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# *Inocybe diabolica*, a new agaric from subarctic regions

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**Summary.** A new species of *Inocybe* (Fr.) Fr. (Cortinariaceae, Agaricales), viz. *I. diabolica*, is described and illustrated, and its distribution is mapped. It has been so far found in Finland, Sweden, Norway and Canada, nearly always close to the timberline. The species belongs to sect. Splendentes.

**KEY WORDS:** Agaricales, Basidiomycetes, Fennoscandia, *Inocybe diabolica*, taxonomy.

## Introduction

Several alpine species of *Inocybe* have been described from the Alps (Favre 1955, Horak 1987, Kühner 1988). Further, Lange (1957) and Kobayasi & al. (1971) described some species from Greenland. In Fennoscandia, no truly alpine *Inocybe* species has been published as a new taxon. However, two recently described species of this genus show a northern distribution pattern, and occasionally have been above the timberline (Jacobsson & Vauras 1990, Vauras 1994).

During my field work in Finnish Lapland and Southern Norway (Dovre Mountains), an unidentified *Inocybe* with fairly variable spores was found. When I checked the bulk of *Inocybe* specimens in the Finnish herbaria (H, KUO, OULU and TUR), the material filed as *Inocybe* sp. and *I. hirtella* in O, and the material of *Inocybe* sp. from northern Sweden in S and UPS (Holmgren et al. 1990), I could locate a few more collections of the present species, which is described here as *Inocybe diabolica* Vauras.

## Material and methods

Microscopical characters were examined with the microscope Leitz Laborlux D at the magnifications up to 1250, and drawn with the Leitz drawing tube. The measurements and drawings were made from dried material mounted in 10% NH<sub>4</sub>OH. The spore dimensions were obtained by measuring from 7 collections, 20 or 40 spores each. In presenting the variation of spores and pleurocystidia, 5% of the measurements from each end of the range are in parentheses. The colours of fresh fruit bodies were compared with those of Cailleux (1981). The soil sample was collected from humus layer to a depth of 10 cm and analysed by Soil Analysis Service Ltd. (Finland).

## Description

*Inocybe diabolica* Vauras, sp. n.

Figs. 1–5

Pileus 4–24 mm latus, obtuso-umbonatus, flavido-castaneo-brunneus, aurantio-brunneus vel brunneus, villosulo-fibrillosus vel fibrilloso-squamulosus. Lamellae usque ad 5 mm latae, adnatae, pallide griseae, deinde flavido-brunneo-griseae, subbrunneae vel subgriseo-flavido-brunneae. Stipes 10–30 mm longus, 1.2–4 mm crassus, aequalis vel bulbosus, haud marginatus, pallide subbrunneo-flavidus vel subcastaneo-brunneus, ad basim albus, omnino pruinosis, longitudinaliter striatus. Cortina deest. Odor indistinctus. Sporae (9.5–)10–15(–17)×(6.5–)7–9(–10) μm, Q = (1.2–)1.3–1.85(–2.1), laeves, variiformes et polymorphicae, praecipue amygdaliformes, plerumque apice papillato, interdum indistincte undulatae. Pleurocystidia (52–)66–91(–100)×(13–)16–28(–34) μm, ventricosa, tunica crassissima instructa. Caulocystidia descendentes ad basem stipitis. Finlandia. In zona alpina et subalpina, cum Salicibus Betulisque. Holotypus TURA 3164.

Pileus 0.4–2.4 cm in diam, 0.3–1 cm high, campanulate to hemisphaerical when young, becoming expanded with broad umbo, margin broadly rounded, rarely straight; colour pale yellowish chesnut brown, orange-brown (Cailleux 57P), brown (49P), disc occasionally paler (50N), smooth to subtomentose, on age sometimes slightly breaking up, outwards woolly-fibrillose to fibrillose-sub-squamulose, finally even recurvately squamulose-squarrose, margin occasionally rimulose and breaking up, rarely appendiculate; velipellis absent. Lamellae normally crowded, up to 5 mm broad, ventricose, narrowly adnate, pale grey when young, then yellow-brownish grey, pale brown (70M) to pale greyish yellow-brown (67N); edge fimbriate, pale or concolorous, occasionally brown at pileus margin. Stipe 10–30 mm long, 1.2–4 mm wide, equal to bulbous, but never marginately bulbous, pale yellow with brownish tint (91K) to pale chestnut-brown (69M), base white; longitudinally striate, totally white-pruinose, at base finely white-felted to white-fibrillose. Cortina lacking. Context in pileus and stipe white to pale brown-yellow to pale yellow-brown. Colour not changing when cut. Smell indistinct.

