

A contribution to the study of fungi associated with *Cistus* spp. in the Sierra Calderona Nature Reserve, Castellón–Valencia, Spain. II

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Abstract. Fifty-eight species and seven varieties of fungi and one protozoan associated with *Cistus* spp. have been collected and studied in the Sierra Calderona Nature Reserve, Castellón–Valencia, Spain. Significant diagnostic characteristics are given for some of them. Several species that belong to *Myxomycota*, anamorphic fungi and *Basidiomycota* are of special interest: *Agrocybe ochracea*, *Cladosporium tenuissimum*, *Cortinarius scobinaceus* var. *volvatus*, var. nov., *Entoloma malenconii*, *Gymnopus lanipes*, *Hebeloma plesiocistum*, *Inocybe amblyspora*, *I. splendens*, *Inocybe* cf. *squarrosa*, *Lindbladia tubulina*, *Lyophyllum cistophilum*, *Melanoleuca polioleuca*, *M. subpulverulenta*, *Panaeolina foenisecii*, *Tomentellopsis pusilla* and *Tulostoma macrocephalum*.

Key words: fungi associated with *Cistus* spp., Spain

Introduction

As a continuation of a previous work (Torrejón 2007), regarding the fungi associated with *Cistus* spp. in the Sierra Calderona Nature Reserve in Spain (Figs 1, 3), the most important areas, where several species of rockrose bushes are found, have been assayed during the years 2006, 2007, 2008 and 2009. As a result of the forays, fifty-eight species and seven varieties of fungi and one protozoan have been studied. Further information about the most important characteristics of this nature reserve can be found in Torrejón (2007).

Some photographs, a few pen drawings and several descriptions on principal macroscopic characteristics of fresh carpophores are cited. The collected material was dried and kept in paper envelopes.

In order to study the specimens in the laboratory, the author used the same methods that were used in Torrejón (2007). The specimens are kept in the author's herbarium (MTH). The species have been systematically arranged according to Kirk *et al.* (2008).

Most collections were made on siliceous red sandy soil from the Buntsandstein.

An asterisk (*) before the scientific name indicates those species that have been collected for the first time in this nature reserve.

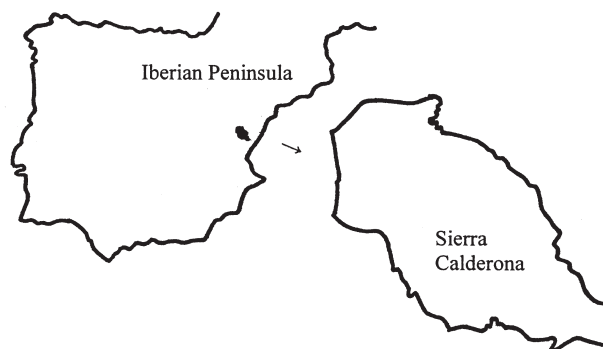


Fig. 1. Map of the prospected area

Results

Myxomycota

Order Liceales

**Lindbladia tubulina* Fr.

Figs 4–5

Altura, Chirivilla I, 545 m, UTM 30SYK1209. On dead wood, bark, twigs and leaves of *Cistus monspeliensis*, 10 Apr 2007 (MTH 952); 11 Apr 2007 (MTH 953). — Calcic granules on the peridium and the absence of pseudocapillitium are determining factors that help to identify this species. This species occurs on dead wood of gymnosperms and occasionally on leaf litter and wood of angiosperms. — Further information can be found in Lado & Pando (1977).

Anamorphic fungi

**Cladobotryum* state of *Hypomyces aurantius* (Pers.) Fuckel

Segorbe, La Mocha, 520 m, UTM 30SYK1307. On a decaying agaric from the previous autumn, beneath *Cistus monspeliensis*, 13 Apr 2007 (MTH 971). — One-septate conidia help to identify this species. — Further information can be found in Ellis & Ellis (1988).

**Cladosporium tenuissimum* Cooke

Fig. 6

Altura, Chirivilla I, 545 m, UTM 30SYK1209. On a decaying carpophore of *Lactarius tesquorum* from the previous autumn, beneath *Cistus monspeliensis*, 11 Apr 2007 (MTH 955). Segorbe, La Mocha, 520 m, UTM 30SYK1307. On a decaying carpophore of *Lactarius tesquorum* from the previous autumn, beneath *C. monspeliensis*, 13 Apr 2007 (MTH 972, 973). Altura, Chirivilla II, 608 m, UTM 30SYK1109. Found on decaying *Russulaceae* from the previous autumn, beneath *C. monspeliensis*, 29 Dec 2007 (MTH 981, 982). — This saprophytic Acroblastosporae Kiffer & Morelet (2000) designates a group of fungi, which earlier had been labelled as Blastosporae *sensu stricto*. It is the primary fungus to take part in the decomposition process of *Lactarius tesquorum* carpophores in this nature reserve. The colonies of the fungi, covering the surface of the substrate, are velvety and olivaceous stawish. — Further information about this species can be found in Ellis (2001).

**Myrothecium inundatum* Tode

Segorbe, La Mocha, 520 m, UTM 30SYK1307. On a decaying agaric from the previous autumn, beneath *Cistus monspeliensis*, 13 Apr 2007 (MTH 974) — small collection. Sporodochia sessile, up to 1 mm in diameter, flat, black with a white perimeter. — There is further information about this species in Ellis & Ellis (1988).

