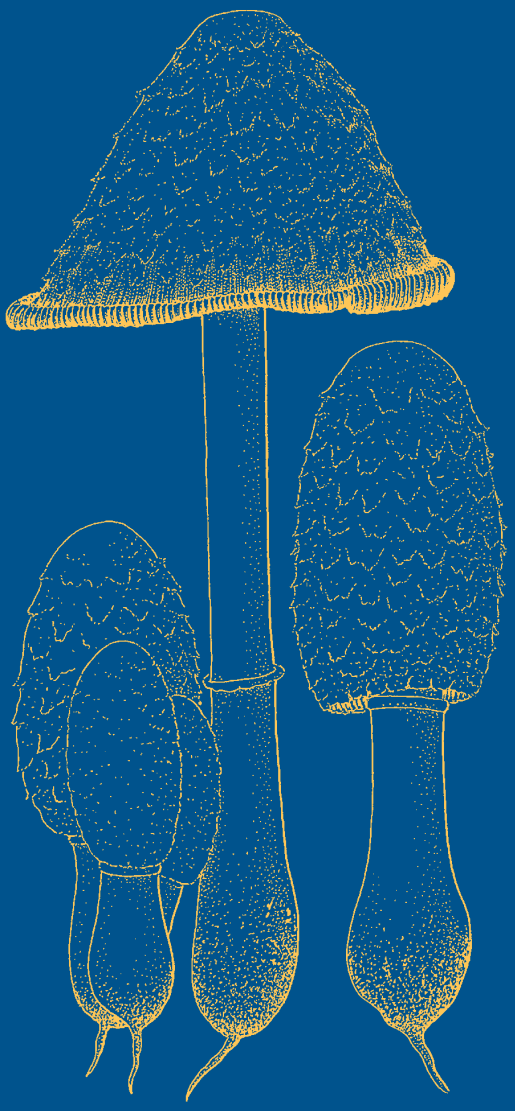
FLORA AGARICINA NEERLANDICA

6



CRC Taylor & Francis
Taylor & Francis Group

FLORA AGARICINA NEERLANDICA

Critical monographs on families of agarics and boleti occurring in the Netherlands

FLORA AGARICINA NEERLANDICA

Critical monographs on families of agarics and boleti occurring in the Netherlands

Edited by

M. E. NOORDELOOS, TH. W. KUYPER, and E. C. VELLINGA

VOLUME 6

Taylor & Francis
Taylor & Francis Group

Boca Raton London New York Singapore

A CRC title, part of the Taylor & Francis imprint, a member of the Taylor & Francis Group, the academic division of T&F Informa plc.

Part of the work for the *Flora agaricina neerlandica* has been supported by research grants of the Foundation Rijksherbariumfonds Dr. E. Kits van Waveren.

For the complete set of *Flora agaricina neerlandica* (cloth): ISBN 90-6191-861-8
For Volume 1: ISBN 90-6191-859-6 (cloth) ISBN 90-6191-758-1 (paper, o.o.p.)
For Volume 2: ISBN 90-6191-971-1 (cloth) ISBN 90-6191-972-X (paper, o.o.p.)
For Volume 3: ISBN 90-5410-616-6 (cloth) ISBN 90-5410-617-4 (paper, o.o.p.)
For Volume 4: ISBN 90-5410-492-9 (cloth) ISBN 90-5410-493-7 (paper, o.o.p.)
For Volume 5: ISBN 90-5410-494-5 (cloth) ISBN 90-5410-495-3 (paper)

Published in 2005 by
CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

Printed in the United States of America on acid-free paper
10 9 8 7 6 5 4 3

International Standard Book Number-10: 9-05-410496-1 (Hardcover)
International Standard Book Number-13: 978-9-05-410496-4 (Hardcover)

Library of Congress Cataloging-in-Publication Data

Catalog record is available from the Library of Congress

T&F informa

Taylor & Francis Group is the Academic Division of T&F Informa plc.

Visit the Taylor & Francis Web site at
http://www.taylorandfrancis.com

and the CRC Press Web site at
http://www.crcpress.com

Contents

A

General part

Chapter 1

Scope, methods, and presentation

Cornelis ("Kees") Bas, Machiel E. Noordeloos,
Thomas W. Kuyper, and Else C. Vellinga

Scope

Flora Agaricina Neerlandica provides original descriptions and illustrations of agarics and boletes (Agaricales sensu lato, Boletales, and Russulales) occurring in the Netherlands, together with chorological and ecological data. It also provides the correct names of individual taxa, concise synonyms, and keys.

Since the publication of Volume 1, new understanding of the relationships between orders, families, and genera has emerged, especially from molecular research (e.g., Moncalvo et al. in *Mol. Phylogen. Evol.* 23: 357–400. 2002). These new findings are discussed and incorporated in the text. However, the circumscription of the groups treated in this flora have not been changed. Essentially, this flora treats the agaricoid and boletoid representatives of the Agaricales, Boletales, and Russulales. The gastroid, secotioid, and cyphelloid fungi belonging to these orders have been excluded.

Extralimital taxa that may occur in the Netherlands on account of their ecology or geographical distribution are also included, though with shorter diagnostic descriptions. A number of taxa less likely to be encountered in the Netherlands are included in the keys, but only with an author citation and one reference to the literature.

Fungi that have spontaneously established themselves in the Netherlands through human intervention (e.g., mycorrhizal symbionts of the introduced *Larix* species) are considered indigenous. Hothouse fungi are not treated except for some species of *Leucocoprinus* frequently found indoors in flowerpots. Short diagnostic descriptions are given for species growing in unheated greenhouses.

Introductory Chapters

The history of agaricology in the Netherlands, the ecology and distribution of agarics and boletes in the Netherlands, specific and infraspecific delimitation, generic concepts, orders and families of the agarics and boletes, and nomenclature are topics covered elsewhere in this flora (Volume 1, Chapters 1–6).

Descriptions

Great care was taken to base descriptions on material from the Netherlands. New observations were made specifically for the flora. Occasionally, when suitable material was not available, observations were based on collections from northwestern Europe. Special labels have been added to all collections that were examined.

When firsthand observation, particularly of macroscopic characters, was impossible, data were taken from the literature. Such cases are clearly indicated and references to the sources are provided.

Ideally, spore print colours are recorded with colour code notations. Unfortunately, such precision is lacking for many taxa. Colour indications without quotation marks have been taken from the descriptive notes of the collections; those between quotation marks are taken from literature or are based on general consensus.

Sizes of spores were measured in tenths of a µm but have been rounded to the nearest half µm. Sizes of basidia, cystidia, and other microscopical elements were measured and given in µm, except that when any dimension was less than 10 µm, the measurements were made and given to the nearest half µm.

Ecological and Distributional Data

Extensive notes are given on ecology and geographical distribution both within and outside the Netherlands. Distribution maps are not included but have been published elsewhere (Nederlandse Mycologische Vereniging, Kaartenbijlage Overz. Paddest. Nederland 1. Agaricales. 1999).

Specific localities are named only for very rare species (five or fewer localities known in the Netherlands).

Frequency classes (extremely rare, very rare, rare, rather rare, moderately common, rather common, common, very common) are estimated from the number of locations in the Netherlands from which collections have been reported.

Definitions of the frequency classes are found in Arnolds et al. (Overz. Paddest Nederland: 27. 1995), based on numbers of quadrants of 5×5 square km in which the taxa have been found.

Extremely rare: 1–2 quadrants
Very rare: 3–6 quadrants
Rare: 7–17 quadrants
Rather rare: 18–47 quadrants
Moderately common: 48–113 quadrants
Rather common: 114–246 quadrants
Common: 247–426 quadrants
Very common: > 426 quadrants

Illustrations

All species are illustrated with line drawings of basidiocarps, spores, and cystidia (if present), supplemented with drawings of other microscopic characters when these are diagnostic. The magnifications of these drawings (unless indicated otherwise) are:

basidiocarps × 1
spores × 1500
cystidia and basidia × 1000
tissues × 500

Dotted areas indicate the presence of a gelatinous substance.

For the abbreviations used in the illustrations, see the list of abbreviations at the end of this chapter.

Formulas

Formulas of chemical reagents and stains may be found in several places (e.g., Kühner and Romagnesi, Fl. anal. Champ. sup. 1953; Moser, Röhrlinge Blätterpilze, 5. Aufl. 1983; Singer, Agar. mod. Taxon., Ed. 4. 1986).

Nomenclature

Nomenclature adheres closely to the "International Code of Botanical Nomenclature." Since the appearance of Volume 1, the issue of typification of sanctioned names has been clarified. This clarification furthermore enables nomenclatural stability. One minor change in the citation of sanctioned names needs to be mentioned. The colon (:) is now used directly in conjuction with the name of the sanctioning author as : Fr.

Synonymy is not complete, but restricted to synonyms that have appeared in modern monographs, well-known floras, Dutch mycological literature, and popular books with a wide distribution. A similar selection is made for the misapplied and excluded names.

Names of pteridophytes and phanerogams are in accordance with Heukels/Van der Meijden, Flora van Nederland, Ed. 22. 1996.

New Names and New Taxa

New names found to be necessary and new taxa discovered in the course of preparing this flora are not published in the flora itself, but in a series of notes titled "Notulae ad Floram agaricinam neerlandicam," appearing in the journal *Persoonia.* More extensive discussions of taxonomic and nomenclatural problems are also included therein.

Addresses of the Authors and Editors

Dr. E.J.M. Arnolds, Holthe 21, 9411 TN Beilen, the Netherlands. E-mail: Eefarnolds@hetnet.nl

Dr. C. Bas, Nationaal Herbarium Nederland, Universiteit Leiden Branch, P.O. Box 9514, 2300 RA Leiden, the Netherlands. E-mail: Cornelis.bas@raketnet.nl

Dr. Th. W. Kuyper, Department of Soil Quality, Wageningen University, P.O. Box 47, 6700 AA Wageningen, the Netherlands. E-mail: Thom.Kuyper@wur.nl

Dr. M.M. Nauta, Nationaal Herbarium Nederland, Universiteit Leiden Branch, P.O. Box 9514, 2300 RA Leiden, the Netherlands. E-mail: Nauta@nhn.leidenuniv.nl

Dr. M.E. Noordeloos, Nationaal Herbarium Nederland, Universiteit Leiden Branch, PO. Box 9514, 2300 RA Leiden, the Netherlands. E-mail: Noordeloos@nhn.leidenuniv.nl

C.B. Ulje († 2003) (correspondence to M.E. Noordeloos)

Dr. E.C. Vellinga, University of California at Berkeley, Dept. of Plant and Microbial Biology, 111 Koshland Hall-3102, Berkeley, CA 94720-3102, U.S.A. E-mail: Vellinga@ berkeley.edu

LIST OF ABBREVIATIONS IN TEXT AND DRAWINGS

ad int. – ad interim
auct. – auctores (= authors)
auct. eur. – auctores europaei (= European authors)
auct. neerl. – auctores neerlandici (= Dutch authors)
Aug. – August
av. – average
cc – caulocystidia
cf. – confer (= compare)
ch – cheilocystidia
Dec. – December
descr. – description
diagn. – diagnosis
dpt. – department
emend. – emendavit (= corrected)
et al. – et alii
excl. – excluded
f. – forma
Feb. – February
Fig., figs. – Figure, figures
illegit. – illegitimate
Jan. – January
K. & W. – Kornerup, A. & Wanscher, J.H., Methuen Handbook of colour; Farver i Farver.
l – number of lamellulae between two lamellae
L – number of lamellae
lit. – literature
loc. cit. – loco citato (= in the passage already quoted)
misappl. – misapplied
Mu. – Munsell soil colour charts
nom. conserv. – nomen conservandum
nom. nud. – nomen nudum
not val. publ. – not validly published
Nov. – November
Oct. – October
pc – pileocystidia
pl – pleurocystidia
pl. – plate
pp – pileipellis or elements of pileipellis
p.p. – pro parte
p.p.maj. – pro parte majore (= for the greater part)
p.p.min. – pro parte minore (= for the minor part)
prov.- province
Romagn. – Romagnesi, Les Russules d'Europe (colour chart)
Q – quotient of length and width or breadth
Qav – average quotient
sect. – section
sel. – selected
sensu auct. maj. – sensu auctores majores
Sept. – September
s.l. – sensu lato (= in a wide sense)
s.str. – sensu stricto (= in a restricted sense)
subgen. – subgenus
subsect. – subsection
subsp. – subspecies
subvar. – subvariety
trib. – tribus
v – velum
var. – variety
vern. – vernacular

Chapter 2

Glossary

E.C. Vellinga and M.E. Noordeloos

abrupt papilla – (on pileus) (Vol. 1, Fig. 29.30).
abruptly bulbous – (base of stipe) (Vol. 1, Fig. 31.18).
acanthocyte – globose, spiny element produced on the basal mycelium of some Strophariaceae.
acrophysalidic – (tissue) consisting of connective hyphae and abundant, large, terminal, inflated elements ("acrophysalides").
acuminate – (cystidia) tapering from inwardly curved sides off to a point (Vol. 1, Fig. 34.39).
acute – (cystidia) tapering off to a sharp point (Vol. 1, Fig. 34.40); (spore apex) pointed (Vol. 1, Fig. 33.30).
acute papilla – (on pileus) (Vol. 1, Fig. 29.31).
adnate – (lamellae) broadly attached to stipe (Vol. 1, Fig. 30.21), see also narrowly adnate.
adnexed – (lamellae) rounded towards stipe (Vol. 1, Fig. 30.19).
aeriferous – (pileus and stipe surfaces) with silvery shine because of air present among superficial hyphae.
allantoid – (spores) with adaxial side concave and parallel to abaxial side (Vol. 1, Fig. 33.21).
amygdaliform – (spores) with adaxial side straight or less convex than abaxial side (Vol. 1, Figs. 33.18, 33.19).
amyloid – (spore wall, spore ornamentation, hyphal walls), staining greyish to blackish blue in Melzer's reagent.
anastomosing – (lamellae) provided with irregular transverse connections (Vol. 1, Fig. 30.4).
angiocarpy – a type of development of the basidiocarp in which at some stages the developing hymenium is situated in a closed cavity; see also primary and secondary angiocarpy.
annular belt – (stipe) remnants of partial veil in form of a girdle round (upper half of) stipe.
annulus – (stipe) ring-like structure round (apex of) stipe, formed by partial veil.
apex – (of spores) summit (Vol. 1, Fig. 32.4A).
apical – (spores) situated at the tip.
appendage – (of spores) see hilar appendage.
appendiculate – (margin of pileus) with small appendages (Vol. 1, Fig. 29.48).
applanate – (pileus) flattened, flat (Vol. 1, Figs. 29.7, 29.19).
arachnoid – (pileus and stipe surfaces or velum) cobwebby.
arcuate – (lamellae) with concave lamella edge (Vol. 1, Figs. 30.15, 30.16).
areolate-rimose – (pileus surface) marked with numerous superficial clefts or cracks forming angular patches.
ascending – (hyphae) curving upward.
aseptate – (hyphae) without septa.
auriscalpioid – (habit) shaped like *Auriscalpium* spp.: with vertical eccentric stipe and horizontal pileus.
bacilliform – (spores) Q > 3.0 (Vol. 1, Fig. 33.7).
ballistosporic basidium – a basidium that actively discharges its spores.
basidiocarp – fruitbody producing spores on basidia.
basidiole – immature basidium.
bilateral – see divergent.
binding hyphae – branching, rarely septate, thick-walled, narrow hyphae binding the other elements of a tissue together.
binucleate – with two nuclei.
bivelangiocarpy – a type of angiocarpic development of the basidiocarp in which partial and universal veil participate.
breadth – (of spore) largest distance between sides as seen from frontal view (Vol. 1, Fig. 32.2).
brevipes-type – see urticiform.
broadly clavate – (cystidia) clavate with Q < 1.5 (Vol. 1, Fig. 34.14).
broadly conical – (pileus) (Vol. 1, Fig. 29.13), see also truncately broadly conical; (cystidia) conical with Q < 1.5 (Vol. 1, Fig. 34.18).
broadly cylindrical – (cystidia) cylindrical, with Q < 2 (Vol. 1, Fig. 34.11).
broadly ellipsoid – (spores) Q = 1.15–1.3 (Vol. 1, Fig. 33.3); (cystidia) Q = 1.15–1.3 (Vol. 1, Fig. 34.3).
broadly fistulose – (stipe) with very wide tube (Vol. 1, Fig. 31.12).
broadly fusiform – (spores) fusiform with Q = 1.5–2.0 (Vol. 1, Fig. 33.12); (cystidia) fusiform with Q = 1.5–2.0 (Vol. 1, 34.21), see also very broadly fusiform.
broadly lageniform – (cystidia) (Vol. 1, Fig. 34.26).
broadly utriform – (cystidia) (Vol. 1, Fig. 34.29).
broadly ventricose – (lamellae) (Vol. 1, Fig. 30.14).
broom-cells – elements in pileipellis or hymenium consisting of a more or less clavate or spheropedunculate body, bearing few to numerous warts of finger-like appendages in upper half. Two types are distinguished: Rotalis-type with rounded-warty appendages (Vol. 3, Fig. 139), and Siccus-type with elongate, finger-like appendages (Vol. 3, Fig. 154).
brosse – see en brosse.
bulbangiocarpy – a type of angiocarpic development of the basidiocarp in which the basidiocarp is initiated in a cavity of the primordial bulb.
bulbous – (base of stipe) enlarged (Vol. 1, Fig. 31.17), see also abruptly bulbous and marginately bulbous.
campanulate – (pileus) bell-shaped (Vol. 1, Fig. 29.12).
canaliculate – (stipe) (= channelled) with a longitudinal groove or channel.
cantharelloid – (basidiocarp) with decurrent obtuse rib- or vein-like lamellae.
capitate – (apex of cystidia) having a distinct and abrupt knob (Vol. 1, Fig. 34.44).
cartilaginous – (stipe) cartilage-like, flexible but tough.