Spores (9.5–)10–15(–17)×(6.5–)7–9(–10) μm, total range of mean values 11.3–13.5×7.2–8.2 μm,  $\bar{x}$  = 12.3×7.9 μm (7 collections, 200 spores), Q = (1.2–)1.3–1.85(–2.1), Q = 1.44–1.72, the average for 7 collections being 1.56; smooth, variable, mostly amygdaliform and with apical papilla, often broadly ellipsoid, occasionally irregular in outline, fairly thick-walled. Basidia 29–47×11–14 μm, clavate, 4-spored. Pleurocystidia (52–)66–91(–100)×(13–)16–28(–34) μm,  $\bar{x}$  = 77×22 μm (7 collections, 60 pleurocystidia), ventricose with obtuse apex, base with pedicel, wall up to 5 μm thick, pale yellow; mostly crystalliferous at apex; frequent. Cheilocystidia more variable than pleurocystidia, often totally brown, frequent. Paracystidia cylindrical to pyriform, thin-walled, colourless to yellow-brown, rather frequent. Caulocystidia occurring down to base of



Fig. 1. *Inocybe diabolica*, photographed in situ. Part of type ( $\times 1.3$ ).

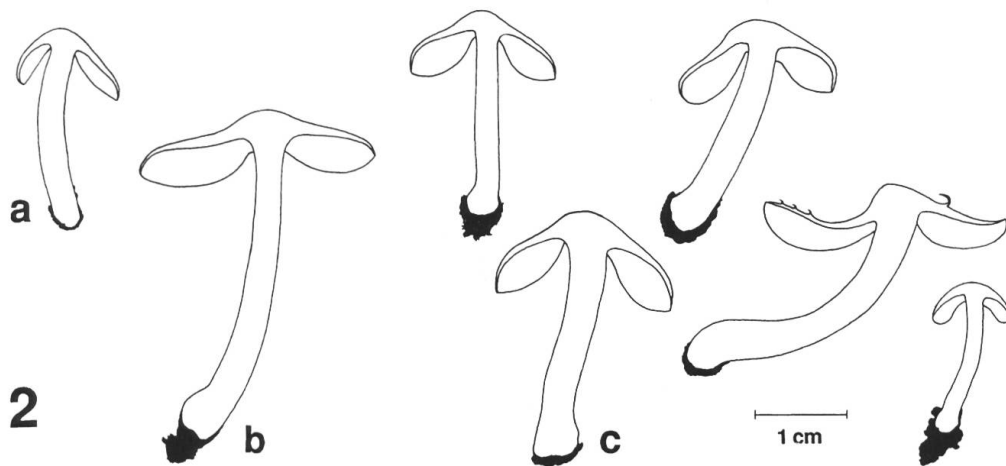
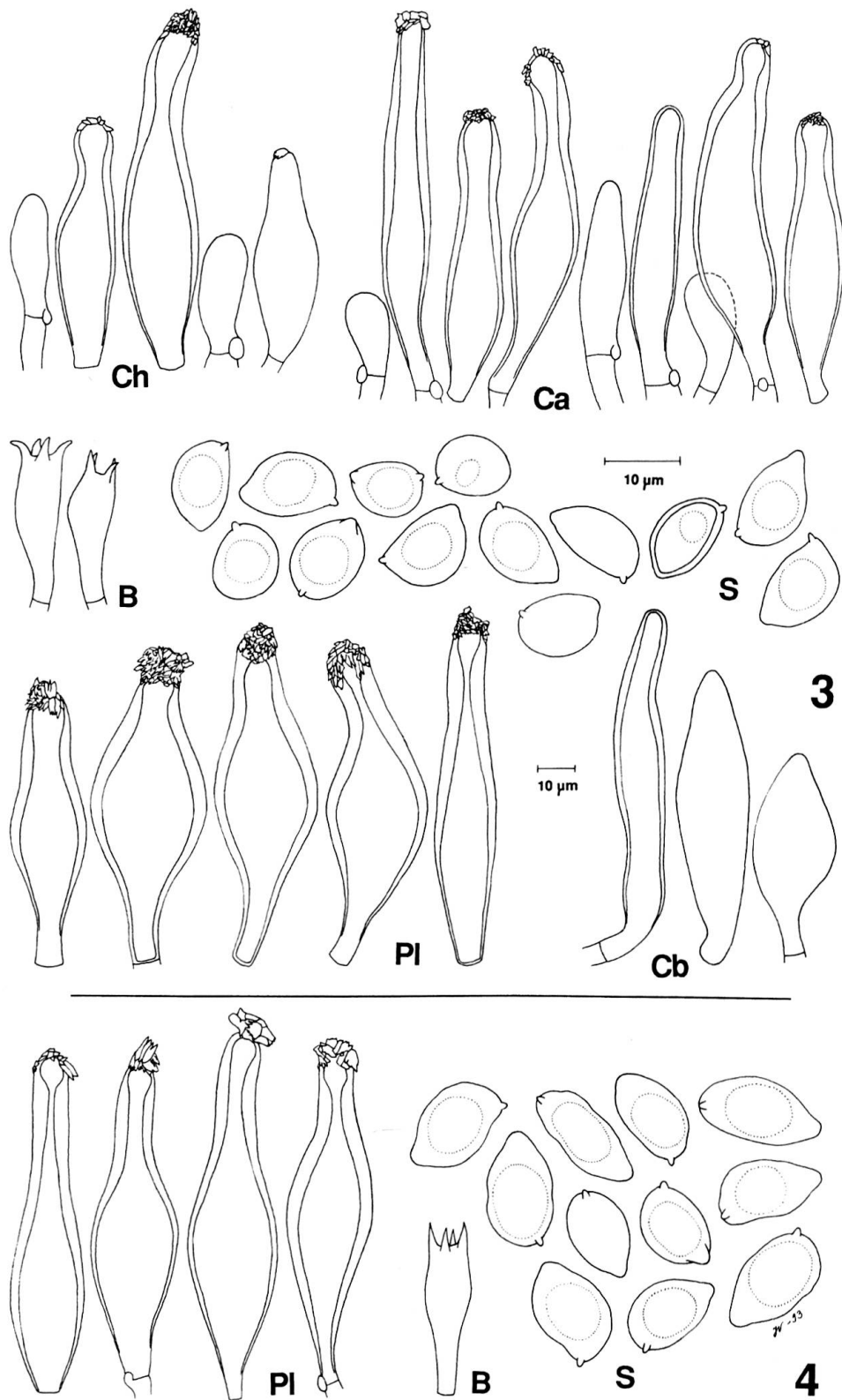


Fig. 2. Fruitbodies of *Inocybe diabolica* ( $\times 1$ ): a. from Vauras, 4721F. – b. from Vauras 5992. – c. from the type.



