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Cortinarius pinophilus Soop in the Pacific Northwest of North America

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Abstract: *Cortinarius pinophilus* is reported from western Washington and northwestern British Columbia. In Fennoscandia it occurs with *Pinus sylvestris*, however, in the Pacific Northwest the host trees are more diverse and include *Pinus contorta*, *Tsuga heterophylla*, and *Pseudotsuga menziesii*. A description of North American material is presented.

Key words: Agaricales, Cortinariaceae, *Cortinarius*, boreal

Introduction: *Cortinarius pinophilus* is documented from Washington State at Shadow Lake Bog near Renton, and near Deer Park, in Olympic National Park. In British Columbia it was collected in forests near Hazelton and Smithers. The morphology and coloration of the

basidiomata together with the microscopic characteristics make *C. pinophilus* difficult to place in traditional taxonomic schemes. The coloration of the basidiomata would place it in the stirps *Rapaceus* (Moser 1986), but microscopic characteristics do not agree well

with other species in this group. Soop (1993) and Niskanen et al. 2008 placed *C. pinophilus* in subgenus *Phlegmacium*. Soop (1993) discussed a possible relationship of *C. pinophilus* with species in the section *Callistei* due to its fluorescence, dry cuticle, and yellow tints. In Harrower et al. (2011) it is sister to the Ochroleuci clade which contain *Cortinarius vibratilis* (Fr.:Fr.) Fr. and its relatives.

Materials and Methods: Fresh basidiomata were used for the morphological description. Macrochemical reactions with 40% KOH were done by placing a drop of the solution directly on the pileus and stipe surfaces and context of fresh and dried specimens, and then observing the color change. Microscopic examinations were made from fresh and dried basidiomata mounted in 3% KOH. Mature basidiospores deposited on the stipe apex and veil hyphae were measured in 3% KOH. GenBank accessions for sequenced specimens follow the collection numbers.

Results: *Cortinarius pinophilus* is described and illustrated below.

Cortinarius pinophilus Soop, *Agarica* 12 (no.21): 114 (1993)
Fig. 1-7

Pileus 20–70 mm diam., rounded to convex, obtusely convex to plane or somewhat uplifted, disc even to flattened or slightly depressed, margin incurved to decurved or straight to uplifted, surface dry to moist or slightly viscid to sublubricous, not hygrophanous, not striate, smooth, margin innately streaked, sometimes white silky fibrillose at edge from veil, often with a ± persistent whitish to pallid bloom or pale sheen, color pallid buff, whitish tan, honey color to tawny ochraceous, developing light yellow ochre to orange yellow colors with age, becoming light orange buff brown to orange ochraceous tawny, usually darker in the center, somewhat brittle and fragile. *Context* of the pileus relatively

thick, 8–10 mm at disc, very thin in outer margin, solid in pileus and stipe or somewhat stuffed in lower stipe, sometimes pale lilac in stipe apex at first, in base of stipe white, otherwise context whitish to pallid buff with orange buff brown to light clay color areas, developing orangish discolorations in age. *Lamellae* adnate to adnexed with a decurrent line, edges even to eroded, somewhat crowded to close or subdistant, at first slightly pinkish lilac to creamy white, pale cream color to whitish buff or pallid, developing grayish brown to brownish colors, then becoming ochraceous buff to light yellow ochre or orange brown in age from spores. *Stipe* 40–110 mm long, above 5–13 mm thick, base 10–19 mm thick, slightly clavate, subbulbous or ± equal, sometimes tapered or twisted at base, surface silky to innately fibrillose, covered with longitudinal veil fibrils at times, moist to dry, color white to creamy white to cream color or honey-buff, apex sometimes with a slight lilac tint, below soon discolored clay color, orange buff brown, brown or carrot orange; veil white, thin, leaving slight remnants or a zone of fibrils near apex; with small, white strands at base.

Taste mild or slightly sour. *Odor* slightly cheese-like (Brie), yeasty or not distinctive.

Color of Exsiccatae - Pileus ochraceous brown, lamellae brown, and stipe concolorous with the pileus, or sometimes somewhat more bright yellowish brown, towards the base becoming pale yellowish to cream whitish.

Chemical Reactions - KOH 40% : fresh specimens - blackish on pileus surface, dull yellow to yellow-brown on pileus context, yellow brown to orange brown on stipe context; dried specimens - brown on pileus surface and context, on surface of stipe base bright yellowish becoming yellowish orange.