catenate – (of cheilocystidia) united as in a chain.
catenulate – (elements) united or linked as in a chain.
caulocystidium – cystidium situated on surface of stipe.
central – (stipe) attached to centre of pileus (Vol. 1, Fig. 31.1); (germ pore) situated at the central tip of the spore (Vol. 1, Fig. 33.27).
chambered – (stipe) with several cavities (Vol. 1, Fig. 31.13).
cheilochrysocystidium – chrysocystidium situated on edge of lamellae.
cheilocystidium – cystidium situated on edge of lamellae or tube.
cheiloleptocystidium – thin-walled cystidium situated on edge of lamellae (only used when confusion with cheilochrysocystidia may occur).
chrysocystidium – cystidium with yellow amorphous body or bodies in contents after treatment with ammonia or KOH.
circular – (pileus) round (Vol. 1, Fig. 29.1).
clavate – club-shaped (stipe) (Vol. 1, Fig. 31.8); (cystidia, basidia), Q = 1.5–4 (Vol. 1, Fig. 34.13), see also narrowly, and very narrowly clavate, and broadly clavate.
clitocyboid – see omphalioid.
collarium – a tube around, but free from, the apex of the stipe to which the lamellae are attached (Vol. 1, Fig. 30.5).
colliculose – (pileus surface) covered with hillock-like elevations.
collybioid – (habit) characterised by pileus neither umbilicate, nor conical; lamellae free or adnate; context tough; context of pileus continuous with context of stipe (Vol. 1, Figs. 28.2, 28.3).
concave – (pileus) (Vol. 1. Fig. 29.21).
congophilous – (spore wall) accumulating Congo red.
conical – cone-shaped (pileus) (Vol. 1, Fig. 29.14), see also broadly conical and narrowly conical, truncately broadly conical, truncately conical, and obtusely conical; (cystidia) Q = 1.5–4 (Vol. 1, Fig. 34.17), see also narrowly conical and broadly conical.
conidium – a non-motile asexual spore.
connate – (stipes) grown together at their bases.
connective hyphae – usually narrow undifferentiated hyphae of the context of a basidiocarp connecting all other elements (used in opposite of fundamental hyphae).
constriction – see median constriction.
continuous – context of pileus and stipe forming one entity; pileus and stipe not easily separating.
convex – (pileus) (Vol. 1, Fig. 29.9).
coprinoid – (habit) ephemerous basidicarps with ellipsoid or conical, quickly expanding, sulcate pileus and free, deliquescent lamellae.
coralloid – irregularly branching, like in coral.
corneous – (stipe) horny, horn-like in texture.
cortina – a web-like veil connecting pileus margin and stipe.
costate – (pileus and stipe surfaces) with ridges.
crenate – with rounded teeth (margin of pileus) (Vol. 1, Fig. 29.45); (lamella edge) (Vol. 1, Fig. 30.33).
crenulate – minutely crenate (margin of pileus) (Vol. 1, Fig. 29.46); (lamella edge) (Vol. 1, Fig. 30.34).
crepidotoid – see pleurotoid.
curved – (stipe) bent from substrate upwards as to adjust to the gravitation.
cutis – a pileipellis consisting of repent non-gelatinising hyphae (Vol. 1, Fig. 36.1A).
cyanophilous – (spore wall) accumulating Cotton blue.
cylindrical – (stipe) circular in cross-section and of equal diametre from apex to base (Vol, 1, Fig. 31.4); (spores) Q = 2.0–3.0, in outline with parallel sides; (cystidia) Q = 2–4 (Vol. 1, Fig. 34.10), see also narrowly cylindrical and broadly cylindrical.
cyphelloid – (basidiocarp) more or less cup-shaped with smooth hymenophore.
cystidioid – cystidium-like.
cystidium – sterile, differentiated, terminal element in the hymenium or on the surfaces of the basidiocarp.
decurrent – (lamellae) descending down the stipe (angle lamellae-stipe 40–60°) (Vol. 1, Fig. 30.28), see also deeply decurrent.
decurrent tooth – (of lamellae) (Vol. 1, Figs. 30.25, 30.26).
deeply decurrent – (lamellae) (angle lamellae-stipe < 40°) (Vol. 1, Fig. 30.29).
deeply infundibuliform – (pileus) (Vol. 1, Fig. 29.23).
deeply umbilicate – (pileus) with deep abrupt depression (Vol. 1, Fig. 29.28).
deflexed – (margin of pileus) bent downwards (Vol. 1, Fig. 29.37).
deliquescent – (lamellae and/or basidiocarp) becoming liquid after maturing.
depressed – (pileus) with central depression/sinking (Vol. 1, Fig. 29.25), see also slightly depressed.
depression – (of pileus), see depressed; (of spores), see suprahilar depression.
derm – a pileipellis consisting of erect elements or of ascending elements, see trichoderm and hymeniderm.
dextrinoid – (spore wall, hyphal walls) staining red to reddish brown in Melzer's reagent.
dimitic – (tissues) consisting of generative hyphae and skeletal hyphae or binding hyphae.
divergent (= *bilateral*) – (hymenophoral trama) having downward hyphae turning outward from a median line (Vol. 1, Figs. 35.5, 35.6).
diverticulate – (cystidia) with short finger-like excrescences (Vol. 1, Fig. 34.45).
discontinuous – context of pileus and stipe not forming one entity; pileus easily separating from stipe, see also pluteoid.
duplex – (context) consisting of two structurally differing layers.
eccentric – (stipe) not attached to centre of pileus (Vol. 1, Fig. 31.2); (germ pore) situated at the abaxial side of the spore (Vol. 1, Fig. 33.26).
echinate – (spores) with spines.
ectosporium – the very thin outer layer of the basidiospore wall.
ellipsoid – (spores) Q = 1.3–1.6 (Vol. 1, Fig. 33.4); (cystidia) Q = 1.3–1.6 (Vol. 1, Fig. 34.2), see also broadly ellipsoid.
emarginate – (lamellae) notched near the stipe (Vol. 1, Fig. 30.23).
en brosse – (of cystidia) with excrescences, diverticulate (Vol. 1, Fig. 34.45).
encrusted, encrusting – see incrusting.
endosporium – the electron transparent inner layer of the basidiospore wall at the inside of the episporium, but lacking in many white- and pale-spored taxa.
entire – (lamella edge) straight, smooth, and glabrous (Vol. 1, Figs. 30.30, 30.38).
episporium – the electron opaque fundamental layer present in all basidiospores of the Hymenomycetes; it is the innermost layer of the spore wall when the endosporium is lacking.
epithelioid hymeniderm – a hymeniderm made up of elements with Q = 1.0–1.15 (Vol. 1, Fig. 36.3C).
epithelium – a pileipellis made up of globose to broadly ellipsoid elements in more than one layer deep; see regular epithelium and irregular epithelium.
equal – (stipe) of equal diametre from apex to base.
erect – (hyphae or projections of hyphae) perpendicular to surface of pileus.
eroded – irregularly toothed (margin of pileus) (Vol. 1, Fig. 29.47); (of lamella edge) (Vol. 1, Fig. 30.37).

euhymeniderm – a hymeniderm made up of elements with Q = 1.15–6 (Vol. 1, Fig. 36.3B).
eusporium – the inner set of firm and resistant layers of the basidiospore wall, consisting of the episporium and the endosporium.
even – (lamella edge) straight, smooth and glabrous, entire (Vol. 1, Figs. 30.30, 30.38).
exceeding – (margin of pileus with regard to lamellae) (Vol. 1, Fig. 29.42).
exosporium – a layer of the basidiospore wall between perisporium and episporium, frequently responsible for the ornamentation of spores.
exscissa-type – see urticiform.
fasciculate – (basidiocarps) growing in a bundle.
felted – (pileus and stipe surfaces or volva) composed of, or covered with, densely compressed, matted hairs or fibrils.
fertile – (lamella edge) composed of basidia only.
fibrillose – (pileus and stipe surfaces) covered with thin, thread-like fibres.
filiform – (cystidia, stipe), very long and narrowly cylindrical.
fimbriate – (lamella edge) with regular hair-like projections (Vol. 1, Fig. 30.39).
fissurate – (pileus and stipe surfaces) with deep and/or distinct clefts.
fistulose – (stipe) hollow (Vol. 1, Fig. 31.11), see also broadly fistulose.
flabelliform – (pileus) fan-shaped (Vol. 1, Fig. 29.2), see also rounded flabelliform.
flattened. – (spores) spores adaxially flattened, resulting in a different measure for breadth and width (Vol. 4, Fig.1.1).
flexuous – (stipe) full of bends; (cystidia) cylindrical but with bends (Vol. 1, Fig. 34.36).
flocci – small flocks or tufts.
floccose – (pileus and stipe surfaces) covered with tufts of soft hairs.
flocculose – (pileus and stipe surfaces) minutely floccose.
free – (lamellae) not attached to stipe (Vol. 1, Fig. 30.18).
fringed – (lamella edge) with irregular appendages.
frontal view – (of spores) (Vol. 1, Fig. 32.2).
fugacious – (veil) evanescent, early disappearing.
fundamental hyphae – the inflated hyphae giving the fleshy basidiocarp its firmness.
furcate – (lamellae) forked (Vol. 1, Fig. 30.2).
fusiform – spindle-shaped, tapering at both ends, (spores) with Q = 2.0–4.0 (Vol. 1, Fig. 33.13); (cystidia) with Q = 2.0–4.0 (Vol. 1, Fig. 34.20), see also narrowly, broadly, and very broadly fusiform.
gelatinous – jelly-like in consistence.
generative hyphae – the basic type of septate, thin- to thick-walled, branching hyphae, present in all (young) basidiocarps, from which all differentiated hyphae arise (used in opposite of binding and skeletal hyphae).
germ pore – (of spores) apical thin-walled spot in spore wall (Vol. 1, Fig. 32.6E), see also central and eccentric germ pore.
glabrous – (pileus and stipe surfaces) bald.
globose – spherical (spores) Q = 0.95–1.05 (Vol. 1, Fig. 33.1); (cystidia) Q = 1.0–1.05 (Vol. 1, Fig. 34.5).
glutinous – slimy, very viscid.
granulose – (pileus and stipe surfaces) covered with (or composed of) minute grains.
gregarious – (basidiocarps) growing in a group.
guttate – (pileus and stipe surfaces) with roundish darker spots.
guttulate – (contents of spores and other elements) with (oil) droplets.
guttule – droplet (Vol. 1, Fig. 32.6G).
gymnocarpy – a type of development of the basidiocarp in which the hymenium is exposed from initiation till maturity.
hemispherical – (pileus) with shape of a half sphere (Vol. 1, Fig. 29.10).
heterogeneous – (lamella edge) composed of cystidia and basidia.
heteromerous – (tissue) consisting of hyphae and "nests" of sphaerocysts.
hexagonal – (spores) six-angled (Vol. 1, Figs. 33.22, 33.23).
hilar appendage – (of spores) short process at basal end of spore by which it was attached to sterigma (Vol. 1, Fig. 32.4C).
hilum – scar left on the hilar appendage of the basidiospore after its discharge from the sterigma.
hirsute – (pileus and stipe surfaces) covered with rather long, rather coarse hairs (coarser than in pubescent, less coarse than in hispid).
hispid – (pileus and stipe surfaces) covered with long or short, erect stiff hairs or bristles.
hispidulous – (pileus and stipe surfaces) minutely hispid.
homoiomerous – (tissue) consisting of hyphae and without nests of sphaerocysts.
horsehair-like – (stipe) very long and thin, stiff, like the hair of a horse.
hymeniderm – a derm made up of non-septate elements originating at the same level, see also epithelioid hymeniderm, and transition between hymeniderm and epithelium.
hymenocarpy – a type of development of the basidiocarp in which the differentiation of the hymenophore starts as a circular zone in the otherwise still undifferentiated primordium.
hymenopodium – a special (usually large-celled) layer between subhymenium and hymenophoral trama.
hyphal peg – fascicle of unbranched hyphae projecting beyond basidia.
imbricate – (basidiocarps) growing immediately above each other.
incrusted – see incrusting.
incrusting – (pigment) situated on the outer side of the wall, and visible as bands, granules, or patches.
inflated – (hyphae) consisting of swollen elements, constricted at septa, not cylindrical.
inflexed – (margin of pileus) bent inwards (Vol. 1, Fig. 29.38).
infundibuliform – (pileus) funnel-shaped (Vol. 1, Fig. 29.22), see also deeply infundibuliform.
insititious – (stipe) grafted on substratum; base of stipe seems inserted in substrate because basal hairs or tomentum are lacking.
intercalary element – between two other elements, not terminal.
intercellular – (pigment) situated between the elements.
intervenose – (lamellae) provided with veins between the lamellae (Vol. 1, Fig. 30.3).
intracellular – (pigment) situated inside the elements.
intricate trichoderm – a trichoderm made up of interwoven elements (Vol. 1, Fig. 36.2B).
inverse – (hymenophoral trama) having downward convergent hyphae, i.e., turning inward to a median line (Vol. 1, Fig. 35.4).
involute – (margin of pileus) rolled in (Vol. 1, Fig. 29.39).
irregular – (hymenophoral trama) having interwoven hyphae (Vol. 1, Fig. 35.3).
irregular epithelium – an epithelium made up of irregularly disposed elements (Vol. 1, Fig. 36.4B).
irregular trichoderm – (Vol. 1, Fig. 36.2C).
isocarpy – a type of development of the basidiocarp in which the differentiation of pileus, stipe, and hymenophore starts at the same time.
ixocutis – a cutis made up of gelatinising hyphae (Vol. 1, Fig. 36.1B).
ixohymeniderm – a hymeniderm made up of gelatinising elements.
ixohyphidium – a gelatinising, more or less differentiated, hypha-like terminal element in the pileipellis.
ixotrichoderm – a trichoderm, made up of gelatinising elements (Vol. 1, Fig. 36.2D).
laccate – (pileus surface) as though varnished.

lacrymoid – (spores) with confluent hilar appendage; tear-shaped (Vol. 1, Figs. 33.16, 33.17).

lageniform – (cystidia) characterised by neck narrower than half width of cell body (Vol. 1, Fig. 34.U), see also narrowly lageniform and broadly lageniform.

lamellate – (hymenophore) consisting of lamellae (= gills).

lanate – (pileus and stipe surfaces) (= woolly) covered with long, soft, matted hairs.

lateral – (stipe) attached to one side of pileus (Vol. 1, Fig. 31.3).

lecythiform – (cystidia) lageniform and abruptly capitate (Vol. 1, Fig. 34.33).

length – (of spores) distance from apex to bottom as seen in side view (Vol. 1, Fig. 32. 1).

leptocystidium – thin-walled cystidium. Only used in the combination cheiloleptocystidium, when confusion with cheilochrysocystidia may occur.

lichenized – living in symbiotic association with an alga, forming a lichen.

lignicolous – growing on wood.

linear – (lamellae) with straight lamella edge and parallel upper side (Vol. 1, Fig. 30.6).

luminescent – (basidiocarp) fluorescent; giving light in darkness.

marasmioid – (stipe) tough, slender, and yellow-brown, red-brown, or grey-brown at least at base; (habit) with plicate pileus and horse-hair-like stipe, revivescent.

marginately bulbous – (base of stipe) provided with a bulb with a raised border (Vol. 1, Fig. 31.19).

marmorate – pileus and stipe surfaces, and context (= marbled) looking like marble: faintly and irregularly striped or innately veined.

medallion clamp – a clamp connection with an opening between the clamp connection itself and the elements connecting by it.

median constriction – transverse contraction in the middle (of spores) (Vol. 1, Figs. 33.24, 33.25); (of cystidia) (Vol. 1, Fig. 34.30).

mediostratum – middle layer.

metachromatic – (spore wall) turning reddish to violet in solution of Cresyl blue in H_20.

metuloid – deep-rooting cystidium becoming distinctly thick-walled and often incrusted with age.

micaceous – (pileus surface) with glistening particles or spots.

moniliform – (cystidia) cylindrical but contracted at regular intervals, like a string of beads (Vol. 1, Fig. 34.35).

monomitic – (tissue) built up of one type of hyphae.

monovelangiocarpy – a type of angiocarpic development of the basidiocarp in which only a universal veil participates.

mitriform – (spores) shaped like a mitre (Vol. 4, Fig. 2.3).

mucilaginous – consisting of mucilage (= viscous substance).

mucous – (pileus and stipe surfaces) slimy.

mucronate – (cystidia) with small abrupt, acute, or blunt protuberance at apex (Vol. 1, Fig. 34.37).

