, adnate-emarginate, grey-beige with a pink tinge, with concolourous or slightly paler edge. Stipe 40–60 × 7–15 mm, cylindrical to somewhat compressed, base somewhat rooted, concolorous with pileus, with white fibrillose covering, pruinose at apex, whitish and almost smooth at base. Context thick and firm, grey. Smell and taste strongly farinaceous.

Spores 8.5–11(–12.5) × 7–10 µm, Q = 1.0–1.3, almost isodiametrical, rather obtusely angled. Basidia 4-spored. Lamellae edge fertile. Cystidia absent. Pileipellis cutis of cylindrical hyphae, 4–13 µm broad, pileitrama made of inflated elements up to 22 µm broad. Pigment yellow-brown intracellular. Clamps abundant in all tissues.

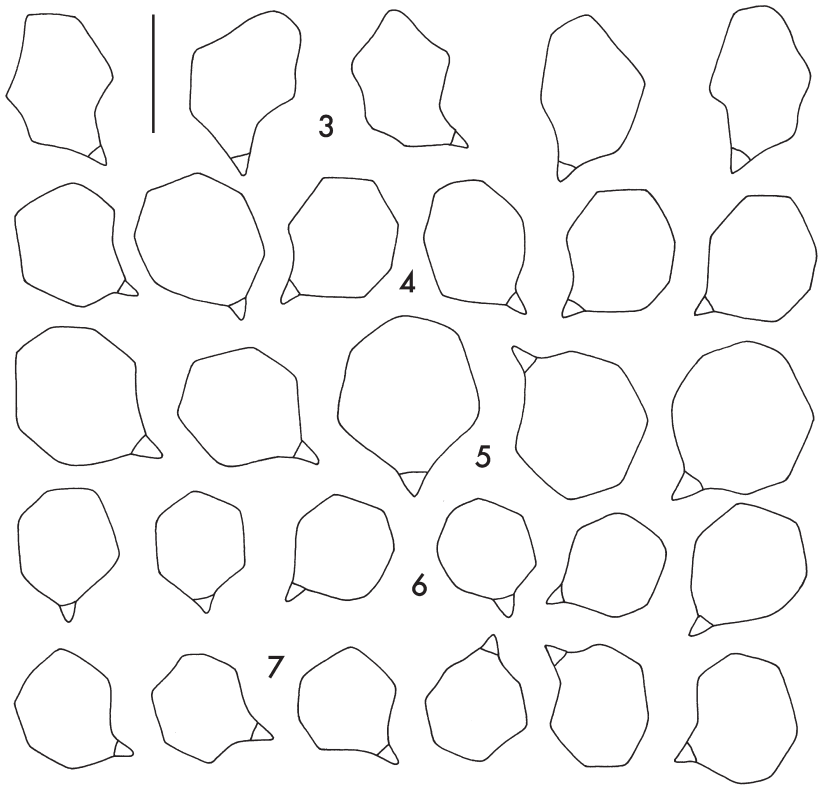
Habitat: In dry heath land with various Mediterranean spiny scrubs (*Phrygana*), on soil among *Sarcopoterium spinosum* scrubs.

> Collection examined: Greece, Isl. Amorgos, Kiklades (C. Aegean), Theologos Monastery, 4 Dec. 2005, E. Polemis 05-M199.

Entoloma griseopruinatum is a very distinct species in stirps *Lividoalbum* in subgenus *Entoloma* with relatively stout, firm basidiocarps. The dark colours, non-hygrophanous, and pruinose pileus are distinctive (Noordeloos 2004). So far it was known only from the type locality in France, Haute Savoie, where it was found growing in a mountainous *Fagus* wood, a habitat very different from the Greek location, which represents the second known locality of this rare species. The type collection showed a distinct yellow tinge at the base of the stipe, which has not been observed in the Greek material. Recently, it has been recorded from two localities in Spain (Girona), in montane mixed broadleaved forests of *Corylus avellana, Betula pendula, Fraxinus excelsior, Salix caprea* and *Sorbus aria* (Vila & Caballero 2007). *Entoloma griseorugulosum* is somewhat similar, differing, however, by a more fibrillose-rugulose pileal surface, and the presence of incrusting pigment in the pileipellis (see below).