Figs. 3–4. Microscopical details of *Inocybe diabolica* (Fig. 3 from type, Fig. 4 from Vauras 4721F). Abbreviations: B = basidia, Ca = caulocystidia and cauloparacystidia at apex of stipe, Cb = caulocystidia and cauloparacystidia at base of stipe, Ch = Cheilocystidia and paracystidia, PI = pleurocystidia, S = spores. – Scales: spores  $\times 1000$ , other characters  $\times 500$ .

stipe, upto 117  $\mu\text{m}$  long, on upper part frequent, partly similar to pleurocystidia, but more irregular and wall up to 4  $\mu\text{m}$  thick, mixed with numerous thin-walled cauloparacystidia; on lower third more scarce. Cap cuticle composed of hyphae 4–31  $\mu\text{m}$  in diam, with yellow-brown, incrustated walls.

Holotype: NORWAY: Oppland, Dovre, ca. 1.5 km SW of the boundary of Sor-Trondelag, NNW of the mountain Hjerkinnhø, between the main road and the river Svaani, near the river. Moist depression, on humus on gravel soil, near *Betula pubescens* subsp. *czerepanovii* (Orlova) Hämet-Ahti, *Betula nana* L. and *Salix* spp., alt. 985 m, 10.8.1991, J. Vauras 5712F (TURA 3164; isotypi in H, L, MICH, O, S, TAA, TUR).