mycenoid – (habit) characterised by pileus conical to paraboloid; lamellae free to adnate; stipe usually long and slender, context usually brittle (Vol. 1, Figs. 28.7, 28.8).

myxosporium – the set of often mucilaginous layers on the outside of the basidiospore wall enveloping the eusporium; its components are ectosporium, perisporium, and exosporium.

narrowly adnate – (lamellae) (Vol. 1, Fig. 30.20).

narrowly clavate – (cystidia, basidia) clavate with Q = 4.0-8.0 (Vol. 1, Fig. 34.12), see also very narrowly clavate.

narrowly conical – (pileus) (Vol. 1, Fig. 29.15); (cystidia) conical with Q > 4 (Vol. 1, Fig. 34.15).

narrowly cylindrical – (cystidia) cylindrical with Q > 4 (Vol. 1, Fig. 34.9).

narrowly fusiform – (spores) fusiform with Q > 4.0 (Vol. 1, Fig. 33.14); (cystidia) fusiform with Q > 4 (Vol. 1, Fig. 34.19).

narrowly lageniform – (cystidia) (Vol. 1, Fig. 34.24).

narrowly utriform – (cystidia) (Vol. 1, Fig. 34.27).

necropigment – dark brownish black pigment, usually in form of intracellular pigment-clots.

nettle-hair shaped – (cystidia) lageniform with long, narrow, slender neck (Vol. 1, Fig. 34.23).

nodulose type of hilum – hilum an approximately circular area covered with protuberances (frequent in thin-walled spores).

non-amyloid – (spore wall, spore ornamentation, hyphal walls) not changing colour or only becoming yellowish in Melzer's reagent.

oblong – (spores) Q = 1.6–2.0 (Vol. 1, Fig.33.5); (cystidia) Q > 1.6 (Vol. 1, Fig. 34.1).

obovoid – reversely ovoid, with the broadest and widest part uppermost, (spores) (Vol. 1, Fig. 33.9); (cystidia) (Vol. 1, Fig. 34.8).

obpyriform – (cystidia) reversely pyriform, with the broadest and widest part above (Vol. 1, Fig. 34.32).

obtuse – (apex of cystidia) rounded (Vol. 1, Fig. 34.41).

obtusely conical – (pileus) conical with rounded apex (Vol. 1, Fig. 29.18).

omphalinoid – see omphalioid.

omphalioid – (including omphalinoid or clitocyboid) (habit) characterised by pileus plano-convex to deeply infundibuliform; lamellae decurrent (Vol. 1, Figs. 28.4, 28.5, 28.6).

opaque – (pileus) not translucent.

open pore type of hilum – hilum with a depression or perforation at one side and sometimes a perforation or tear at the other side of the hilar appendage often connected by a slit (frequent in thick-walled spores).

ovoid – egg-shaped (spores) (Vol. 1, Fig. 33.8); (cystidia) (Vol. 1, Fig. 34.7).

palisade – (pileipellis) special type of hymeniderm, in which the elements are very long and slenderly cylindrical.

papilla – small nipple-like protuberance (on pileus) (Vol. 1, Fig. 29.29); (on spores) (Vol. 1, Fig. 33.28), see also abrupt and acute papilla.

papillate – (pileus surface) covered with papillae.

paraboloid – (pileus) (Vol. 1, Fig. 29.11).

paravelangiocarpy – a type of angiocarpic development of the basidiocarp in which only a partial veil participates.

parietal – (pigment) situated in the hyphal wall.

partial veil – see velum partiale.

patent – (hyphae or projections of hyphae) perpendicular to surface of stipe.

pedicillate – (cystidia) provided with a stalk (Vol. 1, Fig. 34.48).

pedunculate – (cystidia) provided with a stalk (Vol. 1, Fig. 34.48).

pellicle – an easily peeling ixocutis.

perisporium – the often mucilaginous layer of the basidiospore wall just inside the ectosporium; sometimes early disappearing, sometimes filling the spaces between exosporial ornamentation.

phaseoliform – (spores) with concave adaxial side, not parallel to abaxial side (Vol. 1, Fig. 33.20).

pilangiocarpy – a type of secondary angiocarpy in which the originally exposed hymenophore in later stages is enclosed by (an outgrowth of) margin of pileus.

pileipellis – cortical layer(s) of pileus.

pileocarpy – a type of development of the basidiocarp in which the pileus is the first part initiated in the primordial bulb.

pileocystidium – cystidium situated on surface of pileus.

pileostipitocarpy – a type of development of the basidiocarp in which the differentiation of pileus and stipe starts at the same time before that of the hymenophore.
plage – (of spores), see suprahilar plage.
plano-concave – (pileus) slightly concave (Vol. 1, Fig. 29.20).
plano-conical – (pileus) slightly conical, almost flat.
plano-convex – (pileus) slightly convex (Vol. 1, Fig. 29.8).
pleurocystidium – cystidium situated on sides of the hymenophore (lamella or tube).
pleurotoid – (including crepidotoid) (habit) characterised by absent or lateral stipe (Vol. 1, Figs. 28.12, 28.13).
plicate – (pileus) folded radially, like a fan.
pluteoid – (habit) characterised by lamellae free; context of pileus discontinuous with context of stipe; stipe usually longer than diametre of pileus (Vol. 1, Fig. 28.1).
polar view – (of spores) (Vol. 1, Fig. 32.3).
primary angiocarpy – a type of angiocarpic development in which the primordial hymenium is initiated in a closed cavity.
primary mycelium – the uninucleate mycelium produced by a germinating basidiospore.
primordium – a very young, not fully differentiated basidiocarp.
protocarpic tuber – a non-persisting fleshy tuber on which one or more basidiocarps may develop.
pruinose – (pileus, lamella, and stipe surfaces) covered with a (often white or whitish) powdery "bloom."
pseudoangiocarpy – secondary angiocarpy (see there).
pseudoclamp – result of an incomplete clamp forming process: the initial tube bends towards the hyhae, but does not anastomose, and does not develop into a true clamp.
pseudocystidium – differentiated prolongation of vascular hypha into the hymenium.
pseudoinsititious – (stipe) at first sight appearing truly insititious, but on closer inspection (lens) with very poorly developed basal mycelium.
pseudoparaphyses – short cells in the hymenium, surrounding the basidia.
pseudorhiza – a root-like extension of the stipe (Vol. 1, Fig. 31.15).
pubescent – (pileus and stipe surfaces) (= downy) covered with soft, fine hairs.
pulverulent – (pileus and stipe surfaces) covered with powder.
pustulate – (stipe and pileus surfaces) with small rounded warts.
pyriform – (cystidia) pear-shaped (Vol. 1, Fig. 34.31).
quadrangular – (spores) with shape of rectangle or square; Q equal or less than 1.15 (Vol. 1, Fig. 33,10).
radially rimose – (pileus surface) marked with numerous, superficial, radial clefts or cracks.
radiate growth – (hymenophoral trama) formed by hyphae growing radially at the underside of the pileus from centre towards margin of pileus.
Ramealis structure – (of pileipellis) with irregularly shaped and arranged, nodose or en brosse or diverticulate elements (Vol. 3, Fig. 122).
reduced – (of stipe) very short (Vol. 1, Fig. 31.3).
reflexed – (margin of pileus) bent upwards (Vol. 1, Fig. 29.40).
regular – (hymenophoral trama) having parallel hyphae (Vol. 1, Fig. 35.1).
regular epithelium – an epithelium made up of elements in erect rows (Vol. 1, Fig. 36.4A).
reniform – (pileus) kidney-shaped (Vol. 1, Fig. 29.6).
repent – (hyphae) creeping, not ascending.
resinous – consisting of or covered with resin or resin-like substance.
reticularly venose – (pileus surface) marked with anastomosing veins forming angular patches.
revivescent – (basidiocarp) reviving after desiccation when remoistened, restoring the fresh habit and producing spores again.
revolute – (margin of pileus) rolled back (Vol. 1, Fig. 29.41).
rhizomorph – a visible root-like mycelial strand (Vol. 1, Fig. 31.14).
rhomboid – (spores) more or less quadrangular spore with concave sides (Vol. 4, Fig. 2.2).
rimose – see radially rimose; areolate-rimose.
rimulose – (pileus surface) minutely rimose.
rostrate – (cystidia) provided with a beak-like extension at apex (Vol. 1, Fig. 34.38).
rostrum – beak-like extension at the top of a cystidium.
Rotalis-type – see broom-cells.
rounded flabelliform – (pileus) (Vol. 1, Figs. 29.4; 29.5).
rounded triangular – (spores) rounded three-angled (Vol. 1, Fig. 33.15).
rugose – (pileus surface) irregularly wrinkled.
rugulose – (pileus surface) with minute irregular wrinkles.
sarcodimitic – (tissue) consisting of generative hyphae and chains of very long, thin- to thick-walled elements ("sarcoskeletals").
sarcoskeletals – see sarcodimitic.
sarcotrimitic – (tissue) consisting of (1) generative hyphae, (2) chains of very long thin- to thick-walled elements ("sarcoskeletals"), and (3) thick-walled binding hyphae.
scabrous – (stipe surface) scurfy.
Schaeffer-reaction – (pileus surface and surface of base of stipe) cross-reaction of aniline and concentrated nitric acid.
sclerotium – a (long) persisting compact mycelial body.
seceding – (lamellae) at first attached to stipe, but later separating from it (Vol. 1, Fig. 30.22).
secondary angiocarpy – a type of angiocarpic development in which in its later stages the primordial hymenium is enveloped by hyphae originating from the stipe and/or the pileus.
segmentiform – (lamellae) with straight lamella edges and convex upper side (Vol. 1, Figs. 30.7, 30.8, 30.9).
separable pellicle – (pileus) pileipellis a (thick) ixocutis, easily peeling off with help of a needle.
septate – (hyphae) with septa.
sericeous – (pileus and stipe surfaces) (= silky) covered with fine, straight, appressed, glossy hairs or fibrils.
serrate – (lamella edge) toothed like a saw (Vol. 1, Fig. 30.35).
serrulate – (lamella edge) minutely serrate (Vol. 1, Fig. 30.36).
sessile – (cystidia) without a stalk (Vol. 1, Fig. 34.47).
setiform – (cystidia) narrowly conical with thickened wall (Vol. 1, Fig. 34.16).
Siccus-type – see broom-cells.
side-view – (of spores) (Vol. 1, Fig. 32.1).
siderophilous – (particles in basidia) turning blackish purple or blackish violet in acetocarmine in presence of metal ions.
sinuate – (lamellae) having a concave indentation near the stipe (Vol. 1, Fig. 30.24).
skeletal hyphae – aseptate, thick-walled, straight of slightly flexuous hyphae.
slightly depressed – (pileus) with shallow central depression (Vol. 1, Fig. 29.24).
smooth – (pileus and stipe surfaces) without elevations, ridges, grooves, veins, etc.
solid – (stipe) made up of homogeneous tissue. (Vol. 1, Fig. 31.9).
solitary – (basidiocarp) single.
spathuliform – (pileus) elliptic or oblong tapering gradually towards eccentric or lateral stipe (Vol. 1, Fig. 29.3).

spheropedunculate – (cystidia) globose or subglobose with long stalk (Vol. 1, Fig. 34.6).
spinulose – (spores) covered with small spines.
spiny – covered with spines, see also spinulose.
squame – scale.
squamose – (pileus and stipe surfaces) covered with coarse (appressed) scales.
squamule – small scale.
squamulose – (pileus and stipe surfaces) covered with minute scales.
squarrose – (pileus and stipe surfaces) covered with projecting, coarse scales.
squarrulose – (pileus and stipe surfaces) covered with small projecting, coarse scales.
statismosporic basidium – a basidium that does not discharge its spores; they simply break off from the basidium.
sterile – (lamella edge) composed of cystidia only.
stipitipellis – cortical layer of stipe.
stipitocarpy – a type of development of the basidiocarp in which the first differentiating hyphae of the primordium are those of the stipe.
straight – (margin of pileus) not bent upwards or inwards (Vol. 1, Figs. 29.34, 29.35, 29.36).
striate – (pileus and stipe surfaces) marked with regular lines.
strigose – (pileus and stipe surfaces) covered with long, coarse or thick, rather stiff hairs.
stuffed – (stipe) having central part filled with tissue different from tissue in outer part (Vol. 1, Fig. 31.10).
sub- – slightly or almost, under.
subbulbous – (base of stipe) slightly bulbous (Vol. 1, Fig. 31.16).
subcapitate – (apex of cystidia) having a knob (Vol. 1, Fig. 34.43).
subclavate – (stipe) slightly club-shaped (Vol. 1, Fig. 31.7).
subcylindrical – (spores) Q = 2.0–3.0 (Vol. 1, Fig. 33.6).
subdecurrent – (lamellae) slightly decurrent, angle lamella-stipe 60–80° (Vol. 1, Fig. 30.27).
subglobose – nearly spherical (spores) Q = 1.05–1.15 (Vol. 1, Fig. 33.2); (cystidia) Q = 1.05–1.15 (Vol. 1, Fig. 34.4).
subgregarious – (basidiocarps) growing in a small group or growing in a group of widespread specimens.
subpellis – lower layer of (pilei-)pellis.
subregular – (hymenophoral trama) having slightly flexuous, nearly parallel hyphae (Vol. 1, Fig. 35.2).
subumbilicate – (pileus) having a small navel-like depression (Vol. 1, Fig. 29.26).
subumbonate – (pileus) with low, broad umbo (Vol. 1, Fig. 29.32).
subventricose – (lamellae) with slightly convex lamella edge (Vol. 1, Fig. 30.10).
sulcate – (pileus and stipe surfaces) with grooves.
suprahilar depression – (of spores) sinking just above the hilar appendage (Vol. 1, Fig. 32.4B).
suprahilar plage – (of spores) rounded, smooth area just above the hilar appendage (Vol. 1, Fig. 32.5D).
tapering downwards – (stipe) becoming narrower from apex to base (Vol. 1, Fig. 31.5).
tapering upwards – (stipe) becoming narrower from base to apex (Vol. 1, Fig. 31.6).
thick-walled – (spores) (Vol. 1, Fig. 32.6F).
tibiiform – (cystidia) lageniform with a long neck and capitate (Vol. 1, Fig. 34.34).
tomentose – (pileus and stipe surfaces) densely covered with matted (more or less appressed), soft hairs.
tooth – (of lamellae), see decurrent tooth.
tortuous – twisted or bent in different directions.
trabecular – (hymenophoral trama) having transversely oriented elements.
tract – (spores) channel in the spore wall leading to the germ pore.
transition between hymeniderm and epithelium – (Vol. 1, Fig. 36.3D).
transvenose – (lamellae) provided with veins on the surface (Vol. 1, Fig. 31.1).
triangular – (lamellae) (Vol. 1, Fig. 30.17); (spores), see rounded triangular.
trichoderm – a pileipellis made up of erect, straight elements, septate, and/or not originating at the same level (Vol. 1, Fig. 36.2A); see also intricate and irregular trichoderm.
trichohymeniderm – a hymeniderm made up of elements with Q > 6 (Vol. 1, Fig. 36.3A).
tricholomatoid – (habit) characterised by lamellae neither free, nor decurrent; stipe about the same length as pileus diametre or somewhat longer; context fleshy; context of pileus continuous with context of stipe (Vol. 1, Figs. 28.9, 28.10, 28.11).
truncate – ending abruptly as if cut off (apex of spores) (Vol. 1, Fig. 33.29); (apex of cystidia) (Vol. 1, Fig. 34.42).
truncately broadly conical – (pileus) broadly conical with as if cut off apex (Vol. 1, Fig. 29.16).
truncately conical – (pileus) conical with as if cut off apex (Vol. 1, Fig. 29.17).
tubular – (hymenophore) consisting of tubes.
tubuliform – (trama elements) tube-shaped.
twisted – (stipe) fibrils ranged spirally round axis because of the base of stipe being rotated with regard to apex.
umbilicate – (pileus) having a navel-like depression (Vol. 1, Fig. 29.27), see also deeply umbilicate.
umbo – (on pileus) broad rounded knob (Vol. 1, Fig. 29.33).
umbonate – (pileus) with broad rounded knob (Vol. 1, Fig. 29.33).
undate – (margin of pileus) wavy (Vol. 1, Fig. 29.43); (lamella edge) (Vol. 1, Fig. 30.31).
undate – (lamellae) undulating lamella edge.
undulate – minutely undate (margin of pileus) (Vol. 1, Fig. 29.44); (lamella edge) (Vol. 1, Fig. 30.32).
uniguttulate – (spores) with one droplet (Vol. 1, Fig. 32.6).
uninucleate – with one nucleus.
universal veil – see velum universale.
urticiform — (cystidia) lageniform with a long, tapering neck, bearing needle-shaped crystals, reminiscent of the nettle-cells of *Urtica* species. Two types are distinguished in the genus *Melanoleuca*: *brevipes*-type in which the upper cell is slender, cylindrical, and distinctly separated from the lower cell, and the septum without median spot (Vol. 4, Fig. 2.4), and *exscissa*-type with upper cell gradually attenuated towards apex, and base of upper cell rather wide (Vol. 4, Fig. 2.5).
utriform – (cystidia) characterised by neck broader than half width of cell body (Vol. 1, Fig. 34.28), see also narrowly utriform and broadly utriform.
vascular hyphae – usually aseptate, often irregular, flexuous hyphae with refractive contents.
velar sock – (stipe) covering of veil on lower part of stipe, forming a sock
velum partiale – (= partial veil) primordial tissue between the hymenophore and the stipe and tissues differentiating from this primordial tissues.
velum universale – (= universal veil) outer differentiated layer enveloping the primordial basidiocarp and tissues differentiating from this layer.

velutinous – (pileus and stipe surfaces) (= velvety) densely covered with fine, short, erect hairs.

venose – (pileus surface) with vein-like wrinkles, see also reticularly venose.

ventricose – (lamellae) with convex lamella edge (Vol. 1, Figs. 30.11, 30.12, 30.13), see also broadly ventricose; (stipe) considerably broader in the middle than at base and apex.

verrucose – (pileus and stipe surfaces, spores) covered with wart-like elevations; (cystidia) with small hollow or solid protuberances (Vol. 1, Fig. 34.46).

verruculose – (pileus and stipe surfaces, spores) covered with fine, wart-like elevations, see also verrucose.

very broadly fusiform – (spores) fusiform with Q = 1.15–1.5 (Vol. 1, Fig. 33.11); (cystidia) fusiform with Q < 1.5 (Vol. 1, Fig. 34.22).

very narrowly clavate – (basidia) clavate with Q > 8.0.

villose – (pileus and stipe surfaces) covered with fairly long, soft, more or less straight, not interwoven hairs.

virgate – (pileus and stipe surfaces) streaked.

viscid – (pileus and stipe surfaces) sticky.

water-spots – (surface of pileus and stipe) with roundish, darker spots, as if stained by drops of water.

width – (of spores) largest distance between sides as seen in side-view (Vol. 1, Fig. 32.1).

zonate – (pileus surface) with concentric paler and darker alternating coloured zones or bands.