**Taeniolella* sp.

Altura, Chirivilla II, 608 m, UTM 30SYK1109. On excretions produced by cochineal insects on branches and twigs of *Cistus monspeliensis*, 29 Dec 2007 (MTH 983). Gátova, Chervilla, 700 m, UTM 30SYK1108. It occurs on branches and twigs of *C. monspeliensis*, 15 Apr 2007 (MTH 987).

**Trichoderma viride* Pers.

Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. It was found on dead wood of *Cistus monspeliensis*, 5 Jun 2008 (MTH 1042). — Further information can be found in Gams (2006).

Basidiomycota

Order Agaricales

**Agaricus pseudoprattensis* (Bohus) Wasser var. *niveus* Bohus

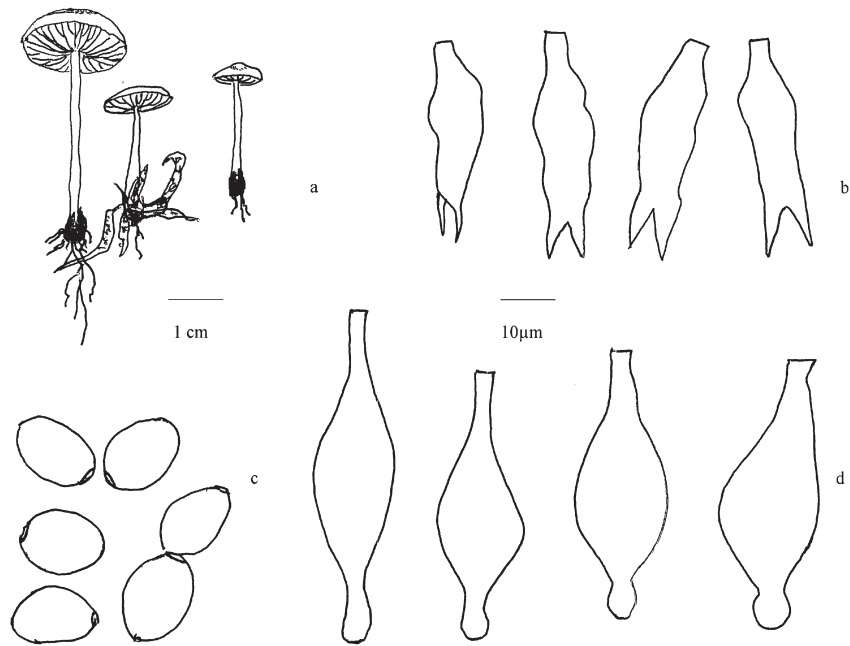
Altura, Chirivilla II, 608 m, UTM 30SYK1109. Scattered on soil, beneath *Cistus albidus*, 6 Jun 2008 (MTH 1018). — Spores 5–7 × 4–4.5 µm, drab yellowish. A slight strangulation and the attenuated stipe at the base and less intense yellow colour allow separating this species from *Agaricus xanthodermus*, bulbous and with intense yellow colour change. — Due to the faintness of the carbolic smell and of the yellow colour change in stem base, the fungus is often mistakenly gathered as the edible *A. campestris* (Cappelli 1984).

**Agrocybe ochracea* Nauta

Fig. 2

Altura, El Garabal, 600 m, UTM 30SYK1110. Scattered on soil, beneath *Cistus monspeliensis*, 20 May 2008 (MTH 937). Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *C. monspeliensis*, 10 Apr 2007 (MTH 967). Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Scattered on soil, beneath *C. monspeliensis*, 5 Jun 2008 (MTH 1024). — Features from MTH 937 collection: Pileus 9–20 mm in diameter, convex to planoconvex at maturity, slightly viscid, dark cream yellowish to brownish olivaceous, darker at the mammiform area. Lamellae distant, adnate, slightly arcuate, brown, lamellulae present. Stipe 22–37 × 1–2 mm, cylindrical, cream, slightly bulbous at base, where it shows light cream rhizomorphs. Basidia 28–32 × 10–12 µm, 2-spored. Basidiospores 14–16 × 8–10 µm, ellipsoid, yellow brownish with thick walls and germ pore. Pleurocystidia 32–50 × 10–20 µm, lageniform with capitate apex. Cheilostidia 22–40 × 8–16 µm, lageniform, lecitiform or tibiform with capitate apex. — Features from MTH 967 collection: Pileus 27 mm in diameter, convex, flocculose, viscid, from dark cream yellowish to brownish olivaceous, darker at the mammiform area with a small rest of the veil at the margin. Lamellae distant, adnate, slightly arcuate, vinaceous buff, lamellulae present. Stipe 47 × 7 mm, cylindrical, hollow, cream with flocculose rust brown yellowish, slightly bulbous at the base, where it shows whitish rhizomorphs. Flesh taste and smell mealy. Basidia 28–36 × 8–11 µm, 2-spored. Basidiospores 15–18 (–20) × 10–12 µm, ellipsoid, yellow brownish with thick walls and germ pore. Pleurocystidia 44–62 × 10–14 µm, lageniform with capitate apex. Cheilostidia 24–40 × 7–10 µm, lageniform, lecitiform or tibiform with capitate apex. — Petrov (1983) described *Agrocybe pediades* (Fr.) Fayod f. *bispora* A.N. Petrov with the following Latin description: *A forma typica basidiis*

Fig. 2. *Agrocybe ochracea*: a – basidiocarps, b – basidia, c – basidiospores, d – pleurocystidia



bisporis et *sporis magnis* 12–17 (–20) × 9–10 (–12) µm differt. *Typus*: URSS, regio Irkutskensis, distr. Sljudjanensis, in viciniis stationis Marituj, ad tramitem, in ripa lapidosa amniculi, 17.08.1981, A.N. Petrov; in herbario Instituti Botanici Acad. Sci. URSS (LE) conservatur. Pleurocystidia was the most important characteristic that allows separating *Agrocybe ochracea* from *A. pediades* f. *bispora*. — Further information about this species can be found in Noordeloos *et al.* (2005).