Paratypes. – CANADA: Quebec, Fort Chimo area, Stewart Lake, at the sea-plane base, 58°08' N, 68°27' W, 25.7.1967, Y. Mäkinen (TUR). – FINLAND: Sompion Lappi, Sodankylä Kitinen, Peurasuvanto, 15.8.1978, J. Issakainen (H); Enontekiön Lappi, Enontekiö, Kilpisjärvi, Malla Strict Nature Reserve, 9.8.1986, J. Vauras 5992 (TURA), 11.8.1990 J. Vauras, 4721F (TURA). – NORWAY: Buskerud, Nes, Nystølen-Mortentjernvollen, 16.9.1955, J. Stordal 10052 (O). – SWEDEN: Torne Lappmark, Jukkasjärvi, Vassitjokko, 15.8.1909, L. Romell (S).

Ecology, distribution, phenology. – Most collections of *Inocybe diabolica* have been made in localities characterized by calcareous bedrock close to the timberline in open subarctic birch belt or above it. The growing sites are fairly to very moist. The type site of *I. diabolica* is at a riverside, which is inundated in early summer.

*Inocybe diabolica* shares the locality with e. g. *I. lacera* var. *helobia* Kuyper. Surface soil characteristics at the type site were as follows: pH 6.5, Ca 1200 mg/l, K less than 20 mg/l, Mg 70 mg/l and P 0.3 mg/l.

In Finnish Lapland, Kilpisjärvi area, Malla Strict Nature Reserve, the species has been collected at two sites. Both of them are on the NE slope of the Pikku-Malla mountain. One is oroarctic site above the timberline, under a precipice, with dripping nutrient-rich water and characterized by *Salix reticulata* L. The other site is in orohemiarctic mountain birch belt, in eutrophic fen close to *Betula pubescens* subsp. *czerepanovii* and *Salix* spp. At the last mentioned site it was found together with another unknown *Inocybe* species, elsewhere described as *I. hirculus* (Vauras, 1994). A number of interesting species of macrofungi are reported from Kilpisjärvi area by Bendiksen & Bendiksen (1993).

*Inocybe diabolica* is known from Canada, Finland, Norway and Sweden. In Fennoscandia its main distribution area is the mountain range of the Scandes (Fig. 5). No Finnish specimens could be identified in TUR, where there is an abundant material of *Inocybe* collected in northern Finland, Utsjoki area, which is poor in lime and other basic materials. *I. diabolica* is clearly a rare and demanding species, preferring calcareous soil and growing mainly at timberline localities.

According to the present material, the fruiting season of *I. diabolica* starts in late July, reaching a maximum in mid-August, and ceases in mid-September.

### Discussion

Microscopically *Inocybe diabolica* is easily recognized by the large variable spores, mainly with apical papilla, and by the long, thick-walled pleurocystidia. Macroscopically the species can easily be taken for a representative of the sect. *Marginatae* Kühner, because part of the spores can be subangular and with an large apical papilla (Fig. 4). However, because the majority of spores are smooth, the species is better placed in the sect. *Splendentes* Singer. It is a good example of an intermediate species, which is not always easy to classify as smooth- or angular-spored. Because of this and the variability of the spores, the epithet "*diabolica*" was chosen for the species.

Another taxon of *Inocybe*, showing even greater variability of spores than *I. diabolica*, is *I. lacera* var. *heterosperma* Grund & Stuntz (1977). It is fairly common in Nordic countries. Four collections of a taxon recorded as *Inocybe hirtella* Bres. from mountains of southern Norway (Gulden & Lange 1971) very likely refer to *I. diabolica*.

*Inocybe hirtella* is represented in Fennoscandia by two varieties, viz. var. *hirtella* and var. *bispora* Kuyper, both growing on calcareous soil. The species has been reported even from northern Norway, Nordland (Brandrud & Bendiksen 1984). I have checked this specimen, deposited in O, and it actually belongs to var. *hirtella*. This taxon is easily distinguished by the smell of bitter almonds and by the fairly short pleurocystidia. *Inocybe muricellata* Bres. differs from *I. diabolica* in possessing pleurocystidia with bright yellow walls and smaller (especially narrower) spores. *I. muricellata* grows in Fennoscandia up to Lapland (Kilpisjärvi area), which is situated in the orohemiarctic mountain birch belt (collections deposited in TURA).