CHAPTER 3

Abbreviations of Authors' Names in This Volume

E.C. VELLINGA AND M.E. NOORDELOOS

Allen & Young – S.J. Allen and A.M. Young
Anastasiou – C.J. Anastasiou
Anon. – Anonymous
Arnolds – E.J.M. Arnolds
Arnolds & Hauskn. – E.J.M. Arnolds and A. Hausknecht
Atk. – G.F. Atkinson
B. & Br. – M.J. Berkeley and C.E. Broome
Barbier – M. Barbier
Bas – C. Bas
Batsch – A.J.G.K. Batsch
Baumgartner – H. Baumgartner
Beeli – M. Beeli
Bender – H. Bender
Bender & Enderle – H. Bender and M. Enderle
Bender & Uljé – H. Bender and C.B. Uljé
Berk. – M.J. Berkeley
W. Beyer – W. Beyer
Bisby – G.R. Bisby
Boedijn – K.B. Boedijn
Bolt. – J. Bolton
M. Bon – M. Bon
Bon & Courtec. – M. Bon and R. Courtecuisse
Boud. – E. Boudier
Breitenb. & Kränzl. – J. Breitenbach and F. Kränzlin
Bres. – G. Bresadola
Brig. – V. Briganti
Britz. – M. Britzelmayer
Bull. – J.B.F. Bulliard
Bull. & Vent. – J.B.F. Bulliard and E.P. Ventenat
Buller – A.H.R. Buller
Cacialli – G. Cacialli
Cetto – B. Cetto
Chrispijn – R. Chrispijn
Citérin – M. Citérin
Clémençon – H. Clémençon
Colin & Joss. – M. Colin and M. Josserand
Consiglio – G. Consiglio
Contu – M. Contu
Cooke – M.C. Cooke
Cortés – C. Cortés
Courtec. & Duhem – R. Courtecuisse and B. Duhem
Courtecuisse – R. Courtecuisse
Curt. – M.A. Curtis
Daams – J. Daams
Dähncke – R.M. Dähncke
DC. – A.P. de Candolle
DC. & Lam. – A.P. de Candolle and J.B.A.P. de Monnet de Lamarck
Dennis – R.W.G. Dennis
Derbsch & Schmitt – H. Derbsch and J.A. Schmitt
Donelli & Simonini – G. Donelli and G. Simonini
Døssing & Watl. – H. Døssing and R. Watling
Doveri & Uljé – F. Doveri and C.B. Uljé
Dozy & Molkenboer – F. Dozy and J.H. Molkenboer
Earle – F.S. Earle
Enderle – M. Enderle
Enderle & Bender – M. Enderle and H. Bender
Enderle & Hübner – M. Enderle and H.-J. Hübner
Enderle & Moreno – M. Enderle and G. Moreno
Esteve-Rav. & de la Cruz – F. Esteve-Raventos and M. de la Cruz
Esteve-Raventos – F. Esteve-Raventos
J. Favre – J. Favre
Fay. – V. Fayod
Fillion – R. Fillion
Fr. – E.M. Fries
Fraiture & Vanholen – A. Fraiture and B. Vanholen
Furrer-Ziogas – C. Furrer-Ziogas
Geesink – J. Geesink
Gerhardt – E. Gerhardt
Gibbs – L.S. Gibbs
Gillet – C.C. Gillet
Godey – Godey
Göpfert – H. Göpfert
S.F. Gray – S.F. Gray
Guern. – C. de Guernisac
Guzmán – G. Guzmán
Harmaja – H. Harmaja
A. Hauskn. – A. Hausknecht
Hauskn. & Krisai – A. Hausknecht and I. Krisai
Hauskn. & Rücker – A. Hausknecht and T. Rücker
Hauskn. & Svrček – A. Hausknecht and M. Svrček
Hauskn. & Zucch. – A. Hausknecht and A. Zuccherelli
R. Heim – R. Heim
Heim & Romagn. – R. Heim and H.C.L Romagnesi
P. Henn. – P. Hennings
Henrici & Læssøe – A. Henrici and T. Læssøe
Hongo – T. Hongo
Hongo & Aoki – T. Hongo and H. Aoki
Hongo & K. Yokoyama – T. Hongo and K. Yokoyama
Hopple & Vilgalys – J.S. Hopple Jr. and R. Vilgalys
Horak – E. Horak
Horvers & de Cock – B. Horvers and A.W.A.M. de Cock
Hübner – H.J. Hübner

Hübsch – P. Hübsch
Huijsman – H.S.C. Huijsman
Imaz. – R. Imazeki
Imaz. & Hongo – R. Imazeki and T. Hongo
Imler – L. Imler
Imler & Springael – L. Imler and R. Springael
Immerzeel – G. Immerzeel
Jalink & Vellinga – L.M. Jalink and E.C. Vellinga
Jamoni – P.G. Jamoni
Joss. – M. Josserand
Joss. and Enderle – M. Josserand & M. Enderle
Kalchbr. – K. Kalchbrenner
P. Karst. – P.A. Karsten
Kawam. – S. Kawamura
Keizer & Uljé – P.J. Keizer and C.B. Uljé
G.J. Keizer – G.J. Keizer
Kemp & Watl. – R.F.O. Kemp and R. Watling
Kits v. Wav. – E. Kits van Waveren
Konr. & M. – P. Konrad and A. Maublanc
Krieglst. – G.J. Krieglsteiner
Krisai – I. Krisai and I. Krisai-Greilhuber
Kühn. & Joss. – R. Kühner and M. Josserand
Kühn. & Romagn. – R. Kühner and H.C.L Romagnesi
Kühn. & Watl. – R. Kühner and R. Watling
Kühner – R. Kühner
Kumm. – P. Kummer
Kytövuori – I. Kytövuori
L. – C. Linnaeus
Lanconelli – L. Lanconelli
Lanconelli & Lanzoni – L. Lanconelli and G. Lanzoni
J. Lange – J.E. Lange
J. Lange & Kühn. – J.E. Lange and R. Kühner
M. Lange – M. Lange
M. Lange & A.H. Smith – M. Lange and A.H. Smith
Lasch – W.G. Lasch
Legros – J.-P. Legros
Lév. – J.H. Léveillé
C.G. Lloyd – C.G. Lloyd
Locq. – M. Locquin
Lohmeyer – T.R. Lohmeyer
Lonati – G. Lonati
Longyear – B.O. Longyear
Ludwig – E. Ludwig
Ludwig & Roux – E. Ludwig and P. Roux
Lund. & Nannf. – S. Lundell and J.A. Nannfeldt
Lundell – S. Lundell
Maire – R. Maire
Maire & Kühner – R. Maire and R. Kühner
Marchand – A. Marchand
Métrod – G. Métrod
M. Meusers – M. Meusers
Michael – E. Michael
Middelhoek & Reijnders – A. Middelhoek and A.F.M. Reijnders
Migl. & Coccia – V. Migliozzi and M. Coccia
Moncalvo – J.-M. Moncalvo
Monti – G. Monti
Moreno – G. Moreno
Morgan – A.P. Morgan
Mos. – M.M. Moser
Mos. & Jül. – M.M. Moser and W.F.B. Jülich
O.F. Müll. – O.F. Müller
Murrill – W.A. Murrill
Narducci & Petrucci – R. Narducci and P. Petrucci
Nauta – M.M. Nauta
Olofsson – D. Olofsson
P.D. Orton – P.D. Orton
P.D. Orton & Watl. – P.D. Orton and R. Watling
Otth – G.H. Otth
Overeem & Weese – C. van Overeem and J. Weese
Papeti – C. Papeti
Pat. – N.T. Patouillard
Paulus – W. Paulus
Pears. & Dennis – A.A. Pearson and R.W.G. Dennis
Peck – C.H. Peck
Pegl. & Legon – D.N. Pegler and N.W. Legon
Peintner – U. Peintner
Penn. – L.H. Pennington
Pers. – C.H. Persoon
Petch – T. Petch
R. Phillips – R. Phillips
Pilát & Svrek – A. Pilát and M. Svrek
Quél. – L. Quélet
Raithelhuber – J. Raithelhuber
Rald – E. Rald
Rald & Strandberg – E. Rald and M. Strandberg
Rea – D. Rea
Redeuilh – G. Redeuilh
Redhead – S.A. Redhead
Redhead, Vilgalys & Hopple – S.A. Redhead, R. Vilgalys and J.S. Hopple Jr.
Redhead, Vilgalys & Moncalvo – S.A. Redhead, R. Vilgalys and J.-M. Moncalvo
D. Reid – D.A. Reid
Reijnders – A.F.M. Reijnders
Richter & Bender – T. Richter and H. Bender
Rick. – A. Ricken
Rocabruna – A. Rocabruna
Romagn. – H.C.L. Romagnesi
Roussel – H.F.A. de Roussel
Ryman & Holmåsen – S. Ryman and I. Holmåsen
Sacc. – P.A. Saccardo
Sacc. & Sacc. – P.A. Saccardo and D. Saccardo
J.E. Sass – J.E. Sass
Schaeff. – J.C. Schaeffer
J. Schaeff. – J. Schaeffer
S. Schulz. – S. Schulzer von Muggenburg
Schum. – H.C.F. Schumacher
Schwegler – J. Schwegler
Sing. – R. Singer
Sing. & Hausknecht – R. Singer and A. Hausknecht
A.H. Smith – A.H. Smith
W.G. Sm. – W.G. Smith
Springael & Imler – R. Springael and L. Imler
Stamets – P. Stamets
Stangl – J. Stangl
Strandberg – M. Strandberg
Stridvall – L. Stridvall
Svrček – M. Svrček
Tabarés – M. Tabarés
Täglich – U. Täglich
Thümen – F. (K.A.E.J.) von Thümen
Uljé – C.B. Uljé

Uljé & Bas – C.B. Uljé and C. Bas
Uljé & Noordel. – C.B. Uljé and M.E. Noordeloos
Uljé & Horvers – C.B. Uljé and B. Horvers
Uljé & Verbeken – C.B. Uljé and A.T. Verbeken
Van De Bogart – F. Van De Bogart
Velen. – J. Velenovsky
Veselský & Watl. – J. Veselský and R. Watling
Vesterholt – J. Vesterholt
Vilgalys, Hopple & Johnson – R. Vilgalys, J.S. Hopple Jr. and J. Johnson
T.J. Wallace – T.J. Wallace
Watl. & Gregory – R. Watling and N.M. Gregory
Watl. & Knudsen – R. Watling and H. Knudsen
Watling – R. Watling
Weinm. – J.A. Weinmann
Zschieschang – G. Zschieschang
Zuccherelli – A. Zuccherelli

Chapter 4

Bibliographic Abbreviations

E.C. Vellinga and M.E. Noordeloos

a. Books

Arnolds et al., Overz. Paddest. Nederland – Overzicht van de paddestoelen in Nederland.

Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands – Ecology and Coenology of macrofungi in grasslands and moist heathlands in Drenthe, the Netherlands. In *Bibltheca mycol.* 90.

Batsch, Elench. Fung., Cont. prima – Elechus fungorum continuatio prima.

Berk., Outl. Brit. Fungol. – Outlines of British fungology.

Berk., Brit. Fungi – British Fungi.

Bisby et al., Fungi Manitoba – The fungi of Manitoba.

Bolt., Hist. Fung. Halifax – A history of fungusses growing in Halifax.

M. Bon, Champ. Eur. occid. – Champignons d'Europe occidentale.

M. Bon, Mushr. Toadst. – Mushrooms and Toadstools of Britain and North-Western Europe.

Breitenb. & Kränzl., Pilze Schweiz – Pilze der Schweiz.

Bres., Fungi trident. – Fungi tridentini.

Bres., Iconogr. mycol. – Iconographia mycologica.

Bresinsky & Besl, Giftpilze – Giftpilze mit einer Einführung in die Pilzbestimmung. Ein Handbuch für Apotheker, Ärzte und Biologen.

Brig., Hist. Fung. Neapol. – Historia fungorum regni Neapolitani …

Britz., Hymenomyc. Südbayern. – Hymenomyceten aus Südbayern. In various journals.

Bull., Herb. France – Herbier de France.

Bull. & Vent., Hist. Champ. Fr. – Histoire des champignons de la France.

Cacialli et al., Contributio ad Cognitionem Coprinorum – Contributio ad Cognitionem Coprinorum. Pagine di Micologia, Monografie, Tomo 1.

Cetto, Funghi Vero – Funghi dal Vero.

Cetto, Gr. Pilzf. – Der große Pilzführer.

Chrispijn, Champ. Jordaan – Champignons in de Jordaan. De paddestoelen van Amsterdam.

Cooke, Ill. Brit. Fungi – Illustrations of British fungi.

Courtec. & Duhem, Guide Champ. France Europe – Guide des champignons de France et d'Europe.

Curt., Fl. londin. – Flora londinesis.

Dähncke, 1200 Pilze – 1200 Pilze.

DC. & Lam., Fl. franç. – Flore française, …

Derbsch & Schmitt, Atlas Pilze Saarland – Atlas der Pilze des Saarlandes. In Aus Natur und Landschaft im Saarland.

J. Favre, Ass. fong. Hauts-Marais – Les associations fongiques des hauts-marais jurassiens et de quelques régions voisines. In Mat. Fl. crypt. Suisse 10(3).

Fr., Epicrisis – Epicrisis systematis mycologi.

Fr., Hymenomyc. eur. – Hymenomycetes europaei sive Epicriseos systematis mycologici.

Fr., Ic. sel. Hymenomyc. – Icones selectae hymenomycetum selectum nondum delineatorum.

Fr., Monogr. Hymenomyc. Sueciae – Monographia Hymenomycetum Sueciae.

Fr., Observ. mycol. – Observationes mycologicae.

Fr., Syst. mycol. – Systema mycologicum.

Fr., Syst. mycol., Ind. gen. – Systema mycologicum, Index generalis.

Gerhardt, Gr. Pilzf. – Große BLV Pilzführer.

Gerhardt, Grote Paddestoelengids – De Grote Paddestoelengids.

Gillet, Champ. France – Les champignons (fungi, hyménomycètes) qui croissent en France et description et iconographie, propriétés utiles ou vénéneuses.

Gillet, Hyménomycètes – Les Hyménomycètes.

S.F. Gray, Nat. Arr. Br. Pl. – Natural Arrangement of British Plants.

Hook., Brit. Fl. – W.J. Hooker, British Flora.

Horak, Syn. Gen. Agar. – Synopsis Generum Agaricalium. In *Beitr.* Kryptog. Fl. Schweiz 13.

Imaz. et al., Fungi Japan – Fungi of Japan.

Imaz. & Hongo, Col. Ill. Mushr. Japan – Coloured illustrations of mushrooms of Japan.

P. Karst., Ryssl., Finl. Skand. Halføns Hattsvamp. – Rysslands, Finlands och den Skandinaviska halføns hattsvampar. In Bidr. Känn. Finl. Nat. Folk 32.

P. Karst., Symb. mycol. fenn. – Symbolae ad mycologicam fennicam. In various journals.

Kawam., Icones Jap. Fungi – Icones of Japanese fungi.

G.J. Keizer, Interactieve paddestoelengids – Interactieve paddestoelengids; CD-ROM

G.J. Keizer, Paddestoelenencyclopedie — Paddestoelenencyclopedie.

Konr. & M., Ic. sel. Fung. – Icones selectae Fungorum.

Kühn. & Romagn., Compl. Fl. anal. – Compléments à la 'Flore analytique'. In various journals; in Biblthеca mycol. 56.