Entoloma griseorugulosum Noordel. & Fern. Sas. Fungi Europaei, **5a**: 872 (2004)

Description—Pileus 30–40 mm, convex then applanate with low umbo, margin involute then straight, slightly lobed, not hygrophanous, not translucently striate, dark grey-black to drab-sepia, becoming at centre smoke to mouse-grey, silky, innately fibrous. Lamellae moderately distant, adnate, moderately



Figs. 3-7. Spores.
3. *E. nigroviolaceum*. 4. *E. griseopruinatum*. 5. *E. griseorugulosum*.
6. *E. juncinum*. 7. *E. sordidulum*. Bar = 10 µm.

thick, smoke-grey to milky-coffee, with concolourous edge. Stipe up to 50 × 10–20 mm, ventricose, with somewhat rooting base, whitish-greyish, coarsely fibrillose lengthwise, pruinose at apex, at base white tomentose, compact and firm, with white rhizomorphs. Context brittle, grey, smell and taste distinctly farinaceous.

Spores (9–)10–14(–17) × (8–)9.5–13.5(–15) µm, Q = 1–1.2, subisodiametrical, with 6–8 obtuse to pronounced angles, moderately thick walled. Basidia 55–74 × 13–17 µm, (2–)4-spored. Lamellae trama made up of cylindrical hyphae, mostly longer than 100 µm, with pustulate wall-surface. Lamellae edge fertile. Cystidia absent. Pileipellis a cutis of long cylindrical, 3–8 µm wide hyphae. Pileitrama densely packed, made up of short inflated elements, in chains. Pigment intracellular, and additionally incrusting in the narrow hyphae of pileipellis and subpellis. Clamps abundant in all tissues.

Habitat: In calcareous *Quercus ilex* stand, on rich humus mixed with excessive amounts of goat dung under *Q. ilex*.

Collection examined: Greece, Isl. Naxos, Kiklades (C. Aegean), Kinidaros, 12 Dec. 2004, E. Polemis 04-N207.

Entoloma griseorugulosum was described from a thermophilic *Quercus* wood in the Basque country, northern part of the Iberian peninsula, and is very distinctive on account of its very dark basidiocarps, non-hygrophanous, strong farinaceous smell, fibrous pileus and fibrous stipe surface, and two types of pigment in the pileipellis.

Entoloma juncinum (Kühner & Romagn.) Noordel., Persoonia 10: 255 (1979)

Description—Pileus 20–40 mm, convex, soon plano-convex, obtuse, margin slightly involute at first, but soon straight, slightly undulating, hygrophanous, when wet dark brown at disc and striae, grey to milky-coffee towards the margin, striate from the half radius up to disc, fading to yellowish-brown, surface smooth, silky. Lamellae emarginated to almost free, beige then greyish-pink. Stipe 60–70 × 2–5(–7) mm, cylindrical, compressed, broadened towards the base, concolorous with pileus, smooth and polished, apex pruinose.

Spores 7.5–10.5(–11) × 7–9(–10) µm, Q = 1–1.2, almost isodiametrical, 5–7 angled. Basidia 32–42 × 10–13 µm, 4-spored. Lamellae edge fertile. Cystidia absent. Pileipellis cutis of cylindrical hyphae, to 12 µm broad, with incrusting yellow-brown pigment. Pileitrama made of inflated cells to 25 µm broad, with incrusted walls. Clamps present in hymenium, not seen elsewhere.

Habitat: In a moist thicket by a stream, on humus-rich soil under *Quercus pubescens*, *Platanus orientalis* and *Alnus glutinosa* (A361). Also in mountain acidic heath land with *Erica arborea*, *Genista acanthoclada*, *Crataegus monogyna*, and *Pteridium aquilinum*, on wet humus-rich, mossy soil (A413).