**Amanita pantherina* (DC.) Krombh.

Altura, Las boqueras, 670 m, UTM 30SYK0705. Single carpophore on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 990). — Further information can be found in Neville & Poumarat (2004).

Bovista aestivalis (Bonord.) Demoulin

Altura, Chirivilla I, 545 m, UTM 30SYK1209. On soil beneath *Cistus monspeliensis*, 11 Apr 2007 (MTH 954). — Although this species is not specific to *Cistus* spp. it is usual in this habitat. Several collections are included in the previous work by Torrejón (2007). It is a frequent species in this particular habitat from late autumn to early winter. However, this is the first time that the author has collected a sample in spring. — Further information can be found in Calonge (1998).

**Clitocybe rivulosa* (Pers.) P. Kumm.

Altura, El Altico del Cura, 515 m, UTM 30SYK1113. Scattered on soil, beneath *Cistus monspeliensis*, 16 Apr 2007 (MTH 950). Segorbe, La Mocha, 520 m, UTM 30SYK1307. Scattered on soil, beneath *Cistus monspeliensis*, 13 Apr 2007 (MTH 976). — Pileus 8–33 mm in diameter, convex to planoconvex, some of them slightly depressed at maturity and showing an inrolled and sometimes lobed margin, powdered white, hygrophorous,

rivulose, where cream rose colour is observable through. Lamellae decurrent, whitish. Stipe 12–29 × 3–5 mm, hollow at maturity, cylindrical, curved, concolorous with pileus, broadened at the apical area and slightly narrowed at the basal one, where sometimes shows white rhizomorphs. — Further information can be found in Phillips (1981) and Bon (1997).

**Coprinellus flocculosus* (DC.) Vilgalys, Hopple & Jacq. Johnson

Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Scattered to subfasciculate on soil, beneath *Cistus monspeliensis*, 7 Apr 2007 (MTH 957, 958, 959). — Spores 8–10 × 5–6 µm. Basidia 24–36 × 8–10 µm, 4-spored. This species has the biggest spores in the subsection *Domestici* and this characteristic helps to separate it from the similar *Coprinellus domesticus* with bigger basidiocarps and from *C. micaceus* that occurs at the base of decaying trees or stumps with many fasciculate basidiocarps. — Further information can be found in Noordeloos *et al.* (2005, as *Coprinus flocculosus*).

**Cortinarius scobinaceus* Malençon & Bertault var. *volvatus* Torrejón, var. nov. Fig. 7

A typo differt stipite volvato. Typus in loco Altura, Las boqueras, Hispania, 670 m, 13.XI.2008, leg. et det. M. Torrejón, sub *Cistus monspeliensis*. *Holotypus* in SOMF 27 906, *isotypus* in MTH 998.

Etyymology: *volvatus* from the cuplike structure around the base of the stipe.

Specimens examined: Altura, Las boqueras, 670 m, UTM 30SYK0705. Scattered on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (SOMF 27 906, MTH 998). — This specimen was collected a little dry and completely mature. Pileus 14–21 mm in diameter, convex, obtusely

mammiform, sienna, cinnamon at the mammiform area, hygrophanous, squamulose with small remnant of the white general veil. Lamellae concolorous with pileus, admate with decurrent to emarginate tooth. Stipe 18–36 × 2–3 mm, cylindrical, fibrillose, bulbous, truncate with whitish volva. Basidiospores 9.5–12.5 × 4–6 µm, amygdaliform to fusiform, slightly verrucose, brown yellowish. Basidia 26–31 × 9–11 µm, 4-spored, claviform. The shape of the cheilocystidia is a transition between hymeniderm and epitelium with claviform to globose apical cells. Pileipellis intricate trichoderm with fibulae and yellow brownish pigments incrustated. — *Cortinarius belleri* in Contu & Lavorato (1986) and Lavorato (1991), is similar to our collection, but there is not a description of a volva there. On the basis of these morphological and ecological data (habitat, basidiospore features and cheilocystidia) we consider *C. belleri* as conspecific with *C. scobinacius* (Ortega *et al.* 2006). According to this study, the author's new variety proposal belongs to *C. scobinaceus*. Neither Malençon & Bertault (1970) nor Campo (2004) found volva in their collections of *C. scobinaceus*. — In the work of Henry & Contu (1985) *Cortinarius bulbosovolvatus*, which occurs in association with *Cistus monspeliensis* is described with white volva. Fortunately, we have a collection of this last species from another nature reserve of Castellón, and it allowed us to compare both. The basidiospores of *C. bulbosovolvatus* are ellipsoid to ovoid or narrowly amygdaloid, shorter and narrower than the species studied. *Cortinarius arcanus* Moreno *et al.* (2004) with fusoid and a little narrower spores, shows a brown blackish volva and was collected beneath *Pinus pinaster*. The rest of the small species of *Cortinarius* that live in association with *Cistus* spp. such as *C. scobinaceus* var. *scobinaceus* in Malençon & Bertault (1970); *C. parvostratus* in Henry & Contu (1985); *C. sabulicola* in Henry & Contu (1987) and Contu (1991); *C. cistophilus* in Henry & Contu (1989); *C. conico-obtusarum* in Ortega & Chevassut (1999); *C. castaneus* var. *monspeliensis* and *C. impolitus* in Contu (2000); *C. subcaninus* in Torrejón (2002); *C. ayanamii* in Torrejón (2002, 2003); *C. cristallinus* in Torrejón (2005); *C. contui* in Ortega *et al.* (2007) and *C. assiduus* var. *pleiocistis*, *C. cystidifer* and *C. scobinaceus* var. *cistohelvelloides* in Torrejón (2008) have no volva. On the other hand, other species of *Cortinarius* such as *C. pseudoprivignus* in Malençon & Bertault (1970); *C. bulliardii*, *C. coeruleopallescens*, *C. dionysae*, *C. glaucescens* var. *maritimus*, *C. fulmineus*, *C. illibatus*, *C. limonae*, *C. parvostratus*, *C. pseudoprivignus*, *C. sabulicola*, *C. variiformis* var. *crustulinicolor* and *C. variiformis* var. *variiformis* as *Cistus* ectomycorrhizal fungi in Comandini *et al.* (2006) including the species from the work of Lavorato (1991); *C. cistoadelphus* in Moreno