Kühn. & Romagn., Fl. anal. Champ. sup. – Flore analytique des champignon supérieurs.

Kühner, Genre Galera – Le genre Galera.

Kumm., Führ. Pilzk. – Der Führer in die Pilzkunde.

L., Spec. Pl. – Species plantarum.

Lanconelli et al., Funghi Lughese – Funghi del Lughese.

J. Lange, Fl. agar. dan. – Flora agaricina danica.

M. Lange, Paddestoelengids – Paddestoelengids.

Ludwig, Pilzkompendium – Pilzkompendium.

Marchand, Champ. Nord Midi – Champignons du nord et du midi.

Michael et al., Handb. Pilzfr. – Handbuch für Pilzfreunde.

Monti, Fungi cenosi Aree bruciate – Fungi cenose di aree bruciati.
Moreno et al., Guia Incafo Hongos Penins. Iberica – La Guia de Incafo de los Hongos de la Peninsula Iberica.
Mos., Blätter, Bauchpilze – Die Blätter und Bauchpilze.
Mos., Röhrlinge Blätterpilze – Röhrlinge und Blätterpilze.
Mos. & Jül., Farbatl. Basidiomyc. – Farbatlas der Basidiomyceten.
O.F. Müll., Fl. Danica – Flora danica.
Nauta, Revisie Agrocybe – Revisie van de in Nederland voorkomende soorten van het geslacht Agrocybe.
Overeem & Weese, Icon. Fung. malay. – Icones fungorum malayensium. Abbildungen und Beschreibungen der malayischen Pilze.
Pat., Tab. anal. Fung. – Tabulae analyticae fungorum.
Pers., Comm. Schaeff. Icon. pict. – Commentarius D. Iac. Christ. Schaefferi, … fungorum Bavariae indigenorum icones pictas differentiis specificis, synonymis et observationibus selectis illustrans.
Pers., Syn. meth. Fung. – Synopsis methodica fungorum.
Pers., Tent. Disp. meth. Fung. – Tentamen dispositionis methodicae fungorum ...
R. Phillips, Mushr. other Fungi – Mushrooms and other fungi of Great Britain and Europe.
R. Phillips, Paddest. Schimm. – Paddestoelen en schimmels van West-Europa.
Quél., Champ. Jura Vosges – Les champignons du Jura et des Vosges. In various journals.
Quél., Enchir. Fung. – Enchiridion fungorum qui in Europa media et praesertim in Gallia vigentium.
Quél., Fl. mycol. France – Flore mycologique de la France et des pays limitrophes.
Rea, Brit. Basidiomyc. – British Basidiomycetae.
Rick., Blätterpilze – Die Blätterpilze (Agaricaceae) Deutschlands und der angrenzenden Länder, besonders Oesterreichs un der Schweiz.
Roussel, Fl. Calvados – Flore du Calvados et des terreins adjacens; composée suivant la méthode de m. Jussieu; comparée avec celle de Tournefort et de Linné.
Ryman & Holmåsen, Svampar – Svampar.
Sacc., Syll. Fung. – Sylloge fungorum.
Schaeff., Fung. Bavariae – Fungorum qui in Bavaria et Palatinatu circa Ratisbonam nascuntur icones.
Schum., Enum. Pl. Saell. – Enumeratio plantarum in partibus Saellandiae septrentionalis et orientalis….
Scop., Fl. carn. – Flora carniolica.
W.G. Sm., Synopsis Brit. Basidiomyc. – Synopsis of the British basidiomycetes.
Velen., České Houby – České Houby.
Velen., Novit. mycol. – Novitates mycologicae.
Velen., Novit. mycol. nov. – Novitates mycologicae novissimae.
Weinm., Hymenomyc. Gasteromyc. Imp. ross. obs. – Hymeno et Gasteromycetes hucusque in imperio rossico observatos….
Zuccherelli, Funghi Pinete Zone medit. – I funghi delle pinete delle zone mediterranee.

b. Journals

Acta bot. Island. – Acta botanica Islandica.
Acta Soc. Fauna Fl. fenn. – Acta Societatis pro fauna et flora Fennica.
Am. J. Bot. – American Journal of Botany.
Ann. Mag. nat. Hist. – Annals and Magazine of Natural History.
Ann. R. bot. Gdns Peradeniya – Annals of the Royal Botanic Gardens of Geradeniya.
Annls mycol. – Annales mycologici.
Annls Sci nat. – Annales des Sciences naturelles.
Annls Soc. linn. Lyon – Annales de la Societé linnéenne de Lyon.
Beih. bot. Zbl. – Beihefte zum Botanischen Zentralblatt.
Beih. Nova Hedwigia – Beihefte zur Nova Hedwigia.
Beih. Sydowia – Beihefte zur Sydowia.
Beitr. Kenntn. Pilze Mitteleur. – Beiträge zur Kenntnis der Pilze Mitteleuropas.
Beitr. Kryptog.Fl. Schweiz – Beiträge zur Kryptogamenflora der Schweiz.
Ber. bayer. bot. Ges. – Bericht der Bayerischen botanischen Gesellschaft zur Erforschung der heimischen Flora.
Ber. naturh. Ver. Augsburg – Bericht des naturhistorischen Vereins in Augsburg.
Biblthеca mycol. – Bibliotheca mycologica
Bidr. Känn. Finl. Nat. Folk – Bidrag til kännedom om Finlands natur och folk.
Blumea – Blumea.
Bol. Soc. argent. Bot. – Boletin Sociedade argentina de Botanica.
Bol. Soc. micol. Castellana – Boletín de la Sociedad Micologia Castellana.
Bol. Soc. micol. Madrid – Boletín de la Sociedad Micologica de Madrid.
Bolets Catalunya – Bolets de Catalunya.
Boletus – Boletus.
Boll. Ass. micol. ecol. Romana – Bollettino dell' Associazione micologica ed ecologica romana.
Boll. Circ. micol. G. Carini – Bollettino del Circolo micologico «Giovanni Carini».
Boll. Gruppo micol. G. Bres. – Bollettino del Gruppo micologico 'G. Bresadola.'
Bot. Zbl. – Botanisches Zentralblatt.
Bot. Gaz. – Botanical Gazette.
Botaniste – Le Botaniste.
Br. Fung. Fl. – British Fungus Flora.
Bull. Buffallo Soc. nat. Sci – Bulletin of the Buffalo Society of Natural Sciences.
Bull. Féd. mycol. Dauph. Savoie – Bulletin trimestriel de la Fédération Mycologique Dauphiné-Savoie.
Bull. mens. Soc. linn. Lyon – Bulletin mensuel de la Société Linnéenne de Lyon.
Bull. N.Y. bot. Gdn – Bulletin of the New York Botanical Garden.
Bull. N.Y. St. Mus. – Bulletin of the New York State Museum.
Bull. semest. Soc. mycol. Nord – Bulletin semestriel de la Société Mycologique du Nord.
Bull. Soc. bot. Fr. – Bulletin Société botanique. France.
Bull. Soc. Nat. Oyonnax – Bulletin de la Société des naturalistes d'Oyonnax pour l'étude et la diffusion des sciences naturelles dans la région.
Bull. Soc. Sci. nat. Saône-et-Loire – Bulletin de la Société des Sciences naturelles de Saône-et-Loire.
Bull. Torrey bot. Cl. – Bulletin of the Torrey Botanical Club.
Bull. trimest. Soc. mycol. Fr. – Bulletin trimestriel de la Société mycologique de France.
C. r. Ass. franç. Av. Sci. – Compte rendu de l'Association française pour l'avancement des sciences.
Can. J. Bot. – Canadian Journal of Botany.
Česká Mykol. – Česká Mykologie.
Collect. bot. – Collectanea botanica.
Coolia – Coolia.
Cryptog. Mycol. – Cryptogamie, Mycologie.
Czech Mycol. – Czech Mycology.
Dansk bot. Ark. – Dansk botanisk Arkiv.
Doc. mycol. – Documents mycologiques.

Encycl. mycol. – Encyclopédie mycologique.
Feddes Repert. – Feddes Repertorium.
Fieldiana, Bot. – Fieldiana, Botany.
Flora – Flora.
Fung. rar. Ic. col. – Fungorum rariorum icones coloratae. In various journals.
Funghi Amb. – Funghi e ambiente.
Fungi exs. suec. – Fungi exsiccati sueci.
Fungi non del. – Fungi non delineatorum.
Fungus – Fungus.
Gdns' Bull. Singapore – Gardens' Bulletin. Singapore.
Göteborgs Svampekl. Årsskr. – Göteborgs Svampeklubbs Årsskrift.
Grevillea – Grevillea.
Hedwigia – Hedwigia.
Hoppea – Hoppea.
Ic. Mycol. – Icones mycologicae. Jardin botanique, Bruxelles.
Icones Jap. Fungi – Icones of Japanese fungi.
J. Cincinnati Soc. nat. Hist. – The Journal of the Cincinnati Society of Natural History.
J. jap. Bot. – Journal of Japanese Botany.
J. linn. Soc., Bot. – Journal of the Linnean Society, Botany.
Jordstjärnan – Jordstjärnan.
Kew Bull. – Kew Bulletin.
Libri bot. – Libri botanici.
Lilloa – Lilloa.
Linnaea – Linnaea.
Lond. J. Bot. – London Journal of Botany.
Mat. Fl. crypt. Suisse – Matériaux pour la Flore cryptogamique Suisse.
Meddn Soc. Fauna Fl. fenn. – Meddelanden af Societatis pro Fauna et Flora fennica.
Meded. Ned. mycol. Vereen. – Mededeelingen van de Nederlandsche Mycologische Vereeniging.
Mem. Fac. Educ. Shiga Univ. Nat. Sci. – Memoirs of the Faculty of Education, Shiga University. Natural Science.
Mém. Soc. Émul. Montbéliard – Mémoires de la Société d'émulation de Montbéliard.
Mém. Soc. Sci. nat. Maroc – Mémoires de la Société des Sciences naturelles de Maroc.
Micol. ital. – Micologia italiana.
Micol. Veget. medit. – Micologia e vegetazione mediterranea.
Micologia 2000 – Micologia 2000.
Mitt. Naturf. Gesellsch. Bern – Mitteilungen der naturforschenden Gesellschaft in Bern.
Mittbl. Arbeitsgem. Pilzk. Niederrhein – Mitteilungsblatt der 'Arbeitsgemeinschaft Pilzkunde Niederrhein'.
Mol. Phylogen. Evol. – Molecular Phylogenetics and Evolution.
Mycol. helv. – Mycologia helvetica.
Mycol. Notes – Mycological Notes.
Mycol. Res. – Mycological Research.
Mycologia – Mycologia.
Mycologist – The Mycologist; Mycologist.
Mycotaxon – Mycotaxon.
Mykol. Mittbl. – Mykologisches Mitteilungssblatt.
Mykologia – Mykologia.
N. Amer. Fl. – North American Flora.
Naturalist – The Naturalist.
Nordic J. Bot. – Nordic Journal of Botany.
Notes R. bot. Gdn Edinb. – Notes from the Royal Botanic Garden, Edinburgh.
Nova Hedwigia – Nova Hedwigia.
Öfvers. K. Vetensk. Akad. Förh. Stockholm – Öfversigt af den Kongeligen Vetenskapsakademiens Förhandlinger Stockholm.
Österr. Z. Pilzk. – Österreichische Zeitschrift für Pilzkunde.
Pag. Micol. – Pagine di Micologia.
Papers Mich. Acad. Sci., Arts Letters – Papers from the Michigan Academy of Science, Arts and Letters.
Persoonia – Persoonia.
Pl. Syst. Evol. – Plant Systematics and Evolution.
Proc. Amer. phil. Soc. – Proceedings of the American Philosophical Society.
Proc. Kon. Ned. Acad. Wetensch. – Proceedings van de Koninklijke Nederlandse Akademie van Wetenschappen.
Rep. N.Y. St. Mus. Nat. Hist. – Report on the New York State Museum of Natural History.
Rev. Mycol. – Revue de Mycologie.
Rheinl. Pfälz. Pilzj. – Rheinländisches Pfälzisches Pilzjahrbuch.
Riv. Micol. – Rivista di Micologia.
Schede Micol. – Schede di Micologia
Schweiz. Z. Pilzk. – Schweizerische Zeitschrift für Pilzkunde.
Sieni Lehti – Sieni Lehti.
Sterbeeckia – Sterbeeckia.
Südwestd. Pilzrundschau – Südwestdeutsche Pilzrundschau.
Svampe – Svampe.
Sydowia – Sydowia.
Symb. mycol. fenn. – Symbolae mycologicae fennicae.
Syst. Biol. – Systematic Biology.
Taxon – Taxon.
Tijdschr. nat. Gesch. Phys. – Tijdschrift voor natuurlijke Geschiedenis en Physiologie.
Trans. Br. mycol. Soc. – Transactions of the British Mycological Society.
Trans. mycol. Soc. Japan – Transactions of the Mycological Society of Japan.
Trudy bot. Inst. Akad. Nauk SSSR – Trudy botanicheskego instituta. Akademiy nauk SSSR.
Ulmer Pilzfl. – Ulmer Pilzflora.
Verh. bot. Ver. Prov. Brandenb. – Verhandlungen des Botanischen Vereins für die Provinz Brandenburg.
Verh. zool. bot. Ges. Wien – Verhandlungen der Zoologisch-botanischen Gesellschaft in Wien.
Westf. Pilzbr. – Westfälische Pilzbriefe.
Z. Mykol. – Zeitschrift für Mykologie.
Z. Pilzk. – Zeitschrift für Pilzkunde.

B

Taxonomic Part

COPRINACEAE Overeem

MACHIEL E. NOORDELOOS

Coprinaceae Overeem in Overeem & Weese, Icon. Fung. malay. 6: 3. 1924. – Psathyrellaceae Redhead, Vilgalys & Hopple, in Taxon 50: 226. 2001.

Basidiocarps small to large, mycenoid or coprinoid, rarely tricholomatoid; veil often present; lamellae deliquescent or not; spore print dark: brown, purple-brown, or black; spores smooth, nodulose, or ornamented, thick-walled, usually with distinct germ pore; hymenium either consisting of uniform basidia or made up of basidia, which can be of unequal length, and sterile pseudoparaphyses surrounding the basidia; hymenial cystidia often present; pileipellis a cutis or a hymeniderm, often covered with velar structures; clamp connections usually present. Development usually bivelangiocarpic or hemiangiocarpic, more rarely gymnangiocarpic or paravelangiocarpic. – Type genus: *Coprinus* Pers.

HABITAT & DISTR. — Solitary to gregarious or in big clusters, saprotrophic in humus, on dead wood, on vegetal debris, dung, etc.

KEY TO THE GENERA

1. Lamellae spotted because of disjunct ripening of the spores, which do not bleach in sulfuric acid **Panaeolus** s.l. (not included here)
1. Lamellae not spotted; spores ripening all in the same time, generally bleaching in concentrated sulfuric acid.
   2. Basidiocarps typically with a plicate pileus; basidia surrounded by pseudoparaphyses; pleurocystidia that bridge the whole space between the lamellae present, rarely absent; lamellae usually deliquescent . . . . . **1. Coprinus**
   2. Basidiocarps different, pileus not plicate; basidia not surrounded by pseudoparaphyse pleurocystidia, which bridge the whole space between the lamellae absent; lamellae not deliquescent
      Psathyrella incl. **Lacrymaria** (not included here)

The family limits are currently under debate as a result of molecular-phylogenetic studies. The position of *Panaeolus* and part of *Coprinus* within the family is questionable. *Panaeolus* might be more related to the Bolbitiaceae, whereas *Coprinus comatus* and similar species definitely have to be transferred to the Agaricaceae (see the discussion following the generic description of *Coprinus*).

1. **Coprinus** Pers.

C. (Kees) B. Uljé (†)

Coprinus Pers., Tent. Disp. meth.: 62. 1797; *Agaricus* subgenus *Coprinus* (Pers. :Fr.) Fr., Syst. mycol. 1: 11, 306. 1821; *Annularius* Roussel, Fl. Calvados, Ed. 2: 61. 1806 (see note); *Onchopus* P. Karst., Ryssl, Finl. Skand. Halföns Hattsvamp.: xxviii, 526. 1879; *Oncopus* P. Karst., Ryssl, Finl. Skand. Halföns Hattsvamp.: 526. 1879 (illegitimate, superfluous name change); *Pselliophora* P. Karst., Ryssl, Finl. Skand. Halföns Hattsvamp.: xxviii, 528. 1879; *Coprinellus* P. Karst., Ryssl, Finl. Skand. Halföns Hattsvamp.: xxviii, 542. 1879; *Coprinopsis* P. Karst. in Acta Soc. Fauna Fl. fenn. 2(1): 27. 1881, non *Coprinopsis* Beeli 1929; *Lentispora* Fay. in Annls Sci. nat., Série VII, 9: 379. 1889; *Pseudocoprinus* Kühner in Botaniste 20: 155. 1928; *Parasola* Redhead, Vilgalys & Hopple in Taxon 50: 235. 2001.