Basidiospores 8.0–10 (-12) x (5-) 5.5–6.0 (-6.5) µm, shape variable, usually ellipsoid but some broadly ellipsoid or somewhat amygdaloid, slightly to moderately verruculose, some more

coarsely verruculose on apex; nondextrinoid to slightly dextrinoid, some collapsing in Meltzer's mounts. *Lamella edges* fertile. *Pileipellis duplex*: surface (viscid) layer thin, hyphae cylindrical, hyaline to yellowish, 2–4 µm wide; *epicutis* poorly developed, hyphae mostly (3–) 4–8 µm wide, radially arranged, ± interwoven, narrow cylindrical to somewhat enlarged, even to uneven in outline, colorless to mostly bright yellowish, occasionally encrusted; *hypocutis* well developed, hyphae interwoven to ± radially arranged, up to 25 µm wide, enlarged to inflated or cylindrical, yellowish brown to mostly brownish, walls colorless to yellowish brown, often refractive, some encrusted, yellowish interhyphal pigment deposits present in some places. Clamp connections present.

Habit and Habitat - Gregarious to scattered in forest with *Tsuga heterophylla* and *Pseudotsuga menziesii* or *Tsuga heterophylla* and/or *Pinus contorta*.

Phenology - Basidiomata appearing from September to mid-November.

Specimens examined - **Canada.** British Columbia. Hazelton (55.15N, 127.4W), SMI 153 (GenBank FJ157123), 9-06-2003 (UBC); Smithers Community Forest (54.40N, 127.16W), SMI-MB05 (GenBank F16494), 09-01-2007 (UBC). **USA.** Washington. King County. Shadow Lake Bog (47.4054N, -122.0860W): JFA 13149 and JFA13150, 10-17-2007 (WTU); SLB2001- 11-10-30; SLB2003-11-02-13; SLB2003-11-09-06; SLB2003-11-16-02, Coll.; SLB2004-10-31-11 (GenBank EU660944), SLB2004-10-31-19 (GenBank EU660943); SLB2005-10-30-24 (GenBank EU660942) (all WTU); Olympic National Park, Road to Deer Park (47°59'N 123°19'E), 07-450, H7001087 (H).

Discussion - In Europe, *Cortinarius pinophilus* occurs with *Pinus sylvestris* with *Cladonia* on calcareous sites and frequently in sandy soils. It

also is often found on non-calcareous rich soils (K, Soop, pers. comm.) At Shadow Lake Bog, it was locally abundant with *Tsuga heterophylla* in deep moss and hummocks (but not with *Sphagnum*) or in needle duff, near areas with *Vaccinium parvifolium* and *Ledum groenlandicum*. In Olympic National Park it occurs in mixed conifer forests with *Tsuga heterophylla*, *Pseudotsuga menziesii* and *Thuja plicata*. While in northwest British Columbia it occurs on oligotrophic xeric to submesic sites in the Interior Cedar-Hemlock zone and the Sub-Boreal Spruce zone (temperate to boreal forests). Tree hosts on these *Cortinarius pinophilus* sites include *Pinus contorta* and *Tsuga heterophylla*. It was commonly found in immature to old growth stands (60 to 225 years), but not in the youngest stands (20-45 years old), and can be frequent and quite abundant on poorer sites in mature forests (Kranabetter et al. 2009, pers. comm., M. Kranabetter, March 1, 2010).

Cortinarius pinophilus can be distinguished macroscopically from other *Phlegmacia* by its relatively slender habit and by its coloration, and microscopically by the *duplex pileipellis* (Garnica et al. 2005) with a distinctive hypocutis and a thin gelatinous surface layer above the epicutis. North American collections show some variation in basidiospore size and shape, as well as stipe shape, while the remaining characteristics are fairly consistent with those of European specimens. The basidiospores of our specimens are not, or only slightly dextrinoid; and some spores collapse in Meltzer's mounts. Soop (1993) in his comparison of *C. pinophilus* with *C. leucophanes* P. Karsten, did not report lilac color in the lamellae of *C. pinophilus*. However, we observed young specimens with distinct lilac coloration in the stipe apex and also the fresh young lamellae often have pinkish lilac tones.