et al. (1997, as *Dermocybe cistoadelpha*); *C. subcotoneus* in Bidaud *et al.* (2007) and *C. mahiquesii* in Vila *et al.* (2008) are not *Telamonia* and all of them are bigger than the specimen studied.

Crucibulum laeve (Huds.) Kambly

Altura, Chirivilla II, 608 m, UTM 30SYK1109. On dead wood and leaves of *Cistus monspeliensis*, 4 Feb 2006 (MTH 1030).

**Entoloma malenconii* Vila & Llimona

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1000). — Pileus 25 mm, expanded, subumbonate, snuff brown, darker at the subumbonate area. Stipe 47 × 2 mm, cylindrical, concolorous with pileus, white at the base. Pileipellis trichoderm. Basidia 28–35 × 9–10 µm, 4-spored, subcylindrical to subclavate. Spores 9–9.5 × 7–8 µm, most of them isodiametrical to heterodiametrical, hyaline and unigutuled. — Further information and a very good photograph of this species can be seen in Vila & Llimona (2002).

**Entoloma undatum* (Fr.) M.M. Moser

Altura, Chirivilla II, 608 m, UTM 30SYK1109. Scattered on soil, beneath *Cistus albidus*, 6 Jun 2008 (MTH 1017). — Further information about this species can be found in Noordeloos (1992, 2004).

Gymnopus dryophilus (Bull.) Murrill

Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Scattered on soil, beneath *Cistus monspeliensis*, 17 Apr 2007 (MTH 932). Altura, Las boqueras, 670 m, UTM 30SYK0705. Scattered on soil, beneath *C. albidus* and *C. monspeliensis*, 20 May 2008 (MTH 938). Segorbe, La Mocha, 520 m, UTM 30SYK1307. Scattered on soil, beneath *C. monspeliensis*, 13 Apr 2007 (MTH 975). Gátova, Chervilla, 700 m, UTM 30SYK1108. Scattered on soil, beneath *C. monspeliensis*, 15 Apr 2007 (MTH 988). Altura, Chirivilla II, 608 m, UTM 30SYK1109. Scattered on soil, beneath *C. albidus*, 6 Jun 2008 (MTH 1028). — The measurements of the different collections are as follows: MTH 932, pileus 12–19 mm, stipe 32–43 × 2–3 mm; MTH 938, pileus 17–34 mm, stipe 25–46 × 2–3 mm; MTH 988, pileus 21–41 mm, stipe 27–43 × 3–6 mm; MTH 1028, pileus 23–32 mm, stipe 40–45 × 2–3 mm. — Further information about this species is included in Torrejón (2007).

Gymnopus lanipes (Malençon & Bertault) Vila & Llimona

Figs 8–9

Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Isolated on soil, beneath *Cistus monspeliensis*, 17 Apr 2007 (MTH 933). — Further information about this species can be found in Malençon & Bertault (1975, as *Marasmius dryophilus* var. *lanipes*), Vila & Llimona (2002) and Torrejón (2007).

Fig. 3. Rock formation of the prospected area. Fig. 4. *Lindbladia tubulina* immature. Fig. 5. *Lindbladia tubulina* mature. Fig. 6. *Cladosporium tenuissimum*. Fig. 7. *Cortinarius scobinaceus* var. *volvatus*. Fig. 8. *Gymnopus lanipes* pileus. Fig. 9. *Gymnopus lanipes* lamellae. Fig. 10. *Inocybe amblyspora*



Gymnopus ocior (Pers.) Antonín & Noordel.

Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. On soil, beneath *Cistus monspeliensis*, 7 Apr 2007 (MTH 962, 963). — Further information can be seen in Breitenbach & Kränzlin (1991, as *Collybia luteifolia*), Bas *et al.* (1995, as *C. ocior*) and Torrejón (2007).

Hebeloma mesophaeum (Pers.) Quél.

Altura, Chirivilla II, 608 m, UTM 30SYK1109. Isolated on soil, beneath *Cistus monspeliensis*, 29 Dec 2007 (MTH 984). — This species has been collected frequently by the same author (Torrejón 2007).