Selected Literature — Bender et al. in Z. Mykol. 50: 17–40. 1984; Bender & Enderle in Z. Mykol. 54: 45–68. 1988; Bender & Enderle in Z. Mykol. 61: 11–28. 1995; Cacialli et al., Contributio ad Cognitionem Coprinorum. 1999; Citérin in Doc. mycol. 22 (86): 1–28. 1992; Enderle et al. in Z. Mykol. 52: 101–132. 1986; Krieglst. et al. in Z. Mykol. 48: 65–88. 1982; Hopple & Vilgalys in Mol. Phylogen. Evol. 13: 1–19, 1999; Lanconelli & Lanzoni in Boll. Gruppo micol. G. Bres. 31: 228–261. 1988; J. Lange, Fl. agar. dan. 4. 1939; M. Lange in Dansk bot. Ark. 14 (6): 1–164. 1952; M. Lange & A.H. Smith in Mycologia 45: 747–780. 1953; P.D. Orton & Watl. in Br. Fung. Fl. 2. 1979; Reijnders in Persoonia 10: 383–424. 1979 (on development); Uljé in Persoonia 13: 479–488. 1988; Uljé & Bas in Persoonia 13: 433–448. 1988; Uljé & Bas in Persoonia 14: 275–339. 1991; Uljé in Persoonia 14: 565–569. 1992; Uljé & Noordel. in Persoonia 15: 257–301, 357–368. 1993; Uljé & Noordel. in Proc. Kon. Ned. Acad. Wetensch. 99: 105–124. 1996; Uljé & Bender in Persoonia 16: 373–381. 1997; Uljé & Noordel. in Persoonia 16: 265–333. 1997; Uljé et al. in Persoonia 16: 537–540. 1998; Uljé et al. in Persoonia 16: 549–551. 1998; Uljé & Noordel. in Persoonia 17: 165–199. 1999; Uljé & Noordel. in Persoonia 17: 339–375. 2000; Uljé et al. in Persoonia 17: 465–471. 2000.

Pileus deliquescent very soon in most species. Basidiocarps coprinoid or mycenoid, rarely very small, small to medium, a few rather large, 3–80 mm when pileus expanded, subglobose to ellipsoid or oblong in young stages, the smaller ones expanding to flat often finally with upturned margin, the medium species in part only expand to conical. Pileus with or without veil; glabrous or pruinose from thin- or thick-walled pileocystidia, granular or powdery from spherocysts or globulose velar element. Veil (if present) covering entire pileus in primordial stage, then breaking up into granular, felty, or hairy flocks, in some species abundant, in others very minute and soon disappearing, white (silvery), grey, ochre-brown, red-brown, sepia to almost black, yellowish or orange, a few species can have a shade of green. Context thin, 0.5–3 mm when pileus 8–40 mm in diam., up to 6 mm thick when 70 mm wide. Lamellae free, first white, soon grey to dark grey or black and then in most cases deliquescent and dissolving into ink. Stipe white, whitish or pale brown, the brown colour especially at base, smooth and naked or pruinose from caulocystidia, slightly tapering towards apex or, less frequent, equal, with somewhat clavate or subbulbous base, not rooting or rarely, with dark rhizomorphs in one species; solid or hollow, in a few species (*C. comatus*) with central strand. A small number of species have a bulbous, often marginate stipe base. A few species have a ring. Spore print very dark purple or violaceous brown to black.

Spores medium to dark red-brown or almost black, in general the largest spores the darkest; very variable in size and shape; Q in frontal view c. 1–2; smooth or warty; with myxosporium in some species; germ pore present, 1–2.5 mm in diametre, central or eccentric. Basidia (1-), 2-, 3-, or 4-spored, trimorphic, the largest twice or more as long as shortest ones; surrounded by 3–6 up to 5–8(9) pseudoparaphyses, the latter often twice as large or more in diametre as the basidia. Pleuro- and cheilocystidia present, seldom absent, and often rather to very large; pleurocystidia absent in subsect. *Coprinus*. Pileipellis hymeniform or a cutis, with or without clamp-connections. Veil present or absent, made up of (sub)globose, ellipsoid to fusoid cells, hyphal elements or a mixture of these type of elements. Clamp-connections present or absent. Development bivelangiocarpic in most species, paravelangiocarpic in subsect. *Setulosi*, and gymnangiocarpic in subsect. *Glabri*, pileostipiticarpic, rarely pileocarpic, perhaps isocarpic in some cases. Lectotype *C. comatus* (O.F. Müll. :Fr.) Pers. or *C. atramentarius* (Bull. :Fr.) Fr. (typus conservandus propositus).

HABITAT & DISTR. — Solitary, gregarious, or fasciculate, saprotrophic, terrestrial or on (dead) plant material, from grass blades to tree trunks, many species on dung of herbivorous animals, a few species developing on sclerotia, in open vegetation, scrub, or woods; cosmopolitan.

Most *Coprinus* species are very easily recognised in the field because of the deliquescent lamellae, making them true " inkcaps." In a few cases this can be difficult, particularly in the case of *C. disseminatus* and related species, which do not have deliquescent lamellae. Microscopical characters, such as distinct pseudoparaphyses clearly characterise these species as coprinoid. Most *Coprinus* species are without value for consumption, except for *C. comatus*, which is well-known for its culinary value. *Coprinus atramentarius*, and possibly also related species, however, can be eaten only with precaution. Consumption in combination with alcohol may lead to severe disease symptoms, known as the coprin-syndrome (Bresinsky & Besl, Giftpilze: 119–129. 1985).

Note from the Editors

After the sudden death of the author in May 2003 the manuscript of *Coprinus* was still in an early stage of editing. The editors, therefore, had to complete the work, including nomenclatural changes, and adding some data in the text. They have been careful, however, to stick as close as possible to the original text and opinions of the author.

The taxonomy of the genus *Coprinus* has been in major flux. A molecular phylogeny of coprinoid fungi indicated that the *C. comatus* clade (incl. *C. comatus*, *C. sterquilinus,* and *Montagnea* species) is distant from the other species of *Coprinus*. In fact, that group is far more related to the Agaricaceae than to the Coprinaceae (Hopple & Vilgalys in Mol. Phylogen. Evol. 13: 1–19. 1999; Moncalvo et al. in Mol. Phylogen. Evol. 23: 357–400. 2002; Johnson in Mycologia 91: 443–458. 1999; Johnson & Vilgalys in Mycologia 90: 971–979. 1998; Vellinga, in Mycol. Res. 108: 354–377. 2004). That conclusion implies that the coprin syndrome (deliquescent lamellae, black spores, presence of pseudoparaphyses) must have originated at least twice. Even though subsequent morphological studies have provided further evidence that the group around *C. comatus* is not a typical *Coprinus* (reddening lamellae when young, hollow stipe with suspending marrow-like strand, absence of pleurocystidia), it is still inevitable that in a morphology-based flora this group has to be included in the identification keys of coprinoid fungi and hence in this volume. Recognition that the *C. comatus* group must be transferred to the Agaricaceae also has nomenclatural consequences, as *C. comatus* has been chosen as the lectotype for *Coprinus*. Redhead et al. (in Taxon 50: 203–241. 2001) have drawn that nomenclatural consequence and have transferred almost all of the species formerly classified in *Coprinus* to other genera. However, in order to avoid undesirable nomenclatural consequences, a proposal has been made (Jørgensen et al. in Taxon 50: 909. 2001) to have *C. atramentarius* as typus conservandus for the genus *Coprinus*. If that proposal is accepted, the generic name *Annularius* should be used for species of the *C. comatus* clade. A further consequences would be that the family name Coprinaceae can be maintained and must not be replaced by the name Psathyrellaceae. A first vote for the proposal to have *C. atramentarius* as a typus conservandus did not get a sufficient majority but was not rejected, either.

As a final decision on nomenclature had not been reached when this volume went to the press, it was unavoidable that the editors had to make their own decision.

- We decided to maintain the family name Coprinaceae and the generic name *Coprinus* for all the coprinoid fungi.
- We did not classify the *C. comatus* clade in *Annularius* (where the new combinations need to be made) as a concession to the users of this flora. We state categorically that we do imply that *Coprinus* is not monophyletic.
- We accept that the *C. comatus* clade is not congeneric with the remainder of the coprinoid fungi, and that this group finds its natural place in the Agaricaceae. In this case, the conflict between morphology and molecules must be resolved in favor of the molecular data (to which some morphological data can be added as additional evidence).

We did not accept a further subdivision of *Coprinus* in several segregate genera. Hopple and Vilgalys (in Mol. Phylogen. Evol. 13: 1–19, 1999) and subsequently Moncalvo et al. (in Mol. Phylogen. Evol. 23: 357–400. 2002) claimed that the remodeled *Coprinus* (after exclusion of the *C. comatus* group) may still not be monophyletic. Both phylogenies suggest that *Coprinus* could be polyphyletic (and that *Psathyrella* may be paraphyletic or polyphyletic). However, a comparison of both phylogenies suggests a number of unexplained anomalies (the position of *Lacrymaria* as a sister group of subsect. *Auricomi* and *Glabri*, or as a sister group to a *Psathyrella* species; the position of *C. cordisporus*; *Psathyrella* as paraphyletic or polyphyletic aggregate; the monophyly of subsect. *Setulosi*; monophyly of subsect. *Domestici*). Redhead et al. (in Taxon 50: 203–241. 2001) suggested that the psathyrelloid fungi may have been

undersampled and that a clear resolution of the taxonomy is not yet possible. Formal statistical tests for alternative phylogenetic tree topologies (and alternative classifications) have not been carried out, so in our view it is premature to further subdivide the coprinoid taxa in three genera.

For comparison the following table lists the classification by Redhead et al. as compared to the classification in the FAN:

Below is the same

Flora agaricina neerlandica	Redhead et al.
Sect. *Coprinus*	
Subsect. *Coprinus*	*Coprinus*[1]
Subsect. *Atramentarii*	*Coprinopsis*[2]
Subsect. *Lanatuli*	*Coprinopsis*[2]
Subsect. *Alachuani*	*Coprinopsis*[2]
Sect. Veliformes	
Subsect. *Micacei*	*Coprinellus*
Subsect. *Domestici*	*Coprinellus*
Subsect. *Nivei*	*Coprinellus*?
Subsect. *Narcotici*	*Coprinopsis*[2]
Sect. Pseudocoprinus	
Subsect. *Glabri*	*Parasola*
Subsect. *Auricomi*	*Parasola*
Subsect. *Setulosi*	*Coprinellus*

1. After conservation of *C. atramentarius* as type species -> *Annularius*
2. After conservation of *C. atramentarius* as type species -> *Coprinus*

Presentation of the Data

Contrary to the normal practice in this flora, the spore measurements given relate to length × breadth (L × B) or length × breadth × width (L × B × W), in which B stands for the width of the spore in frontal view, and W for the width in side view. Consequently, Q stands for the quotient of length (L) and breadth (B). The reason for this deviating notation is the fact that in *Coprinus* the breadth of the spores varies much stronger than the width. This makes the Q value a useful taxonomic character.

In the illustrations the magnification of the microscopical characters conforms with the usual practice in this flora (see Chapter 1), with the exception of the pleurocystidia, which are reproduced at a magnification of 500×.

KEY TO THE SPECIES

1. Pileus without veil, smooth or with setulae or setae (if smooth and rather large, with stipes > 5 mm wide, see KEY FOUR)
   2. Stipe glabrous; pileus glabrous or with scattered, microscopical, long, brown hairs. . . . . KEY ONE
   2. Stipe and pileus with setulae and/or setae . . . . . KEY TWO
1. Pleus with veil
   3. Veil mainly consisting of elongate elements

4. Veil scarce, tightly adhering to surface of pileus and usually difficult to remove; basidiocarps medium to rather large with 4–10 mm wide stipe; pileus white, greyish, grey-brown to ochre brown below veil, if white then pileus with annulus on stipe.
   5. Pileus whitish with cream, ochre, or darker brown centre; stipe with annulus on lower half of stipe; veil white KEY THREE
   5. Pileus grey or brown; stipe without annulus; veil sparse, only at centre and brown; when veil whitish or silvery grey then spores warty . . . . . KEY FOUR
4. Veil abundant, loosely attached and easy removable from pileus; basidiocarps very small to small, a few medium-sized; stipe 1–4(6) mm wide; pileus white to greyish below veil, rare brown; never annulus on stipe.
   6. Veil made up of chains of smooth, thin-walled, filamentous to elongate, sometimes ellipsoid or a few almost globose elements with distinct end cells . . . . . KEY FIVE
   6. Veil made up of branched, diverticulate, thin- or thick-walled hyphae; if elements in chains with distinct end cells then the walls are thickened and yellow-brown . . . . . KEY SIX
3. Veil at least in part consisting of (sub)globose elements
   7. Fruit bodies medium-sized, somewhat fleshy; stipe 3–10 mm thick; pileus usually brown, never pure white; veil present in form of scattered, granulose floccules or small flocculose scales, often (partly) thick-walled and brown-pigmented under microscope; pileus conical or campanulate, long closed, only tardily expanding, never applanate when old, not grooved, without veil at margin when young.
      8. Veil present in scattered, granulose flocks that soon disappear, microscopically existing of a layer of globose, thin-walled cells, slightly colouring pink or lilaceous in KOH or ammonia . . . . . KEY SEVEN
      8. Veil breaking up in small, more persistent flocculose scales, microscopically existing of chains of fusiform, ellipsoid to globose, in part usually thick-walled cells not colouring in KOH or ammonia KEY EIGHT
   7. Fruit bodies very small to small, very thin-fleshed; stipe 0.5–3 mm thick; pileus white to grey; veil mealy-powdery, entirely covering the pileus, at centre often woolly-floccose, white, sometimes pale pinkish brown, yellowish or grey; thin-walled, not pigmented or rarely thick-walled, pale yellow-brown in centre of pileus; pileus expanding to become applanate, usually radially grooved and splitting, when young covered in woolly veil at margin.
      9. Elements of veil smooth or with crystals that easily dissolve in HCl; spores without myxosporium KEY NINE
      9. Elements of veil with persistent, nipple-shaped warts that do not dissolve in HCl; spores usually with distinct, rarely indistinct or lacking myxosporium . . . . . KEY TEN

KEY ONE

1. Pileus with long (200–400 µm), brown, thick-walled setae; lamellae free but reaching stipe; stipe smooth, lacking veil or caulocystidia, spores ellipsoid or ovoid with central or slightly eccentric germ pore; stipe smooth; pileus without veil but with long sclerocystidia (up to 400 µm); pileipellis hymeniform . . . . . 1. **C. auricomus**
1. Both pileus and stipe smooth, lacking veil or caulocystidia; lamellae free but not reaching stipe. Spores heart-shaped, with rounded angles or not, triangular, 3–5 angular, flattened or not and then ellipsoid (only *C. megaspermus*); basidia 4-spored, rarely 2-spored; germ pore eccentric; pseudoparaphyses varies from 3–6 to 5–8; pileipellis hymeniform; pleurocystidia present except in one species (*C. miser)*; cheilocystidia present; clamp-connections present
   2. Basidiocarps growing on pure dung.
      3. Pileus > 10 mm when expanded; length of spores 10–15 µm.
         4. Spores heart-shaped with average Q < 1.4 . . . . . 7. **C. schroeteri**
         4. Spores ellipsoid with average Q > 1.4 . . . . . 10. **C. megaspermus**
      3. Pileus < 10 mm when expanded; length of spores < 11 µm . . . . . 9. **C. miser**
   2. Basidiocarps not on dung.
      5. Spores not ellipsoid or if so then on average less than 14 µm in length.
         6. Average breadth of spores > 7.8 µm; spores on average > 9 µm broad when rounded triangular.

