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A NEW SPECIES OF GYMNOPILUS (CORTINARIACEAE) FROM SANDY SOILS IN PINUS FORESTS

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The new species *Gymnopilus arenophilus* A. Ortega & Esteve-Rav. is described. It is characterized by its particular habitat in sandy, sometimes burned, soils of thermophilous *Pinus* forests. Macroscopically *G. arenophilus* resembles *G. penetrans*, from which it differs in the larger spores and the scarcely bitter taste. Microscopically *G. arenophilus* reminds of *G. fulgens*, with which it has probably been mistaken in the past. The latter species has very different macroscopical features, spore ornamentation and a paludicolous habitat. A discussion of European and some non-European related species is also given.

Gymnopilus arenophilus has been found in large amounts in the province of Sevilla (Spain) in the last years, during a research project carried out by one of us (A.O.) to compile and list the mycobiota of the macromycetes growing in an area close to the river Guadiamar basin. This territory suffered in April 1998 an important ecological damage, caused by a toxic mineral waste after the breaking of a mining pond (Cabezudo et al., 2003; Ortega, 2003). One of the most interesting areas of study in this territory has been the Mediterranean plant communities which develop on sandy soils, such as the thermo-mediterranean xero-psammophilous cork-oak forests (Myrto communis-Querceto suberis halimietoso halimifolii S. (Cabezudo et al., 2003)). These cork-oak forests, which always develop in acid soils, are often wide open forests, accompanied by pines (*Pinus pinea*) and evergreen oaks (*Quercus ilex* subsp. *ballota*), with the presence of 'jaras' (*Cistus* spp.) in those more degraded spots. Previous contributions to the knowledge of the mycobiota of these areas were made by Esteve-Raventós et al. (2001), Migliozzi & Ortega (2001) and Ortega & Esteve-Raventós (2003; in prep.).

Gómez-Busutil et al. (1996) studied the mycobiota of agarics which develop in sandy continental soils of *Pinus pinaster* forests in Segovia (Central Spain), and recorded a species of *Gymnopilus* P. Karst. which was identified as *G. fulgens* (J. Favre & Maire) Singer, growing on sandy soil, sometimes amongst charcoal of *Pinus* debris.

A thorough study of all these collections has confirmed their conspecificity, and also showed that the name *G. fulgens* cannot be applied to them; a scanning of the literature of *Gymnopilus* available to the authors has revealed that this new species has probably been mistaken with *G. fulgens* by some European authors. Other contributions concerning American taxa (e.g., Hesler, 1969; Singer, 1969; Dennis, 1970; Pegler & Fiard, 1983; Guzmán-Dávalos & Guzmán, 1986, 1991, 1995; Pegler, 1988; Seidl, 1989; Guzmán-Dávalos, 1994, 1995, 1996, 2003; Guzmán-Dávalos & Ovrebo, 2001) or extra-European

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taxa (e.g., Pegler, 1977, 1986; Horak, 1989; Høiland, 1998; Rees & Ye, 1999; Rees et al., 1999, 2002; Rees, 2003; Thomas et al., 2003), do not treat any species with the combination of morphological and ecological characters of *G. arenophilus*, therefore it is described here as new.

Gymnopilus arenophilus A. Ortega & Esteve-Rav., *spec. nov.* — Fig. 1a–d

Pileus 10–50 mm diam., primo conico-convexus, deinde plano-convexus ad applanatus, obtuso-umbonatus, aurantiacus deinde disco brunneo-aurantiacus, margine luteo-aurantiaco; glabrosus vel minute fibrillosus. Lamellae adnatae, flavae, ad maturitas ferrugineo-aurantiae. Stipes 20–60 mm longus, 4–7 mm crassus, cylindraceus, primo pallidus, deinde flavidus vel concoloribus, sericeo-fibrillosus, rhizomorphis albidis. Velum album vel flavidum, sericeo-fibrillosum, arachnoideum, fugax. Caro sapore subamaro.

Sporae 8.5–10.8 × 5.5–6.5 µm, Qm = 1.6, ellipsoideae, oblongae vel subamygdaliformae, verrucosae, dextrinoideae. Basidia 4-sporigera. Cheilocystidia 25–45 × 5.5–9(–11) µm, lageniformia, apice capitato vel subcapitato (4.5–6.5 µm lato). Pleurocystidia nulla.

In solis arenosis in Pineto (*P. pinaster, P. pinea*), interdum in solis adustis.

Holotypus: Hispania, Sevilla, Aznalcázar, 2.XII.2000, L. Alcoba & A. Ortega (GDA 47384).