**Hebeloma plesiocistum* Beker, U. Eberh. & Vila

Altura, Chirivilla II, 608 m, UTM 30SYK1109. Isolated on soil, beneath *Cistus monspeliensis*, 4 Feb 2006 (MTH 1037). — Only one basidiocarp was collected. Spores 10–12 × 5.5–7 µm, amygdaliform, weakly ornamented, a few of them with slight apical papilla, yellow brownish, strongly dextrinoid, then rusty tawny to brick, perispore not loosening. — Particular characteristics of its spores are the most important microscopic features to separate this species in the section *Theobromina* and also to separate it from species that belong to others sections, establishing mycorrhizal symbiosis with *Cistus* spp. — More information can be found in Eberhardt *et al.* (2009).

**Hebeloma sacchariolens* Quél.

Altura, Las boqueras, 670 m, UTM 30SYK0705. Scattered on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 999). — Pileus 17–30 mm in diameter, convex to expanded, viscid, pale cream with whitish to white areas close to the margin. Lamellae cinnamon. Stipe 11–14 × 2–4 mm, cylindrical, fibrillose and whitish. Spores 11–15 × 6–8 µm, amygdaloid to citriform, destrinoid, strongly verrucose with perispore loosening in many of them. — There is further information about this species in Vesterholt (2005).

**Hydropus floccipes* (Fr.) Singer

Altura, Chirivilla II, 608 m, UTM 30SYK1109. Isolated on decaying seeds of *Cistus monspeliensis*, 6 Jun 2008 (MTH 1033). Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Isolated on decaying seeds of *Cistus monspeliensis*, 5 Jun 2008 (MTH 1034). — Pileus 18–19 mm. Stipe 22–23 × 2 mm. Spores 6–7.5 × 5–7 µm, subglobose, smooth, hyaline and anamyloid. — The shape of the spores separates this species within the genus. — Further information can be found in Bon (1989) and Bas *et al.* (1999).

**Hygrophorus pseudodiscoideus* (Maire) Malençon & Bertault var. *cistophilus* Bon & G. Rioussset

Altura, Casicas de Chupa, 730 m, UTM 30SYK0909. On soil, beneath *Cistus monspeliensis*, 28 Oct 2007 (MTH 978). — Further information about this variety can be found in Bon (1990) and Candusso (1997).

**Inocybe amblyspora* Kühner

Fig. 10

Altura, Las boqueras, 670 m, UTM 30SYK0705. Scattered on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1012). — Pileus 12–22 mm in diameter, convex, obtusely mammiform, fibrillose and slightly rimose, brown yellowish at the margin and darker at the central area. Lamellae slightly ventricose, narrowly adnate, slightly eroded, between smoke grey yellowish and grey olivaceous. Stipe 22–34 × 3–4 mm, cylindrical, slightly striate, whitish to white brownish towards the base, bulb white. Spores 7.5–9.5 × 4.5–6 µm, subamygdaliform, some of them subreniform. Basidia 22–35 × 7–10 µm, 4-spored, clavate. Cheilocystidia 35–75 × 10–22 µm, fusiform, subfusiform, lageniform, narrowly lageniform, ventricose clavate, ventricose fusiform, subcylindrical, most of them with apical incrustations, some of them submoniliform in shape towards the apex. — Further information can be found in Alessio (1980), Strangl (1991), Breitenbach & Kränzlin (2000) and Ferrari (2006).

**Inocybe dulcamara* (Alb. & Schwein.) P. Kumm.

Altura, Chirivilla II, 608 m, UTM 30SYK1109. Scattered on soil, beneath *Cistus albidus*, 6 Jun 2008 (MTH 1021). — There is further information about this species in Ferrari (2006).

**Inocybe flocculosa* (Berk.) Sacc.

Altura, Las boqueras, 670 m, UTM 30SYK0705. Scattered on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1010, 1011). — Further information can be found in Heim (1931).

**Inocybe geophylla* (Pers.) P. Kumm.

Altura, Las boqueras, 670 m, UTM 30SYK0705. Scattered on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1009).

**Inocybe splendens* R. Heim

Altura, Chirivilla II, 608 m, UTM 30SYK1109. Scattered on soil, beneath *Cistus monspeliensis*, 4 Feb 2006 (MTH 1038). — Pileus 16–22 mm in diameter, convex, expanded at maturity, subumbonate, brown, with greyish veil, more abundant at the subumbonate area. Lamellae cream, brown yellowish at maturity. Stipe 19–32 × 4–5 mm, cylindrical, marginately bulbous, pruinose and striate. Spores 8–12 × 4.5–7 µm, subamygdaliform, subfusiform, some of them ellipsoid with median constriction, many of them with apical papilla. — Further information can be found in Stangl (1991) and Ferrari (2006).

**Inocybe cf. squarrosa* Rea

Fig. 11

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1013). — Small collection. Pileus 10–11 mm, in diameter, convex, subumbonate, brown, squamulose with grey scales. Lamellae slightly ventricose, free to adnexed, grey, fulvous at maturity, margin cream