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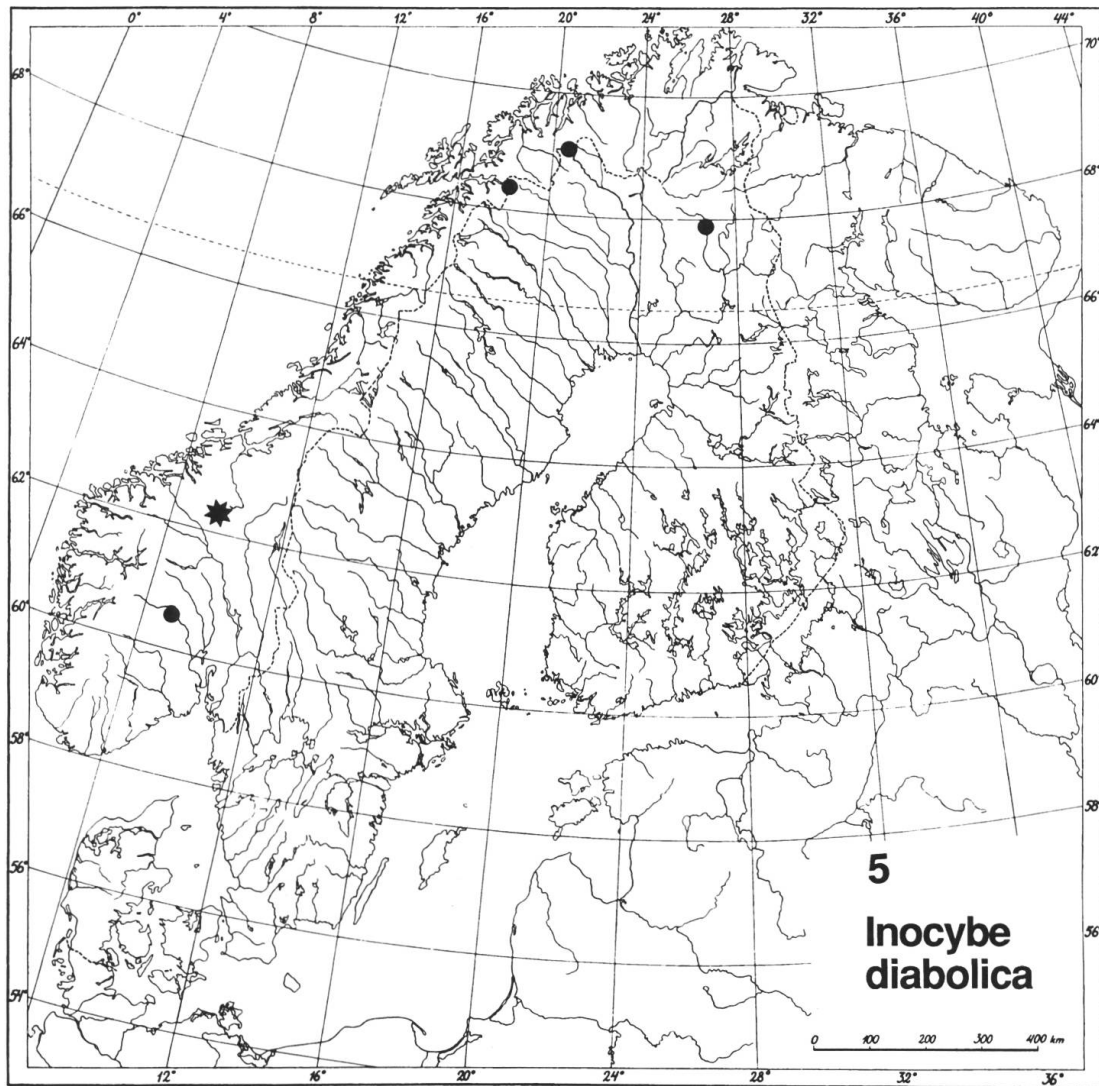


Fig. 5. Distribution of *Inocybe diabolica* in Fennoscandia, according to the specimens examined. The asterisk indicates the type locality.



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