
NEWSCORNER

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A manual of concise descriptions of North American ectomycorrhizae

The CDE manual had its genesis in a workshop on describing ectomycorrhizae at the 9th North American Conference on Mycorrhizae in Guelph, Ontario, in 1993. Following the workshop, a poll by D.M. Durall found extensive international opinion supporting the development of a concise, standard set of ectomycorrhizal characters, and a standard system for storing ectomycorrhizal descriptions. At a May 1995 workshop at Mesachie Lake, B.C., researchers from western North America began to develop an illustrated manual of morphological and molecular descriptions. It was designed to grow by contributions from various researchers and to have a format which is affordable and easy to use in the lab.

The first edition and folios 1 and 2 were published in 1996. A third folio, of five descriptions, was published in 1997. Over the next several years, the editors plan to publish five more folios, to reach a total of 40 descriptions.

Each description includes a photographic plate of morphology (dissection microscope) *presented in colour in the manual*, a black and white plate of anatomy (compound microscope), and a two-page written description (see sample description). To date, 15 ectomycorrhizae of mature trees of Douglas-fir, western hemlock and Engelmann spruce have been described by researchers in four laboratories in western North America.

The first fifteen descriptions (folios 1–3):

Amphinema byssoides-like + *Picea engelmannii* (CDE6) by M. Harniman and D.M. Durall

Cenococcum geophilum + *Picea engelmannii* (CDE10) by M. Harniman and D.M. Durall

Lactarius rubrilacteus + *Pseudotsuga menziesii* (CDE15) by J. Eberhart and D.L. Luoma

Lactarius scrobiculatus + *Tsuga heterophylla* (CDE11) by G. Kernaghan and S.M. Berch

Piloderma fallax + *Pseudotsuga menziesii* (CDE1) by D.M. Goodman and J.A. Trofymow

Rhizopogon vinicolor-like + *Pseudotsuga menziesii* (CDE7) by D.M. Goodman

Russula-like + *Tsuga heterophylla* (CDE13) by D.M. Goodman

Tomentella-like + *Pseudotsuga menziesii* (CDE2) by D.M. Goodman

Truncocolumella citrina + *Pseudotsuga menziesii* (CDE9) by J. Eberhart and D.L. Luoma

unidentified + *P. menziesii* or *T.heterophylla* (CDE3–5,8,12,14) by D.M. Goodman

To accompany the manual, we plan to create an on-line electronic database and synoptic key. This combination will be invaluable to taxonomists as well as those doing practical studies who need to distinguish or identify ectomycorrhizae. A first version of a data entry form has been created which can be used both for creating descriptions and for querying a database. It is included in the British Columbia Ectomycorrhizal Research Network (BCERN) web site at <http://www.pfc.cfs.nrcan.gc.ca/ecosystem/ectoweb/>. The BCERN site includes an on-line version of the manual, a newsletter about ectomycorrhizal research in B.C., and other information about CDE descriptions.

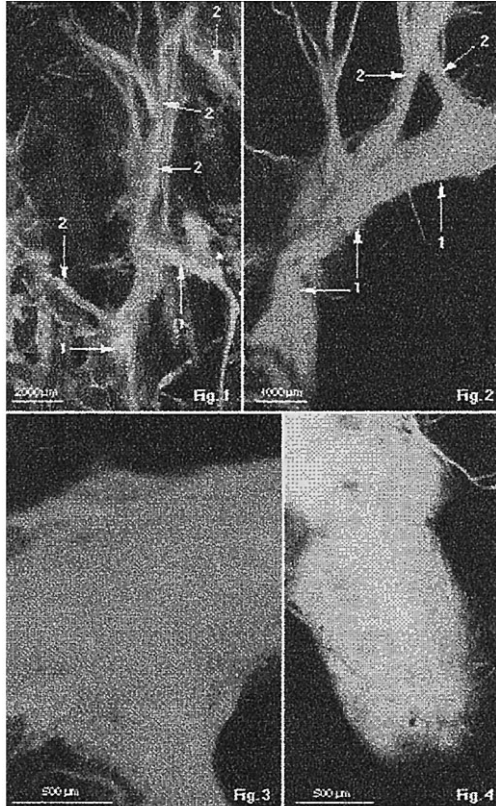
Introductory sections

Sections 1–9 provide information on how to prepare descriptions of ectomycorrhizae:

1. The aims of the manual
2. How to store, clean and photograph ectomycorrhizae and prepare voucher material
- 3A. How to describe the morphology and anatomy of ectomycorrhizae
- 3B. The rationale for examination of RFLP patterns and DNA sequences
- 3C. The recommended protocol for generation of RFLP and sequence data

***Piloderma fallax* (Libert) Stalpers**+ *Pseudotsuga menziesii* (Mirb.) Franco

CDE1



1. Mycorrhizae (arrows 1) and mycelial strands (arrows 2) in decayed wood. 2. Mycorrhizae (arrows 1) and mycelial strands (arrows 2). 3. Mycorrhiza with attached strand. 4. White variant.