Collections examined. Greece, Isl. Andros, Kiklades (C. Aegean), Evrousses, 22 Sept. 2002, E. Polemis 02-A361. Greece, Isl. Andros, Kiklades (C. Aegean), Vourkoti, 8 Oct. 2002, E. Polemis 02-A413.

Entoloma juncinum is a species with a very wide distribution, preferring damp places in mixed forest on rather damp soil, but frequently also found in grassland, where it can be confused with slender forms of *Entoloma sericeum* Quél. (Noordeloos 2004).

Entoloma sordidulum (Kühner & Romagn.) P.D. Orton, Trans. Br. Mycol. Soc. 43: 175 (1960)

Description—Pileus 2.5–4 cm, almost conical, with undulating margin, slightly hygrophanous, when wet dark grey-brown, hazel at centre, olivaceous-buff at margin, indistinctly translucently striate at extreme margin only, drying

to buff, surface smooth, innately fibrillose. Lamellae emarginate, greyish, then vinaceous-buff to clay-pink, with smooth concolorous edge. Stipe 3–5 × 0.5–0.6 mm, cylindrical, greyish-brown smooth, silky-polished to indistinctly striate. Context greyish-white, firm. Smell and taste rancid.

Spores 7–11(–12) × (7–)7.5–8.5(–9) µm, Q=1.0–1.3, almost isodiametrical, rather pronouncedly 5–6-angled in side-view. Basidia 4-spored. Lamellae edge fertile. Cystidia absent. Pileipellis cutis of cylindrical hyphae, 3–10 µm broad, with minute to coarse incrusting and additionally some intracellular yellow-brown pigment. Clamps rare in pileipellis, frequent in hymenium.

Habitat: In thicket, on humus-rich soil under *Quercus pubescens*.

Collection examined: Greece, Isl. Andros, Kiklades (C. Aegean), Falika, 10 Oct. 2002, E. Polemis 02-A430.

Entoloma sordidulum is a widespread and common species, particularly in deciduous and mixed forest on rich soil in North-western Europe (Noordeloos 2004). However, records from the Mediterranean are scarce. It is distinctive with its relatively small and slender basidiocarps, dull brown colour, and predominantly incrusting pigment in the pileipellis. It belongs to a group of rather similar species in section *Rhodopolia,* which may be all mycorrhizal, and difficult to distinguish.

Entoloma lividoalbum (Kühner & Romagn.) Kubička, Česká Mykol. 29: 27 (1975)

Description—Pileus 90–110 mm, convex, then plano-convex with a blunt but distinct umbo, finally applanate to somewhat depressed, margin at first inflexed then straight and irregularly undulating, hygrophanous, indistinctly translucently striate at the extreme margin, dark brown fading to light greyish-beige, smooth, glabrous, with silky appearance. Lamellae moderately crowded, emarginate, ventricose, white then clay-pink, with concolorous edge. Stipe 70–80(–90) × 10–20(–30) mm, cylindrical, attenuates towards the base, whitish, fibrillose-striate lengthwise. Context thick, firm, white. Smell and taste farinaceous.

Spores 9–11(–13) × 8–9(–11) µm, Q=1.1–1.3, 5–7 angled, subisodiametrical. Basidia 37–45 × 11–14 µm, (2)4-spored. Lamella edge fertile. Cystidia absent. Pileipellis an (ixo)cutis of narrow cylindrical hyphae. Pigment brown, intracellular. Clamps abundant in all tissues.

Habitat: In a thicket, on humus-rich soil under *Quercus pubescens*.

Collection examined: Greece, Isl. Andros, Kiklades (C. Aegean), Agios Spyridon, 20 Dec. 1997, E. Polemis 97-A178.

Entoloma lividoalbum is a widespread species in Europe, and prefers *Quercus* forest on rich soil. It is distinctive because of its relatively stout, tricholomatoid habit, smooth, medium brown, hygrophanous pileus and white stipe.