Fig. 11. *Inocybe cf. squarrosa*. Fig. 12. *Lyophyllum cistophilum*. Fig. 13. *Melanoleuca polioleuca* pileus. Fig. 14. *Melanoleuca polioleuca* lamellae. Fig. 15. *Melanoleuca subpulverulenta*. Fig. 16. *Panaeolina foenicicii*. Fig. 17. *Tomentellopsis pusilla*. Fig. 18. *Tulostoma macrocephalum*



and slightly eroded. Stipe 22–23 × 2 mm, cylindrical, concolorous to pileus, squamulose with grey scales, whitish towards the base. Spores 11.5–14 × 6.5–8 µm, ellipsoid to subamygdaliform. Basidia 22–40 × 11–13 µm, most of them 4-spored, clavate. Cheilocystidia 38–65 × 16–24 µm, clavate to utriform, apical incrustations present, but small and not too abundant. — After reading the works of Stangl (1991), Esteve-Raventós & Tabarés (1999) and Ferrari (2006), the conclusion is that the samples studied show some features from all of them. Pileus and stipe dimensions are similar to Ferrari's description. The size of the spores is similar to the description of Esteve-Raventós & Tabarés. Basidia length is similar to the description of Stangl, but basidia width is more in accordance with Esteve-Raventós & Tabarés. Cheilocystidia are similar to the works of Stangl and Ferrari. In the compared works, the collections were made in *Alnus*, *Salix*, *Pinus*, *Crataegus*, *Corylus*, *Populus* and *Quercus*. These habitats are very different from the heliophilous *Cistus* plant ecosystems.

**Lycoperdon lividum* Pers.

Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Isolated on soil, beneath *Cistus monspeliensis*, 6 Jun 2008 (MTH 1022, 1023). — Living on soil and granular exoperidium allow separation of this species from other *Lycoperdon*. Different capillitium and less ornamented spores help to distinguish it from *Bovista aestivalis*.

**Lycoperdon perlatum* Pers.

Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Scattered on soil, beneath *Cistus monspeliensis*, 17 Apr 2007 (MTH 931). — Basidiocarps from the last autumn showing black colour from anamorphic saprotrophic fungi.

**Lyophyllum cistophilum* Vila & Llimona Fig. 12
Altura, Las boqueras, 670 m, UTM 30SYK0705. Coalescent on soil, beneath *Cistus monspeliensis*, 8 Nov 2006 (MTH 1027). — Pileus 26–42 mm, in diameter, convex, expanded at maturity, snuff brown, covering with very abundant fibrils in white greyish colour. Lamellae white greyish. Stipe 25–64 × 6–8 mm, cylindrical, curved to sinuous concolorous to pileus, fibrillose, with two to seven basidiocarps crescent towards the base. Spores 5.5–7 × 4.5–6 µm, subglobose. — An important feature that helped to distinguish this species from *L. decastes* was its white greyish fibrils on the pileus. — Further information can be found in Vila & Llimona (2006).

**Lyophyllum infumatum* (Bres.) Kühner

Segorbe, La Mocha, 520 m, UTM 30SYK1307. On soil, beneath *Cistus monspeliensis*, 13 Apr 2007 (MTH 977). — Five basidiocarps fused at the base. Spores 9–10 × 5.5–7 µm, from amygdaloid to subrhomboid with a big drop inside. Basidia 30–38 × 9–10 µm, 4-spored with fibula. — For further information see Consiglio & Contu (2002).

**Melanoleuca polioleuca* (Fr.) G. Moreno Figs 13–14
Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 10 Apr 2007 (MTH 966). — Pileus 44 mm in diameter, expanded, slightly viscid, mammiform, brown greyish, dark brown at the mammiform area. Lamellae pale cream. Stipe 32 × 10 mm, cylindrical with clavate base, longitudinally striate with white pruinose, dark cream towards the apex and dark brown towards the base where is darker. — The species described here is similar to *M. melaleuca*. Its fusiform cheilocystidia, frequently incrustated by crystals, is an important taxonomic feature that separates it from *M. melaleuca*. — Further information can be found in Bon (1991), Bas *et al.* (1999) and Fontenla *et al.* (2001, 2003).

**Melanoleuca subpulverulenta* (Pers.) Singer Fig. 15
Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 996, 997). — Pileus 54–56 mm in diameter, expanded, grey brownish, slightly depress and obtusely mammiform. Lamellae slightly ventricose, subdecurrent with sinuate insertion, white, lamellulae present. Stipe 40–45 × 7–9 mm, cylindrical, broadened at the basal area, concolorous to pileus. Basidiospores 6.6–9 × 4–5.5 µm, ellipsoid, most of them with a drop and ornamented with amyloid warts. Cheilocystidia 48–70 × 10–13 µm, lageniform, incrustated by crystals or not at the obtuse apex. — For further information see Bon (1991) and Fontenla *et al.* (2002).

**Omphalina meridionalis* Contu & La Rocca
Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Scattered on soil, along a path, in a depressed and damp area, between mosses beneath *Cistus monspeliensis*, 5 Jun 2008 (MTH 1026). — Pileus 6–15 mm in diameter. Stipe 6–10 × 0.6–1.4 mm. Spores 3.5–4.5 × 5.5–7.5 µm. — According to Contu & La Rocca (1999), this species is very common in the particular habitat.

**Panaeolina foenicicii* (Pers.) Maire Fig. 16
Altura, El Garabal, 600 m, UTM 30SYK1110. Scattered on soil, beneath *Cistus monspeliensis*, 14 Apr 2009 (MTH 1040). — Pileus 21–43 mm in diameter, convex, expanded at maturity, hygrophanous, cream, darker at the mammiform area, with white cottony remnant on immature, more abundant towards the margin. Stipe 20–42 × 1.1–2 mm, cylindrical, white, coral towards the base. Basidiospores 12–18 × 6.5–9 µm, ellipsoid to amygdaliform, verrucose with germ pore. Cheilocystidia 33–58 × 12–15 µm, lageniform. — Further information can be found in Breitenbach & Kränzlin (1995, as *Panaeolus foenicicii*).