Carpophores in groups, sometimes rather numerous. Pileus 10–50 cm in diameter, conical to conical-convex when young, soon convex to plano-convex or applanate, even subdepressed at centre in old specimens, with an obtuse and conspicuous umbo, scarcely hygrophanous, not striate, orange to chestnut-orange (Mu. 7.5 YR 5/6–8, 4/6), paler towards margin, which is yellowish-orange (2.5 Y 7/8; 10 YR 6/8, 7/8), slightly pallescent on drying; surface dry, smooth or slightly fibrillose, sometimes forming radial fibrillose adpressed flecks or squamules; margin when young with short fringe of whitish veil remnants. Lamellae moderately crowded to subdistant, L = 28–40, l = 1–2, broadly adnate to emarginate, with decurrent tooth in old specimens, 2–6 mm broad, at first pale yellow, becoming orange-yellow, in some cases with ferrugineous spots in or near the edge, with whitish or paler denticulate edge. Stipe 20–60 × 4–7 mm, cylindrical or progressively enlarged towards base, often curved, hollow with age, at first beige to buff, then becoming concolorous with pileus or paler, sometimes spotted orange-brownish with age or upon handling; surface longitudinally fibrillose with whitish veil remnants, glabrescent with age, at base white tomentose, with several small white rhizomorphs. Context pale yellow. Smell indistinct. Taste hardly bitterish.

Spores 8.5–9.6–10.6(–10.8) × 5.5–6–6.5 µm, Qm = 1.42–1.6–1.77 (n = 30), ellipsoid, oblong to subamygdaliform, with obtuse apex, slightly thick-walled, clearly warty, the warts sometimes subconnected but not crested, without suprahilar plage, quickly but moderately dextrinoid, without germ pore. Basidia 25–33(–37) × 7.5–9 µm. 4-spored, cylindrical to subclavate, with long sterigmata 3–5 µm. Lamella edge mostly homogeneous, composed of cystidia and dispersed, few basidia. Cheilocystidia 25–45 × 5.5–9(–11) µm, lageniform, mostly capitulate, capitula 4.5–6.5 µm wide, sometimes filled with yellowish content. Pleurocystidia not seen. Pileipellis an entangled and hardly gelified cutis, formed by septate hyphae 5–10 µm wide, with scarce free and cylindrical terminal cells; pigment yellow-orange, both 'zebroid' encrusting and parietal; subcutis formed by less pigmented hyphae, –20 µm wide. Lamella trama formed by parallel, 4–13 µm wide hyphae, with yellowish pigment. Pileocystidia not seen. Caulocystidia not seen. Clamp-connections present at all septa.

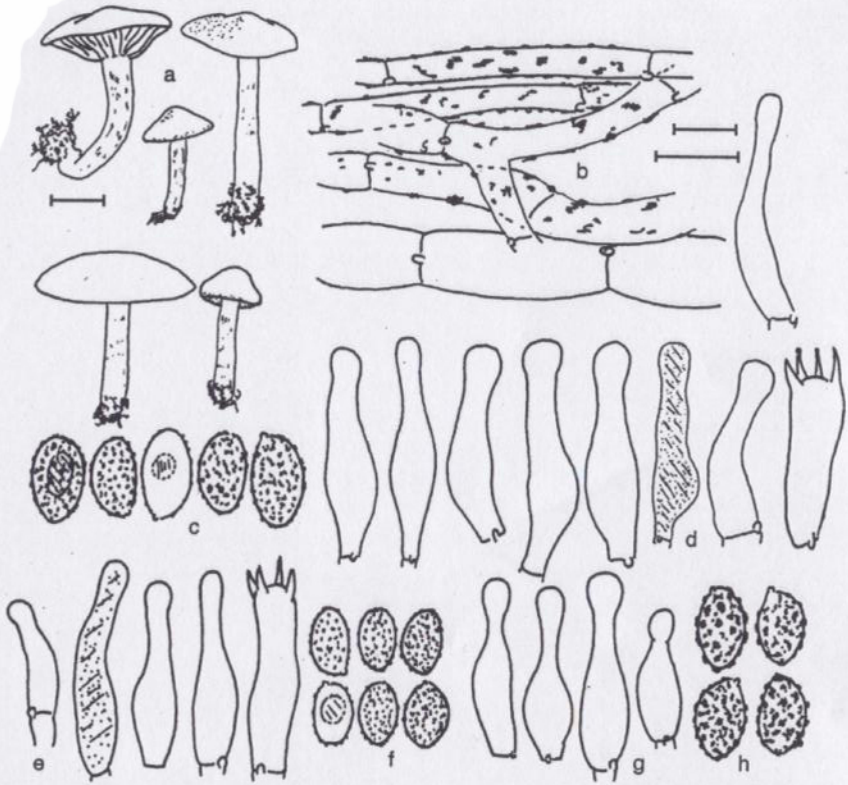

Fig. 1. *Gymnopilus arenophilus* (Holotype). a. Fruit-bodies; b. pileipellis; c. spores; d. cheilocystidia and one basidium. — *Gymnopilus penetrans* (AH 19899). e. Cheilo-, pleurocystidia and one basidium; f. spores. — *Gymnopilus fulgens* (AH 30751). g. Cheilocystidia; h. spores. Scale bars: 1 cm for fruit-bodies, 10 μm for microscopical characters (small bar), except spores (large bar).

Habitat & distribution — Gregarious, humicolous, saprotrophic, on sandy soil of thermophilous *Pinus* forests (*P. pinea*, *P. pinaster*), sometimes attached to woody chips buried in the sand, or in some cases to charcoal and burned woody debris; known from acid soils up to now.