Entoloma mougeotii (Fr.) Hesler, Beih. Nova Hedwigia 23: 158 (1967)
var. ***mougeotii***

Description—Pileus 15–40 mm, convex with involute margin, slightly umbilicate, expanding to applanate, with straight margin, not hygrophanous, not translucently striate, initially dark violaceous-black, then dark grey, violaceous-brown, uniformly coloured, or more often darker at the centre, entirely tomentose to minutely squamulose, somewhat rimose-fissurate when old. Lamellae adnate, or with a decurrent tooth, white then pink, with concolorous, fimbriate margin. Stipe 20–60 × 1–4 mm, cylindrical to slightly compressed, with longitudinally groove, steel-grey, at first longitudinally fibrillose, then smooth shiny, white tomentose at base. Context thin, fragile at stipe, easily splitting lengthwise. Smell indistinct and taste not recorded.

Spores (8.5–)9–11.5(–12) × 6–8 µm, Q = 1.2–1.6, heterodiametrical, with 5–8 pronounced angles. Basidia 27–48 x 10–14 µm, 4-spored. Lamella edge sterile. Cheilocystidia 16–60(–80) × 7–17 µm, cylindrical to slenderly clavate. Pileipellis a trichoderm, made up of inflated cylindrical to clavate, or utriform terminal elements, 6–25 µm wide. Pigment violaceous-brown, intracellular. Clamps absent from all tissues.

Habitat: Along a river's bank, on humus-rich soil under *Platanus orientalis* and *Alnus glutinosa* (A446). On grassy soil, in field with *Olea europaea* and *Cupressus sempervirens*.

Collections examined: Greece, Isl. Andros, Kiklades (C. Aegean), Achlas River, 11 Oct. 2002, E. Polemis 02-A446. Greece, Isl. Andros, Kiklades (C. Aegean), Ypsilou, 28 Nov. 2002, E. Polemis 02-A618.

Entoloma mougeotii is distinctive because of its delicate violaceous-brown colour and sterile lamella edge with large cheilocystidia. It has a wide distribution all over Europe, but only in very special grassland habitats, for which it is a good indicator species (Vesterholt 2002).

Entoloma cruentatum (Quél.) Noordel., Persoonia 12: 201. 1984.

Description—Pileus 20–50 mm, hemispherical, strongly umbilicate, with straight margin, expanding to convex, depressed, not hygrophanous, translucently striate to the half of radius, more evidently as the pileus expands, dark bluish to greyish black, at first uniformly coloured, then only at centre and striae, with the rest of the surface greyish, smooth and silky, somewhat rugulose and then adpressedly fibrillose at centre. Lamellae moderately distant, adnate, greyish-blue, with concolorous margin. Stipe 30–50 × 2–3 mm, cylindrical to slightly enlarged at base, concolorous with pileus, or somewhat paler, smooth, polished, white tomentose at base.

Spores 9–12 × 7–9 µm, Q = 1.3–1.5, heterodiametrical, with 6–8 pronounced angles. Basidia 30–45 × 10–12 µm, 4-spored. Lamella edge fertile. Cheilocystidia

absent. Pileipellis a trichoderm transiting to cutis towards the margin, made up of inflated cylindrical to clavate, or utriform terminal elements, 7–20(–30) μm wide. Pigment brown, intracellular. Clamps absent from all tissues.

Habitat: In an open meadow with *Olea europaea* trees, on grassy soil.

Collection examined: Greece, Isl. Andros, Kiklades (C. Aegean), Ypsilou, 15 Dec. 2007, E. Polemis 07-A906.

Entoloma cruentatum is very close to *E. chalybeum*, from which it mainly differs by the fertile lamella edge without cheilocystidia. Usually a distinct orange coloured mycelium has been observed at the base of the stipe, but this seems to be absent in the Greek material. *Entoloma cruentatum* is a very rare species, recorded so far from North-western Europe where it is a good indicator species for old, poorly manured grasslands. It figures on the Red Data lists of Denmark, Norway and Schleswig-Holstein (Vesterholt 2002). It has not been recorded from the Mediterranean so far. A strongly umbilicate pileus, such as in our specimens, has not been recorded for this species in pertinent descriptions.

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