7. Pileus without lilaceous tinges; spores on average < 9 µm broad when 5–6 angular; cheilocystidia without oily granules.
   8. Average length of spores < 11 µm.
      9. Spores heart-shaped in frontal view with rounded angles . . . . . 2. **C. leiocephalus**
      9. Spores (sub)globose in frontal view without angle . . . . . 4. **C. galericuliformis**
   8. Average length of spores > 11 µm.
      10. Expanded pileus up to 30 mm broad; spores < 14 µm broad.
         11. Spores 10–14 × 7.5–10 µm, elongate 5–6 angular . . . . . 5. **C. plicatilis**
         11. Spores 10–16 × 9–13 µm, rounded triangular . . . . . 7. **C. schroeteri**
      10. Expanded pileus small, up to 13(17) mm; spores 12–17 × 11.5–16 µm. . . . . 8. **C. hercules**
7. Pileus lilaceous when young and fresh; spores 10–13 × 9.0–11 × 6–8 µm, 5–6 angular; pileipellis and cheilocystidia with oily granules . . . . . 6. **C. lilatinctus**

6. Average breadth of spores < 7.8 µm; spores rounded triangular . . . . . 3. **C. kuehneri**

5. Spores ellipsoid, 12.5–17 × 9–11 µm. . . . . 10. **C. megaspermus**

KEY TWO

Pileus and stem with setulae. Pileipellis consisting of (sub)globose, ellipsoid to clavate cells with or without pedicels. Pileo- and caulocystidia always present, often in combination with sclerocystidia and/or globose cells; a few species with sparse veil remnants consisting of hyphae on the pileus

1. Spores smooth.
   2. Basidia 4-spored.
      3. Spores ellipsoid, ovoid or oblong in front view.
         4. Pileocystidia with distinct tapering neck and narrowly tapering apex.
            5. With velar globose cells on pileus.
               6. Sporelength 12.5–16.5 µm. . . . . 13. **C. heptemerus**
               6. Sporelength <11 µm.
                  7. On dung; pileus cream, expanded less than 5 mm; cheilocystidia lageniform; germ pore central 41.**C. parvulus**
                  7. Not on dung; pileus orange-brown, expanded pileus 10–20 mm; cheilocystidia globose; germ pore eccentric . . . . . 14. **C. pyrrhanthes**
            5. Without velar globose cells on pileus.
               8. Germ pore eccentric (sometimes only slightly).
                  9. Pleurocystidia present.
                     10. On dung; closed pileus up to 15 × 13 mm.
                        11. Clamp-connections absent . . . . . 28. **C. congregatus**
                        11. Clamp-connections present. . . . . 29. **C. ephemerus**
                     10. On wood, not on dung; closed pileus up to 7 × 5 mm . . . . . 42. **C. canistri**
                  9. Without pleurocystidia.
                     12. On dung; expanded pileus < 10 mm. . . . . 32. **C. heterosetulosus**
                     12. Not on dung; pileus larger, 10–25 mm when expanded.
                        13. Cheilocystidia lageniform. . . . . 27. **C. impatiens**
                        13. Cheilocystidia (sub)globose or ellipsoid. . . . . 23. **C. callinus**
               8. Germ pore central.
                  14. On dung and decaying straw; length pileocystidia < 90 µm; cheilocystidia globose to oblong, subcylindric or utriform.
                     15. With pleurocystidia; breadth of spores 5–6 µm; expanded pileus up to c. 20 mm; length cheilocystidia up to 70 µm . . . . . 30. **C. brevisetulosus**
                     15. Without pleurocystidia; breadth of spores 4–5 µm; expanded pileus < 8 mm; length cheilocystidia up to 35 µm . . . . . 31. **C. pellucidus**

14. Terrestrial, on soil, not on dung; length pileocystidia up to 125 or 200 µm; cheilocystidia lageniform.
16. With cylindrical elements of veil on pileus; base of spores obconical; germ pore central; length pileocystidia up to 200 µm . . . . . 16. **C. hiascens**
16. Without cylindrical elements of veil on pileus; base of spores rounded; germ pore central to slightly eccentric; length pileocystidia up to 125 µm . . . . . 27. **C. impatiens**

4. Pileocystidia with subcylindrical neck and equal to enlarged apex.
17. With velar globose cells on pileus.
18. Cheilocystidia absent or lageniform; spores in front view with conical base; germ pore central 15. **C. disseminatus**
18. Cheilocystidia (sub)globose or ellipsoid; spores with rounded base; germ pore eccentric.
19. On dung; pileocystidia subcylindrical with capitate apex; spore length > 10 µm; pileus brown 12. **C. curtus**.
19. Not on dung, on wood-chips, compost heaps or vegetable refuse; pileocystidia subcylindric, apex never captitate; spore length < 10 µm; pileus orange-brown . . . . . 14. **C. pyrrhanthes**

17. Without velar globose cells on pileus.
20. Cheilocystidia exclusively lageniform; veil present on pileus.
21. Elements of veil 3–7 µm wide; av. Q of spores c. 1.70. . . . . 17. **C. heterothrix**
21. Elements of veil 6–16 µm wide; av. Q of spores c. 2.00. . . . . 19. **C. allovelus**
20. Cheilocystidia (sub)globose, ellipsoid, oblong, subcylindrical, utriform or mixed with lageniform elements.
22. Cheilocystidia exclusively (sub)globose, ellipsoid or oblong.
23. Spores 7–8.5 µm long; hyphal veil present . . . . . 18. **C. minutisporus**
23. Spores more than 9 µm long; hyphal veil absent.
24. Pileus ochre-brown when young; pileocystidia usually with equal apex; sclerocystidia numerous . . . . . 22. **C. sclerocystidiosus**
24. Pileus dark brown when young, often with purple tinge; pileocystidia with broadened apex; sclerocystidia absent or very scarce.
25. Pileocystidia with distinct broadened apex, often even capitate 24. **C. plagioporus**
25. Pileocystidia with equal to slightly broadened apex; . . . . . 25. **C. subpurpureus**

22. Cheilocystidia mixed, globose and lageniform elements, the latter often in small number or various shaped.
26. Pleurocystidia present; veil absent . . . . . 21. **C. subimpatiens**
26. Pleurocystidia absent; veil present or absent.
27. Veil absent; average spore breadth < 6.5 µm; average Q of spores > 1.80 26. **C. subdisseminatus**
27. Very small, hairy-fibrillose flocks of veil present on pileus, but difficult to find; average spore breadth > 6.5 µm; av. Q of spores < 1.80 . . . . . 20. **C. velatopruinatus**

3. Spores mitriform or angular in front view.
28. On dung; spores hexagonal (more or less 6-angled) . . . . . 11. **C. marculentus**
28. Not on dung; spores mitriform. . . . . 33. **C. angulatus**

2. Basidia 2-spored.
29. Cheilocystidia globose, subglobose, ellipsoid, broadly ellipsoid, ovoid or obovoid.
30. Pleurocystidia usually present; on sticks, not on dung . . . . . 34. **C. bisporiger**
30. Pleurocystidia absent; on dung or decaying straw . . . . . 35. **C. bisporus**

29. Cheilocystidia lageniform.
31. Germ pore eccentric; spores ellipsoid or oblong; average Q of spores > 1.70
31. Germ pore central; spores broadly cylindrical to ovoid, 10–17 × 7–11 µm; average Q of spores 1.35–1.50 39. **C. singularis**
32. Spores 7–9 µm broad; av. Q of spores 1.75–1.80 . . . . . 36. **C. amphithallus**
32. Spores 4.5–6 µm broad; av. Q of spores > 2.10 . . . . . 37. **C. pseudoamphitallus**

1. Spores warty.
   33. Basidia 4-spored; cheilocystidia lageniform; pleurocystidia absent . . . . . 39. **C. silvaticus**
   33. Basidia 2-spored; cheilocystidia ellipsoid to globose; pleurocystidia present. . . . . 40. **C. verrucispermus**

KEY THREE

Pileus up to 15–200 mm high before expanding, whitish, with cream, ochre, or grey-brown centre and scaly from persistent veil, the tips often upturned. Stipe 20–300 × 3–20 mm, white, with movable ring on lower half. Elements of veil less than 25 µm wide. Pleurocystidia absent

1. On dung.
   2. Spores c. 17–26 × 10–15 µm . . . . . 126. **C. sterquilinus**
   2. Spores c. 7–9 × 5.5–6.5 µm . . . . . **C. spadiceisporus** Van De Bogart in Mycotaxon 4: 245. 1976.
   Only known from the type locality in the United States and one find in Italy; see also Uljé & Noordel. in Persoonia 17: 200. 1999.
1. Not on dung.
   3. Spores c. 9–12.5 × 7–9 µm . . . . . 125. **C. comatus**
   3. Spores c. 16–22 × 10–14 µm . . . . . **C. calyptratus** Peck in Bull. Torrey bot. Club 22: 205. 1895.
   Only known from the United States and a few places in central and southern Europe; see also Moreno & Heykoop in Persoonia 17: 97–111. 1998.

KEY FOUR

Pileus medium-sized, 30–80 × 20–60 mm, ochre-brown, grey-brown, or grey, squamulose only at centre, often seemingly smooth. Growing fasciculate, on wood, trunks, or wood-chips. Spores < 10 µm long when smooth, if larger then spores warty.

1. Pileus c. 20–30 mm high, ochraceous, almost smooth; spore breadth 4.5–5.2 µm. . . . . 44. **C. acuminatus**
1. Pileus usually larger, orange-brown, grey-brown, or grey; spore breadth 5–6 µm.
   2. Pileus grey-brown or grey, veil scarce, adpressed, only at centre . . . . . 43. **C. atramentarius**
   (If spores are warty, see *C. insignis*)
   2. Pileus orange-brown squamulose or pale grey with dark squamules . . . . . 45. **C. romagnesianus**

KEY FIVE

Pileus small to medium, with hairy-floccose veil, white, greyish, orange, or yellowish, made up of elongate elements forming chains, usually abundant, sometimes scarce.

1. Spores warty or with rounded-conical nodules
   2. Spores with rounded-conical nodules; only found indoors with a potplant
   C. calosporus Bas & Uljé in Persoonia 15: 359. 1993.
   2. Spores with flattened warts . . . . . 46. **C. insignis**
1. Spores smooth.
   3. Basidia 2-spored.
      4. On dung; veil with some ellipsoid or subglobose elements; average spore breadth < 7.8 µm . . . 58. **C. bicornis**
      4. On compost or sawdust; veil without ellipsoid or subglobose elements; average spore breadth > 7.8 µm
      49. **C. scobicola**
   3. Basidia 4-spored.

5. Growing on *Ammophila arenaria* in outer dunes. . . . . .59. **C. ammophilae**
5. Habitat otherwise.
   6. Veil of centre of pileus thick-walled, wall up to 1 µm thick
      C. pachydermus Van De Bogart in Mycotaxon 8: 274. 1979.
      Only known from the type locality in the United States and one find in England.; see also Uljé & Noordel. in Persoonia 17: 195. 1999.
   6. Veil of centre of pileus thin-walled, wall less than 0.5 µm thick.
      7. Veil cream, ochre, yellow, orange, or orange-red.
         8. Pileus with rust-coloured or orange-red veil, visible at least at base of stipe, soon slimy
            48. **C. erythrocephalus**
      8. Veil cream, yellowish, or ochre, not slimy.
         9. Veil cream or pale ochre; spores very broadly fusiform, av. Q < 1.5; on wood, often in wounds of trees; terminal elements of veil up to c. 40 µm wide, not yellowish encrusted
            60. **C. spelaiophilus**
         9. Veil distinctly yellowish or ochre; sp. ellipsoid to ovoid, av. Q > 1.5; on clayey soil, mud, or wood-chips; terminal elements of veil up to c. 20(25) µm wide, strongly yellowish encrusted
            47. **C. ochraceolanatus**
      7. Veil white, (silvery) grey, or grey-brown.
         10. Average spore length < 9.2 µm.
            11. Average spore breadth > 5.8 µm.
               12. Medium-sized species; spores with av. Q < 1.3; on burnt places or wooden substrate; veil with elements of one kind: sausage-shaped in chains . . . . . .52. **C. jonesii**
               12. Small-sized species; spores with av. Q > 1.3; on dung; veil with two kinds of elements: sausage-shaped and diverticulate . . . . . 61. **C. candidolanatus**
            11. Average spore breadth < 5.8 µm.
               13. On dung or mixed dung; spores with average Q > 1.6; spores ellipsoid, tending to cylindrical
                  57. **C. pseudoradiatus**
               13. On wood-chips, soil mixed with pieces of wood, or vegetable refuse; spores with av. Q < 1.6; spores ellipsoid, tending to rhomboid . . . . . .53. **C. geesterani**
         10. Average spore length > 9.2 µm.
            14. Average spore length < 10.8 µm.
               15. Veil with one kind of elements, sausage-shaped in chains; pileus up to 30 mm when expanded; number of lamellae > 35; spores 8.4–11.8 × 5.8–7.8 µm. . . . . 54. **C. cinereus**
               15. Veil with two kinds of elements; pileus up to 12 mm when expanded; number of lamellae < 30; spores 7.3–10.7 × 4.8–7.2 µm . . . . . 61. **C. candidolanatus**
            14. Average spore length > 10.8 µm.
               16. Average spore breadth > 8.2 µm . . . . . 55. **C. macrocephalus**
               16. Average spore breadth < 8.2 µm.
                  17. On dung or dung mixed with straw or hay; average spore breadth > 7.8 µm; spores ellipsoid, tending to cylindrical . . . . . 57. **C. radiatus**
                  17. On soil, often mixed with rotten pieces of wood, wood-chips, compost heaps, or vegetable refuse; average spore breadth < 7.8 µm; spores ellipsoid.
                     18. Veil on pileus thin, cobwebby, looking silky; av. spore breadth < 6.7 µm
                        50. **C. krieglsteineri**
                     18. Veil on pileus abundant, hairy fibrillose; average spore breadth > 6.7 µm
                        56. **C. lagopus**

KEY SIX

Pileus very small to medium-sized; expanded pileus 6–60 mm. Pileus with veil made up of weakly to strongly diverticulate, and then often thick-walled elements. Stipe smooth, but in most cases covered with very small velar flocks, especially at base.

1. Spores smooth, without ornamentation.
   2. Basidia 2-spored; spores amygdaloid and truncate . . . . . 88. **C. piepenbroekii**
   2. Basidia 4-spored; if spores amygdaloid then never truncate.
      3. Average spore length > 10 µm.
         4. Elements of veil thick-walled, with ascending terminal elements . . . . . 81. **C. vermiculifer**
         4. Elements of veil thin-walled; walls < 0.5 µm thick.
            5. Breadth of spores < 10 µm.
               6. On dung; small species; veil hairy.
                  7. Pileus white when young; average spore length > 11 µm . . . . . 62. **C. xenobius**
                  7. Pileus yellow when young; average spore length < 11 µm . . . . . 63. **C. luteocephalus**
               6. Not on dung; medium species; veil in patches . . . . . 64. **C. stanglianus**
            5. Breadth of spores > 10 µm.
               8. On soil, not on sclerotia. . . . . 65. **C. picaceus**
               8. On dung, growing on sclerotia . . . . . 66. **C. sclerotiorum**
      3. Average spore length < 10 µm.
         9. On dung; spores cylindrical ovoid, rounded rectangular. . . . . 74. **C. filamentifer**
         9. Not on dung; spores otherwise shaped.
            10. Average spore length < 6 µm if veil thin-walled, < 6.5 µm if veil thick-walled.
               11. Veil thick-walled; spores globose
                  C. herinkii Pilát & Svrček in Česká Mykol. 21: 137. 1967; extralimital.
               11. Veil thin-walled; spores the shape of a maize-kernel
                  C. argenteus P.D. Orton in Notes R. bot. Gdn Edinb. 32: 139. 1972; extralimital.
            10. Average spore length > 6 µm if veil thin-walled, > 6.5 µm if veil thick-walled.
               12. Elements of veil thin-walled; walls < 0.5 µm thick.
                  13. Large species; pileus 50–100 mm when expanded; base of stipe with dark red-brown rhizomorphs . . . . . 69. **C. strossmayeri**
                  13. Smaller species; pileus 5–40 mm when expanded; no rhizomorphs at base of stipe.
                     14. Spores rounded quadrangular, with apical papilla. . . . . 75. **C. episcopalis**
                     14. Spores subglobose to ellipsoid or ovoid, without apical papilla.
                        15. Terrestrial, on burnt or bare soil, or in lawns.
                           16. Average Q of spores > 1.25.
                              17. Pleurocystidia up to 55 µm in length with Q c. 2 . . . . . **C. fluvialis**
                              Lanconelli & Uljé; only known from Italy,
                              see Lanconelli & Uljé in Persoonia 16: 297.
                              1997 and discussion under 83. *C. epichloeus*.
                              17. Pleurocystidia becoming longer with Q 2.5 and more . . . . . 71. **C. urticicola**
                           16. Average Q of spores < 1.25.
                              18. Usually on burnt places; expanded pileus 15–30 mm wide
                              72. **C. gonophyllus**
                              18. In lawns, often on bare soil; expanded pileus 8–15 mm wide
                              73. **C. epichloeus**
                        15. Not terrestrial, not on soil.
                           19. Average Q of spores < 1.2.
                              20. Stipe 2–6 mm wide; on straw, coconut mattings, rotting textiles, and straw containing materials like ceilings in old buildings, etc., in Europe usually indoors. . . . . 67. **C. kimurae**
                              20. Stipe 0.5–2 mm wide; on *Phragmites*, *Juncus*, and the like, outdoors
                              68. **C. kubickae**
                           19. Average Q of spores > 1.2.

21. Average Q of spores > 1.55; expanded pileus 10–20 mm wide; spores dark brown 70. **C. goudensis**
21. Average Q of spores < 1.55; expanded pileus 6–15 mm wide; spores pale medium brown . . . . . 71. **C. urticicola**

12. Elements of veil thick-walled; walls > 0.5 µm thick in places.
22. Veil mixed with long, brown, thick-walled hairs . . . . . .82. **C. spilosporus**
22. No long, brown, thick-walled hairs present.
23. Walls of velar elements up to 1.5(2) µm thick in places.
24. Spores short ovoid or subglobose, flattened . . . . . 76. **C. phaeosporus**
24. Spores broadly ellipsoid, ovoid, or slightly rhomboid; not distinctly flattened.
25. Pleurocystidia 20–50 µm wide . . . . . 79. **C. xantholepis**
25. Pleurocystidia 10–30 µm wide.
26. Veil on pileus white or ochre-brown; excrescences (under microscope) often tapering with pointed apex . . . . . 77. **C. pseudofriesii**
26. Veil on pileus dark brown, sepia; excrescences (micr.) often cylindrical with rounded apex . . . . . .78. **C. tigrinellus**
23. Walls of velar elements over 2 µm thick in places . . . . . 80. **C. friesii**

1. Spores warty.
27. Spores amygdaloid . . . . . 85. **C. echinosporus**
27. Spores ellipsoid, ovoid.
28. Basidia 4-spored . . . . . 83. **C. lagopides**
28. Basidia 2-spored . . . . . 84. **C. rugosobisporus**

KEY SEVEN

Pileus medium-sized, somewhat fleshy, pale ochre, rust, or cinnamon; stipe 3–10 mm wide; veil made up of very small, scattered, granular flocks, not covering entire pileus when young, microscopically of (sub)globose, hyalin, thin-walled cells, not in chains; pileus subglobose to ovoid, only tardily expanding to campanulate.