Material studied. SPAIN: Segovia, Sebúlcor, pinar de Sebúlcor, 2.XI.1994, *M. Heykoop & S. Gómez Busutil* (AH 19157); Sevilla, Aznalcázar, pinar de Aznalcázar, 2.XII.2000, *L. Alcoba & A. Ortega* (GDA 47384; holotype, isotype in AH 30900); idem (GDA 47385, GDA 47386); ibidem, 19.I.2001 (GDA 47387); ibidem, 20.XI.2002 (GDA 47388); Sevilla, El Madroño, 29.X.2002, *L. Alcoba & A. Ortega* (AH 30901).

Comparative material examined.

Gymnopilus penetrans (Bull.) Murrill. SPAIN: Avila, Casavieja, 26.XI.1995, on woody debris of *Pinus pinaster*, *M. Villarreal* (AH 19989).

Gymnopilus fulgens (J. Favre & Maire) Singer. SPAIN: Guadalajara, Aldeanueva de Atienza, near river Pelagallinas, 6.IX.2003, among *Sphagnum* and other mosses, in peaty soil in *Pinus sylvestris* forests, *F. Esteve-Raventós* (AH 30751).

The most important diagnostic characters of this new species are its large spores and arenicolous, subcarbonicolous habitat. There are not many species of *Gymnopilus* reaching the spore measurements of *G. arenophilus* in Europe, especially in those devoid of a membranous annulus (subgenus *Gymnopilus*, according to Hesler, 1969 and Bon & Roux, 2002). In a recent classification of *Gymnopilus* proposed by Guzmán-Dávalos & Guzmán (1995), *G. arenophilus* would have to be included within section *Macrospori* Guzm.-Dáv. (species with spores 8–11(–12) µm in length).

However, according to its macroscopical characters, *G. arenophilus* resembles *G. penetrans* (Fr.) Murrill sensu lato (incl. *G. sapineus* (Fr.) Maire and *G. hybridus* (Bull.) Maire, see Høiland (1990)); in fact, both species may share the brown-ferruginous spots on the lamellae, and show similar colours, pileus surface and habit. *Gymnopilus penetrans*, however, is strictly lignicolous, normally fructifying on conifers logs or wood chips, its taste is strongly bitter and the spores are much smaller, measuring 7–8.5(–9) × 4.5–5.5 µm (Fig. 1f). Also, pleurocystidia are commonly present in *G. penetrans* complex (Robich, 1989), whereas they seem to be absent in the new species.

Some European authors, e.g. Bon & Chevassut (1989), have probably described *G. arenophilus* previously under the name *G. fulgens*; the description given of *G. fulgens* by these authors fits perfectly *G. arenophilus*: the spores are large, no pleurocystidia have been observed, the habitat agrees and the taste is said to be slightly bitter. In the same way, Gómez-Busutil et al. (1996) misidentified *G. arenophilus* with *G. fulgens*, owing to the large spores which did not fit within the range of *G. penetrans*. According to the recent monographical study of Bon & Roux (2002), *G. fulgens* is considered a strictly hygrophilous species, bound to peat bogs (which is the original sense of Favre & Maire, 1937); however, in the past, *G. fulgens* has also been considered an arenicolous or carbonicolous taxon, found in dunes or burned soils (Orton in Watling & Gregory, 1993). In fact, a comparison of spore ornamentation of Spanish collections of *G. arenophilus* and *G. fulgens*, has revealed important differences, as *G. fulgens* shows spores with rather coarse and prominent warts, partially connected forming crests (Fig. 1h), whereas in *G. arenophilus* the warts are lower, not so coarse and hardly connected (Fig. 1c).

Romagnesi (1976, 1979) described some new species collected in southern Europe; among these, *G. pseudofulgens* was described as a carbonicolus taxon with long amygdaliform spores (9–11 × 5–5.5 µm), showing a hilar plage and a *Galerina*-like habit. *Gymnopilus spadiceus* has large spores (8–10 × 4.5–6.5 µm), stout basidiomata (2.5–8 cm in pileus diameter), a squamose, dark brown-chestnut pileus, and capitula of cystidia rather wide (5–8 µm).

Moreno (1980) described *G. fulgens* var. *luteicystis* based on the yellow contents of cystidia; this character is rather variable in many species of this genus and seems to lack any taxonomical significance; in his description the spores are said to be amygdaliform, 7–8.5 × 4–5 µm, cystidia not capitate and the carpophores are fasciculate.

Growing on sandy soils in North America, *G. arenicola* Hesler differs from *G. arenophilus* in the smaller spores (7–8 × 3.5–4.5 µm), absence of veil, presence of pleurocystidia and mild taste (Hesler, 1969). Another species with rather large spores, size 7.2–9.6(–10.4) × 5.6–7.2 µm, was described from Mexico by Guzmán-Dávalos (1995) as *G. subfulgens*; it is also characterized by the strongly verrucose, widely ellipsoid to subglobose spores, reddish orange-brown pileus, and lignicolous habitat, characters that strongly differ from those of *G. arenophilus*.

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