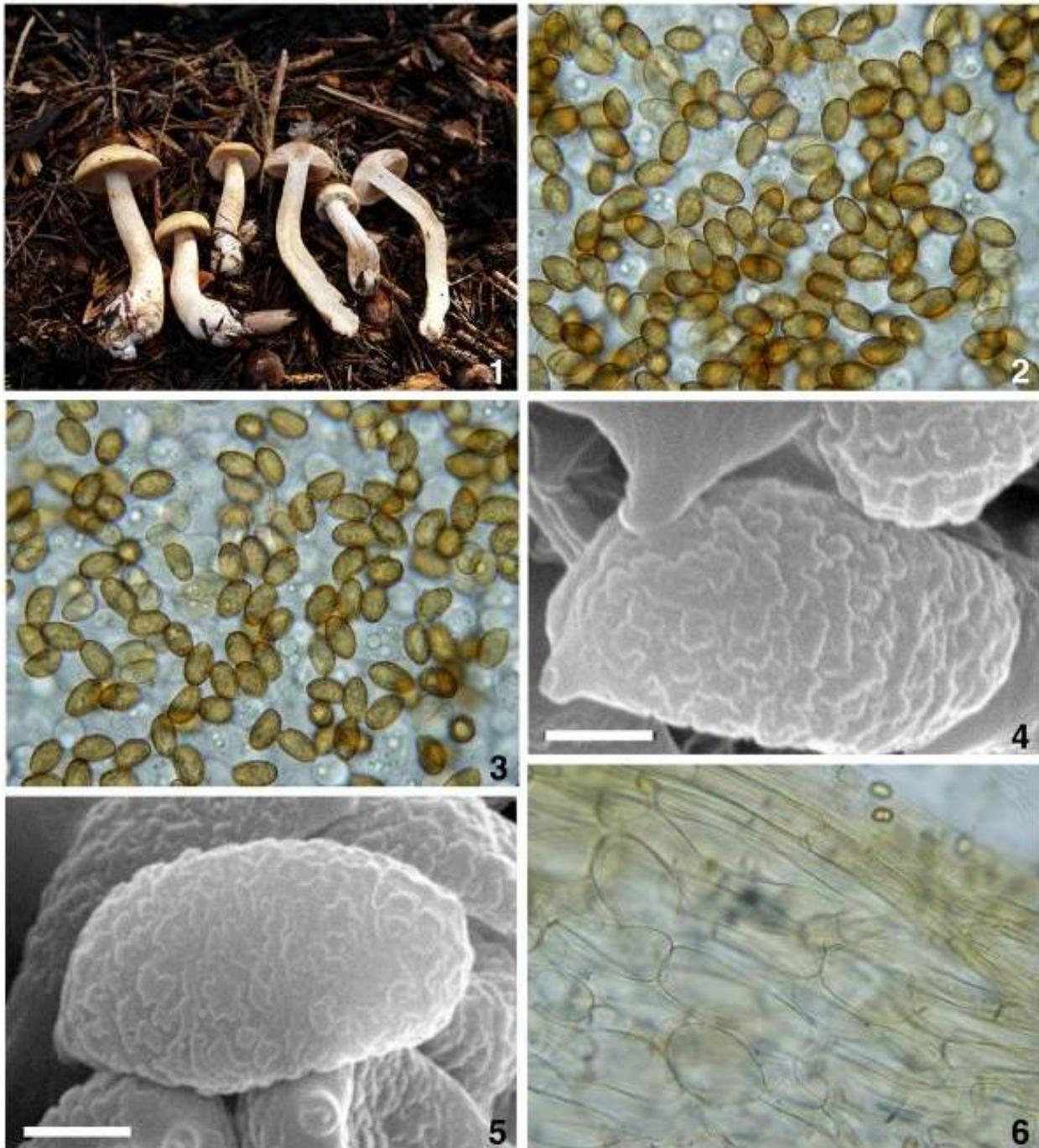
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Shadow Lake Bog led to the original discovery of *C. pinophilus* in western Washington. Access to Olympic National Park provided the opportunity to record this species from the Deer Park area. SEM photos of basidiospores were provided by S. Garnica, Universität Tübingen. We thank Jodi Friesen, Ecological Consulting, Hazelton, BC Canada for providing a photo of *C. pinophilus* and J. Marty Kranabetter, Soil Scientist, Coastal Forest Region, Research Branch Lab, Victoria, Canada for providing data and information for the manuscript.

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Figs. 1–6. Fig. 1. Basidiomata, JFA 13149. Figs. 2–3 Basidiospores of *C. pinophilus* JFA 13149 as seen in light microscope. Figs. 4–5. Basidiospores of SLB 2004-10-31-194 and as seen in scanning electron microscope. Fig. 6. Pileipellis structure (epicutis and hypocutis) Scale bars = 2 μ m.



Figure 7. Basidiomata of *C. pinophilus* SMI –MB05 (photo by Jodi Friesen)