CDE1.1 1996

***Piloderma fallax* (Libert) Stalpers**

(Stereales, Atheliales)

+ *Pseudotsuga menziesii* (Mirb.) Franco

CDE1

DISTINGUISHING FEATURES: bright yellow colour, coarsely felt mantle of felt prosenchyma, abundant undifferentiated mycelial strands; hyphae 3 µm wide, finely verrucose, clampless, with H-shaped anastomoses

MORPHOLOGY (Dissection Microscope):**ECTOMYCORRHIZAL SYSTEM**

Shape and dimensions: irregular systems up to 18 mm long; tips bent; 480 (470-500) µm wide

Colour and texture: (Figs. 1-4) bright yellow or rarely white, slightly brownish, coarsely felt, matt; mantle completely obscures host surface

EMANATING ELEMENTS:

Mycelial Strands: (Figs. 1-4) common, bright yellow, slightly brownish, hairy, diffuse systems of interconnected filaments, round in cross-section, frequently branching at narrow angles, attached to mantle at narrow angles, 170-600 µm diameter

Hyphae: (Figs. 1-4) common, tortuous

ANATOMY (Compound Microscope):

MANTLE IN PLAN VIEW: mantle of medium thickness, hairy net present, specialized cells not seen

Outer Layer: a felt prosenchyma (Fig. 5), matrix materials not seen, cells 2.8 (2.5-3) µm wide; hyphae yellow, finely verrucose, with clear contents; septa common, not clamped; hyphal junctions common; anastomoses common, H-shaped, not clamped

Inner Layer: a net prosenchyma (Fig. 6), cells 2 µm wide, yellow, smooth, with clear contents; septa common, not clamped; hyphal junctions common; anastomoses not seen

MYCELIAL STRANDS IN PLAN VIEW: undifferentiated; hyphae 2 µm wide, yellow, finely verrucose, with clear contents; septa common, not clamped; hyphal junctions common; anastomoses common, H-shaped, not clamped

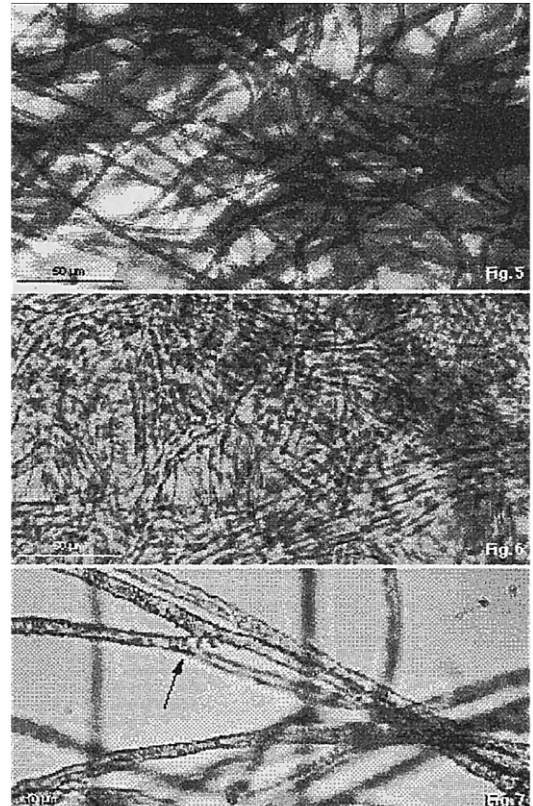
EMANATING HYPHAE: (Fig. 7) common, 3 µm wide, yellow, finely verrucose, with clear contents; septa common, not clamped; hyphal junctions common; anastomoses common, H-shaped, not clamped

CYSTIDS: not seen

CDE1.3 1996

***Piloderma fallax* (Libert) Stalpers**+ *Pseudotsuga menziesii* (Mirb.) Franco

CDE1



5. Outer surface of mantle. 6. Inner surface of mantle. 7. Emanating hyphae, verrucose, with H-shaped anastomosis (arrow).