**Panaeolus fimicola* (Pers.) Guillet
Altura, Chirivilla II, 608 m, UTM 30SYK1109. Isolated on soil, beneath *Cistus albidus*, 6 Jun 2008 (MTH 1039). — Only one basidiocarp. Spores 11–15 × 8–9.5 µm, ellipsoid with germ pore. Basidia 22–29 × 10–13 µm, 4-spored, clavate. Cheilocystidia 25–37 × 7–9 µm, lageniform. — Further information can be found in Breitenbach & Kränzlin (1995).

**Parasola hercules* (Uljé & Bas) Redhead, Vilgalys & Hopple Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Scattered to subfasciculate on soil, beneath *Cistus monspeliensis*, 7 Apr 2007 (MTH 956). — Pileus 12–19 mm in diameter when expanded. Stipe 35–62 × 0.8–1.2 mm. Spores 12–17 × 10–14 µm. — It is difficult to separate this species from *P. schroteri*. Bigger spores and smaller basidiocarps helped to identify the specimen studied. — For further information see Noordeloos *et al.* (2005, as *Coprinus hercules*).

**Parasola megasperma* (P.D. Orton) Redhead, Vilgalys & Hopple Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Isolated on soil, beneath *Cistus monspeliensis*, 7 Apr 2007 (MTH 960, 961). — Collection from MTH 960 is completely mature. Collection from MTH 961 is less mature than the previous one. Large, ellipsoid and dark brown spores allowed determining this species. — Further information can be found in Noordeloos *et al.* (2005, as *Coprinus megaspermus*).

**Psathyrella marcescibilis* (Britzelm.) Singer Altura, El Altico del Cura, 515 m, UTM 30SYK1113. Scattered on soil, beneath *Cistus monspeliensis*, 16 Apr 2007 (MTH 951). — Small collection. Collecting this species locally, it appeared to be a small *Psathyrella candolleana* collection, and this characteristic were written down at that moment. — The larger spores and different pileipellis allow separating this species from the similar *P. candolleana*. — For further information see Breitenbach & Kränzlin (1995) and Torrejón (2003).

**Ripartites tricholoma* (Alb. & Schwein.) P. Karst. Altura, Chirivilla II, 608 m, UTM 30SYK1109. Scattered on soil, beneath *Cistus albidus*, 6 Jun 2008 (MTH 1025). — Pileus 12–31 mm in diameter. Estipe 12–28 × 3–5 mm. Spores 4–6 × 3–4 µm, subglobose to broadly ellipsoid, verrucose. — Strigose stipes are an important feature to separate this species from *Ripartites metrodii*, another species occurring in the same habitat (Torrejón 2004). — There is further information about this species in Bas *et al.* (1995) and Bon (1997).

Stropharia coronilla (Bull.) Quéf.

Altura, Chirivilla II, 608 m, UTM 30SYK1109. Isolated on soil, beneath *Cistus albidus*, 6 Jun 2008 (MTH 1019).

Tricholoma terreum (Schaeff.) P. Kumm.

Altura, Chirivilla II, 608 m, UTM 30SYK1109. Scattered on soil, beneath *Cistus monspeliensis*, 4 Feb 2006 (MTH 1032).

**Tulostoma macrocephalum* Long Fig. 18 Gátova, Chervilla, 700 m, UTM 30SYK1108. Scattered on soil between mosses, beneath *Cistus monspeliensis*, 15 Apr 2007 (MTH 989). — Septate capillitium and ornamented spores allow separating the specimen studied from *T. volvulatum*, which has a volva and a capillitium but without septa and smooth spores. — Further information can be found in Calonge (1998).

Order Atheliales

**Athelia epiphylla* Pers.

Altura, Chirivilla II, 608 m, UTM 30SYK1109. On scorched wood of *Cistus monspeliensis*, 4 Feb 2006 (MTH 1035). — Further information can be found in Breitenbach & Kränzlin (1986) and Telleria & Melo (1995).

Order Boletales

**Leccinellum corsicum* (Rolland) Bresinsky & Manfr. Binder Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. Isolated on soil, beneath *Cistus monspeliensis*, 5 Jun 2008 (MTH 1020). — Further information can be found in Lannoy & Estadès (1995, as *Leccinum corsicum*).

Order Corticiales

**Vuilleminia macrospora* (Bres.) Hjortstam (= *Corticium macrosporopsis* Jülich)

Estivella-Segart, Pla del Garbí, 560 m, UTM 30SYJ2497. On bark of decaying branches of *Cistus monspeliensis*, 17 Apr 2007 (MTH 934). On decaying wood of *C. monspeliensis*, 5 Jun 2008 (MTH 1041). Altura, Chirivilla I, 545 m, UTM 30SYK1209. On bark of decaying branches of *C. monspeliensis*, 11 Apr 2007 (MTH 940, 941, 942), 23 May 2008 (MTH 935). Altura, Chirivilla II, 608 m, UTM 30SYK1109. On bark of decaying branches of *C. monspeliensis*, 11 Apr 2007 (MTH 943, 944), 29 Dec 2007 (MTH 979). Altura, Las boqueras, 670 m, UTM 30SYK0705. On decaying branches of *C. monspeliensis*, 10 Apr 2007 (MTH 964). Segorbe, La Mocha, 520 m, UTM 30SYK1307. On decaying branches of *C. monspeliensis*, 13 Apr 2007 (MTH 968, 969, 970). Gátova, Chervilla, 700 m, UTM 30SYK1108. On decaying branch of *C. monspeliensis*, 15 Apr 2007 (MTH 986). Altura, El Garabal, 600 m, UTM 30SYK1110. On decaying branch of *C. monspeliensis*, 26 Apr 2009 (MTH 1015). — Although this species is not specific with *Cistus* spp. it is very frequent in this habitat. — Further information can be found in Breitenbach & Kränzlin (1986, as *Corticium macrosporopsis*).

Order Hymenochaetales

**Hyphodontia barba-jovis* (Bull.) J. Erikss.

Altura, El Garabal, 600 m, UTM 30SYK1110. On dead wood and bark on a branch of *Cistus monspeliensis*, 20 May 2008 (MTH 936). — The shape of its leptocystidia was useful in separating it from other species of this genus. There is further information about this species in Breitenbach & Kränzlin (1986) and Jülich (1989, as *Grandinia barba-jovis*).

Order Polyporales

Antrodia ramentacea (Berk. & Broome) Donk

Altura, Chirivilla II, 608 m, UTM 30SYK1109. On scorched wood of *Cistus monspeliensis*, 4 Feb 2006 (MTH 1036). — There is further information about this

species in Ryvarden & Gilbertson (1993) and Bernicchia (2005).

Polyporus meridionalis (A. David) H. Jahn

Altura, Chirivilla I, 545 m, UTM 30SYK1209. On decaying branch of *Cistus monspeliensis*, 11 Apr 2007 (MTH 939). Altura, El Altico del Cura, 515 m, UTM 30SYK1113. On decaying branch of *C. monspeliensis*, 16 Apr 2007 (MTH 945, 946, 947, 948, 949). Altura, Las boqueras, 670 m, UTM 30SYK0705. On decaying branch of *C. monspeliensis*, 10 Apr 2007 (MTH 965). Gátova, Chervilla, 700 m, UTM 30SYK1108. On decaying branch of *C. monspeliensis*, 15 Apr 2007 (MTH 985). Altura, Chirivilla II, 608 m, UTM 30SYK1109. On decaying leaves of *C. albidus*, 4 Feb 2006 (MTH 1031). — Although this species is not specific with *Cistus* spp. it is very frequent in this habitat. — Further information can be found in Bernicchia (2005).

Order *Russulales*

**Aleurodiscus dextrinoideocerussatus* Manjón, M.N. Blanco & G. Moreno

Altura, Chirivilla II, 608 m, UTM 30SYK1109. On bark of decaying branches of *Cistus monspeliensis*, 29 Dec 2007 (MTH 980). — Dendrohyphidia dextrinoid at the apical area and bigger spores, allow separating this species from *Acanthophysium minor*. — For further information see Tellería & Melo (1995, as *Acanthophysium dextrinoideocerussatum*).

**Lactarius cistophilus* Bon & Trimbach

Altura, Las boqueras, 670 m, UTM 30SYK0705. Scattered on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 992, 993). — For further information see Basso (1999).

**Lactarius deliciosus* (L.) Gray

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 991).

**Lactarius sanguifluus* (Paulet) Fr. var. *sanguifluus*

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 994). — For further information see Basso (1999).

**Lactarius sanguifluus* var. *violaceus* (Barla) Basso

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 995). — The most important microscopic characteristic that allowed separating this specimen from *L. sanguifluus* var. *sanguifluus* was its larger cheilocystidia. — Further information can be found in Basso (1999).

**Russula cistoadelphia* M.M. Moser & Trimbach

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1007, 1008). — For further information see Sarnari (2005).

Russula monspeliensis Sarnari var. *monspeliensis*

Altura, Las boqueras, 670 m, UTM 30SYK0705. Scattered on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1003). — Further information can be found in Sarnari (1998).

**Russula monspeliensis* var. *sejuncta* (Sarnari) Sarnari

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1004, 1005, 1006). — The appendage located at the apical area of the cystidia is an important characteristic to separate this variety from *Russula monspeliensis* var. *monspeliensis*. — For further information see Sarnari (1998).

**Russula sanguinaria* (Schumach.) Rauschert

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1001).

**Russula torulosa* Bres.

Altura, Las boqueras, 670 m, UTM 30SYK0705. Isolated on soil, beneath *Cistus monspeliensis*, 13 Nov 2008 (MTH 1002).

Stereum rameale (Schwein.) Burt

Altura, El Garabal, 600 m, UTM 30SYK1110. On dead twigs of *Cistus monspeliensis*, 26 Apr 2009 (MTH 1016). — Although this sample was immature, its smaller basidiocarps and its wider skeletal hyphae, allowed separating it from *Stereum hirsutum*. — Further information can be found in Breitenbach & Kränzlin (1986, as *S. ochraceo-flavum*).

Order *Thelephorales*

**Thelephora terrestris* Ehrh.

Altura, Chirivilla II, 608 m, UTM 30SYK1109. On the base of stems of alive *Cistus monspeliensis* and *C. albidus*, 4 Feb 2006 (MTH 1029).

**Tomentellopsis pusilla* Hjortstam

Fig. 17

Altura, El Garabal, 600 m, UTM 30SYK1110. On decaying stem of *Cistus monspeliensis*, 26 Apr 2009 (MTH 1014). — Basidiocarps resupinate, sienna, fulvous sienna. Subicular and subhymenial hyphae simple-septate. Basidiospores 4.5–6.5 in frontal and lateral face, hyaline and echinulate. — Further information can be seen in Kõljalg (1996).

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