CDE1.2 1996

***Piloderma fallax* (Libert) Stalpers**+ *Pseudotsuga menziesii* (Mirb.) Franco

CDE1

OTHER FEATURES:

SCLEROTIA AND MICROSCLEROTIA: not seen

CHLAMYDOSPORES: not seen

AUTOFLUORESCENCE OF WHOLE TIPS: none at 254 nm or 366 nm

CHEMICAL REACTIONS: no reaction of whole ectomycorrhizae to KOH, Møller's, sulfovanillin, dNAD, lactic acid, or FeSO₄

DATA: ITS1-MLSB: Genbank: 360, 260, 192, 150, 122; HinfI: 312, 183, 176, 168; RsaI: 789, 244, 177

ADDITIONAL CHARACTERS: None observed

ADDITIONAL INFORMATION:

COLLECTION AND IDENTIFICATION: collected by D.M. Goodman (PHDS128/EH/6) 9 November 1992, near the Koksilah River on Vancouver Island, 48° 33' 20" N by 123° 44' 50" W, described by D.M. Goodman. Identified by D.M. Goodman; matches description of *P. oregonum* + *Figus sylvatica* by Agner (1993); *P. fallax* is the only golden species of *Piloderma* in North America, and is synonymous with *P. bleasbyi* (Peck) Jülich sensu Jülich and *P. oregonum* J. Erikss. & Hjortstam (Gims and Lefebvre 1993, Larsen 1993, Smith et al. 1996, Stalpers 1994); accessioned in herbarium as DAVFP 25169

ECOLOGY: one of the most abundant ectomycorrhizae found in old-growth (286, 441 year) and mature (87, 89 year) stands of Douglas-fir at two sites in the Coastal Western Hemlock dry maritime (CWHdm) biogeoclimatic zone, site series '13 - Fd-Hw-sal' on southeastern Vancouver Island (Green and Klinka 1994), elevation 450-630 m; twenty-one collections of 600 tips total were made almost exclusively from decaying wood, some tips in fragmented litter, not found in the mineral soil, active in both May and November

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REFERENCES:

- Agner, R. (Ed.) 1987-1995. Colour atlas of ectomycorrhizae. Einhorn-Verlag Eduard Dietersberger GmbH Swedish Grund, Munich.
- Gims, J., and Lefebvre, M.N.L. 1993. Lignicolous corticoid fungi of North America, Mycologia Menzies 18, APS Press, St. Paul Minnesota.
- Green, R.N., and Klinka, K. 1994. A field guide to site identification and interpretation for the Vancouver Forest Region. (285 p.) Government of British Columbia, MCF Research Branch, Victoria, B.C.
- Larsen, M.J. 1993. On *Piloderma bicolor* in North America and its relationship to *Piloderma byssinum*. Mycologia 75: 1092-1093.
- Stalpers, J.A. 1994. A revision of the genus *Sporobolium*. Stud. Mycol., Baarn 24:1-105.
- Smith, J.E., Juppunen, A., Larsen M.J., McKay, D. 1996. Ecology and taxonomy of *Piloderma* spp.: a golden indicator of old-growth forest soil legacy. Abstract, First International Conference on Mycorrhizae, Berkeley, California, August 4-10, 1996. <http://mendel.berkeley.edu/bokeusa/abstracts/arrh2.html>

CDE1.4 1996

4. A checklist of characters to be described
5. A glossary (adapted from the Colour atlas of ectomycorrhizae (Agerer 1987–1997) and Identification of ectomycorrhizas (Ingleby et al. 1990))
6. Specific instructions for preparation and submission of materials needed for a description of an ectomycorrhiza to be included in the manual.
7. A standard format for a citation of a description
8. Lists of the fungus and plant species of the ectomycorrhizae described, and a list of authors of descriptions.
9. The literature cited in sections 1–8

Ordering information

The CDE manual is only available on a subscription basis. The durable series binder, comprehensive and well-illustrated introductory and explanatory material, plus folios 1–8 costs US\$100 (outside Canada) or CAN\$100 (within Canada). If you already have the manual and folios 1 and 2, the cost is US\$70 or CAN\$70. All prices (valid in Spring 1998) include handling and postage, and pre-payment is requested. Send your orders to:

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