1. Stipe smooth or slightly floccose, caulocystidia absent or very sparse; spores ellipsoid, ovoid, or submitriform.
2. Spores ovoid to submitriform, av. Q < 1.4; pileus usually real ochre-brown, sienna . . . . . 100. **C. saccharinus**
2. Spores ellipsoid or ovoid, av. Q > 1.4; pileus usually pale ochre-brown, sometimes sienna . . 89. **C. truncorum**
1. Stipe pruinose of erect hairs, caulocystidia present; spores ovoid or mitriform.
3. Spores ovoid . . . . . 90. **C. pallidissimus**
3. Spores (sub)mitriform.
4. Veil rather dark, pinkish brown . . . . . **C. rufopruinatus** Romagn. in Bull. trimest. Soc. mycol. Fr. 92: 205. 1976. Only known from France.
4. Veil pale, whitish, cream, or ochre . . . . . 87. **C. micaceus**

KEY EIGHT

Pileus medium-sized, somewhat fleshy, pale ochre to ochre; stipe 3–10 mm wide; veil covering entire pileus when young, breaking up of small, woolly flocks (in *C. bipellis* in patches), microscopically of chains of cylindrical, ellipsoid, broadly fusiform, or (sub)globose, hyalin, thin-walled and in part thick-walled and yellow-brown cells; terminal cells distinct, cylindrical, ellipsoid, ovoid, or fusiform; pileus subglobose to ovoid, only tardily expanding to campanulate.

1. Spores ellipsoid, up to 16 µm long; germ pore eccentric . . . . . 91. **C. flocculosus**
1. Spores cylindric-ellipsoid, up to 12(13) µm long; germ pore central.
2. Spore length up to 12(13) µm long . . . . . .92. **C. radians**
2. Spore length less than 10(11) µm.

3. Cheilocystidia lageniform in part; usually on dead branches; pileus c. 20–30 mm high before expanding; spore breadth 4.5–5.5 µm . . . . . 96. **C. xanthothrix**
3. Cheilocystidia (sub)globose, ovoid, ellipsoid to oblong; pileus c. 25–40 mm high before expanding.
4. Veil breaking up in small, woolly flocks (up to 2 mm diam.); spore breadth up to 4.5 µm; av. Q > 1.6; usually on and around trunks or at twigs
5. Spore breadth 3.5–4.8 µm . . . . . 94. **C. domesticus**
5. Spore breadth 3.1–3.8 µm . . . . . 95. **C. ellisii**
4. Veil breaking up in patches (like in *Amanita*); spore breadth 4.5–5.5 or if narrower, av. Q < 1.6; often on burnt places . . . . . 93. **C. bipellis**

KEY NINE

Pileus white, cream-coloured, pinkish cream, or grey with mealy-powdery veil, usually forming a cortina at margin of the pileus in young specimens; veil smooth or covered with crystals or granules that dissolve in HCl; spores without myxosporium; smell indistinct.

1. Av. length of spores > 12 µm.
2. Basidia 2-spored; pileus grey or cream-grey, sometimes white at first . . . . . 100. **C. pachyspermus**
2. Basidia 4-spored; pileus white at first.
3. Spores 12–19 × 11–15.5 µm; spores ellipsoid with apical papilla ("limoniform"); pleurocystidia present 97. **C. niveus**
3. Spores 10–15 × 6.5–8.5 µm; spores 6-angular (hexagonal); pleurocystidia absent or very sparse 99. **C. cothurnatus**

1. Av. length of spores < 12 µm.
4. Spores oval or ellipsoid, sometimes slightly cylindrical
5. Basidia 2-spored . . . . . 107. **C. bellulus**
5. Basidia 4-spored.
6. Cystidia absent . . . . . 106. **C. cortinatus**
6. Cystidia present.
7. Both cheilo- and pleurocystidia present.
8. Average length of spores < 9 µm; pileus very small, expanded < 6 mm
9. Terrestrial, on lawns, never on dung; young pileus white; spores 7–9.5 × 5–6.5 µm. . . 104. **C. idae**
9. On dung; pileus grey or white and then breadth of spores < 5 µm.
10. Young pileus grey; spores 7.5–9.5 × 5–6 µm. . . . . 102. **C. poliomallus**
10. Young pileus white; spores 6–7.5(8) × 3.5–4.5(5) µm. . . . . 103. **C. pseudocortinatus**
8. Pileus larger, 5–25 mm when expanded or average length of spores > 9 µm.
11. Expanded pileus up to 25 mm; av. length of spores < 9 µm; on dung . . . . . 101. **C. utrifer**
11. Expanded pileus 5–12 mm; av. length of spores > 9 µm.
12. On grasses; cheilocystidia 20–45 × 8–13 µm
C. pilosotomentosus Bender in Enderle & Bender in Z. Mykol. 56: 31. 1990; only known from the type-locality in Germany, not yet recorded from the Netherlands.
12. On wood. Cheilocystidia 50–80 × 20–35 µm
C. nemoralis Bender in Uljé & Noordel. in Persoonia 15: 300. 1993; only known from the type-locality in Germany, not yet found in the Netherlands.
7. Only cheilocystidia present.
13. Cheilocystidia utriform . . . . . 105. **C. candidatus**
13. Cheilocystidia (sub)globose or ellipsoid
C. ramosocystidiatus Enderle & Bender in Z. Mykol. 56: 35. 1990; only known from the type-locality in Germany, not yet recorded from the Netherlands.
4. Spores differently shaped.
14. Spores with rounded angles (4–5-angular), 8–10.5 × 8–10 µm; pleurocystidia present.

15. Ring present . . . . . .111. **C. ephemeroides**
15. Ring absent.
16. Cheilocystidia in part lageniform; on dung. . . . . 108. **C. cordisporus**
16. No lageniform cheilocystidia present; on vegetable debris . . . . . .109. **C. patouillardii**

14. Spores differently shaped; breadth of spores < 8 µm or spores ellipsoid with apical papilla ("limoniform"); pleurocystidia present or absent.
17. Pleurocystidia present
18. Breadth of spores 7.5–11.5 µm, ellipsoid with apical papilla ("limoniform") . . . 98. **C. pseudoniveus**
18. Breadth of spores 5–6 µm, heart-shaped or pyriform. . . . . 110. **C. cardiasporus**
17. Pleurocystidia absent.
19. Veil white, often cream-coloured, or slightly ochraceous at centre of pileus; spores 6-angular in frontal view, c. 5–6 µm broad, with two bumps at each side. . . . . 112. **C. iocularis**
19. Veil at centre of pileus dark grey, usually with greenish hue; spores without bumps, narrowly ovoid or amygdaliform, c. 4–5 µm broad . . . . . .113. **C. coniophorus**

KEY TEN

Elements of veil (sub)globose with persistent, nipple-shaped warts that do not dissolve in HCl; spores usually with distinct, rarely indistinct, or lacking myxosporium.

1. Basidia 2- or 3-spored.
2. Basidia 2-spored.
3. Base of spores conical; average Q of spores > 1.8; spore breadth 6–7.5 µm. . . . . .119. **C. cinereofloccosus**
3. Base of spores rounded; average Q of spores < 1.8; spore breadth 7.5–8.5 µm . . . . .118. **C. saccharomyces**
2. Basidia 3-spored . . . . . 117. **C. trisporus**

1. Basidia 4-spored.
4. On dung or dung mixed with straw or other vegetal debris.
5. Spores with rounded base; myxosporium scarce, often seemingly absent, smooth
6. Smell strong, narcotic; pileus up to 12 mm when expanded; never growing from sclerotia.
7. Spores 6–8 × 3–4.5 µm, cylindrical ellipsoid; pileus usually white, sometimes greyish 114. **C. stercoreus**
7. Spores 7.5–10 × 4.5–6.5 µm; pileus mouse-grey . . . . . .116. **C. foetidellus**
6. Smell of raw potatoes or absent; pileus up to 20(25) mm when expanded; usually growing from sclerotia 115. **C. tuberosus**
5. Spores with conical base; myxosporium strongly developed, wrinkled . . . . . 122. **C. narcoticus**
4. Not on dung.
9. On wood; on moss-covered, horizontal cut surfaces of trunks; smell none or indistinct. . . . . 123. **C. laanii**
9. On rotting plants, compost heaps, etc.
10. Spores with rounded base.
11. Average breadth of spores < 6.5 µm; smell of raw potatoes; usually growing from sclerotia; on compost heaps or mixed dung . . . . . 115. **C. tuberosus**
11. Average breadth of spores > 6.5 µm; smell none or otherwise; never growing from sclerotia; never on dung . . . . . 120. **C. martinii**
10. Spores with conical base.
12. Average breadth of spores > 6.5 µm. . . . . 120. **C. martinii**
12. Average breadth of spores < 6.5 µm.
13. Myxosporium smooth; smell absent or indistinct; average breadth of spores < 5.5 µm 121. **C. semitalis**
13. Myxosporium wrinkled; smell strongly narcotic; average breadth of spores 5.5 µm 122. **C. narcoticus**

Sect. **Pseudocoprinus** (Kühn.) P.D. Orton & Watl.

SELECTED LITERATURE — Bender & Enderle in Z. Mykol. 61: 11–28. 1995; Citérin in Doc. mycol. 22 (86): 1–11. 1992; M. Lange in Dansk bot. Ark. 14 (6): 1–164. 1952; M. Lange & A.H. Smith in Mycologia 45: 747–780. 1953; Uljé & Bas in Persoonia 13: 433–448. 1988; Uljé & Bas in Persoonia 14: 275–339. 1991; Uljé & Bender in Persoonia 16: 373–381. 1997.

Basidiocarps very small to medium-sized; expanded pileus 3 to about 40 mm in diam., in extreme cases up to 80 mm. Context thin, less than 3 mm in centre of pileus. Pileus with setulae or setae or glabrous. Lamellae narrow, less than 5 mm wide, free to narrowly adnate. Stipe up to c. 5 mm thick, with setulae or glabrous, hollow, base slightly bulbous or clavate. Pileipellis made up of (sub)globose, ellipsoid, or clavate cells with or without pedicels. Pileocystidia present or absent. Besides normal (thin-walled) pileocystidia sometimes thick-walled or velar globose cells or, rarely, velar hyphae present (the last two elements never at the same time). Pleuro- and cheilocystidia present or absent. Spores with central or eccentric germ pore.

Subsect. **Auricomi** Sing.

Pileus with long (200–400 µm), brown setae; lamellae free; stipe smooth, lacking veil and caulocystidia.

1. Coprinus auricomus Pat., Tab. anal.: 200. 1886. – Fig. 1.

Parasola auricoma (Pat.) Redhead, Vilgalys & Hopple in Taxon 50: 235. 2001. *Coprinus hansenii* J. Lange in Dansk bot. Ark. 2 (3): 48. 1915.

MISSAPL. — *Coprinus crenatus* sensu Rick., Blätterpilze: 66. 1915; *Coprinus hemerobius* sensu J. Lange, Fl. agar. dan. 4: 118. 1939.

SEL. ICON. — Bender et al. in Z. Mykol. 50: opposite 32. 1984; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 266. 1995; Cetto, Gr. Pilzf. 5: pl. 1720. 1987; Dähncke, 1200 Pilze: 554. 1993; Donelli & Simonini in Boll. Gruppo micol. G. Bres. 29: 106. 1986; J. Lange, Fl. agar. dan. 4: pl. 160C. 1939 (as *C. hemerobius*).

SEL. DESCR. & FIGS. — Bender et al. in Z. Mykol. 50: 34–39. 1984; Joss. in Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 50: 60–62, fig. 5. 1934; Kühner in Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 50: 53–55, figs 1 & 2. 1934; Uljé & Bas in Persoonia 13: 435, figs 1 & 12. 1988.

VERN. NAME — Kastanje-inktzwam.

Pileus 5–30 × 3–18 mm when still closed, 10–60 mm wide when expanded, first ellipsoid or ovoid, often somewhat conical, then campanulate to convex, finally flat, sulcate-striate up to centre, chestnut-colour, red-brown or orange-brown (Mu. 2.5 YR 2.5/2, 2.5/4, 3/4; 5 YR 2.5/2, 3/3, 3/4, 4/4, 4/6, 5/7.5; 7.5 YR 5.5/4, 4/6, 5/8; 10 YR 4/6, 5/6; K. & W. 6D/E8) at centre, paler towards margin, glabrous. Lamellae, L = 30–40, l = 0–3, free but not remote from apex of stipe, first whitish, then brown (5 YR 2.5/1, 3/1, 3/3), finally black. Stipe 70–120 × 2–3 mm, with subbulbous base, sordidly white to sordidly yellow-brown (10 YR 8/1).

Spores 10.0–14.5 × 6.0–8.0 µm, Q = 1.35–2.05, av. Q = 1.45–1.95, av. L = 10.8–13.1 µm, av. B = 6.8–7.5 µm, ellipsoid to oblong, rounded at base and apex, dark red-brown; germ pore central to (rarely) slightly eccentric, 1.3–1.5 µm wide. Basidia 19–38 × 8.5–11 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 50–95 × 17–25 µm, utriform, sublageniform, subcylindric or ellipsoid. Pleurocystidia 70–140 × 22–45 µm, subcylindrical or utriform. Pileipellis hymeniform,

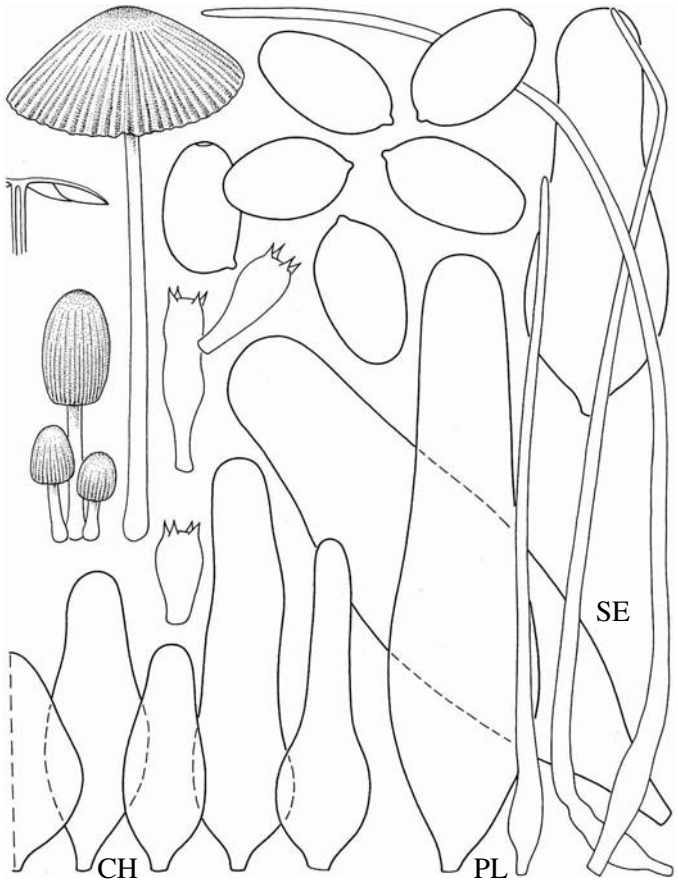


Fig. 1. *Coprinus auricomus*

with scattered, up to 230 µm long, brown, thick-walled hairs. At base of stipe also these hairs are present, and often numerous here and somewhat longer. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, terrestrial, often on wood-chips used to pave paths and tracks and grassy places, on roadsides and in lawns, common in the Netherlands. April to December. In the Netherlands rather common in spring and summer, rather rare in autumn. Widespread in Europe, recorded from Japan.

Microscopically *C. auricomus* can be easily recognised by the smooth stipe (no veil, no caulocystidia), the hymeniform pileipellis with the scattered thick-walled, more than 200 µm long brown setae and the ellipsoid spores with central germ pore.

Uljé & Bas (in Persoonia 13: 435–436. 1988) gave an extended discussion on the synonyms of *C. auricomus*.

Subsect. **Glabri** J. Lange

Both pileus and stipe smooth, lacking veil and caulocystidia; lamellae free leaving a space between stipe and the attachment of lamellae.

2. Coprinus leiocephalus P.D. Orton in Notes R. bot. Gdn Edinb. 29: 88. 1969. – Fig. 2.

Parasola leiocephala (P.D. Orton) Redhead, Vilgalys & Hopple in Taxon 50: 236. 2001.

EXCL. — *C. leiocephalus* sensu Donelli & Simonini in Boll. Gr. Micol. G. Bres. 29: 115. 1986 (= *C. kuehneri*); *C. leiocephalus* sensu Cetto, Gr. Pilzf. 6: pl. 2184. 1989. (= *C. plicatilis*).

SEL. ICON. — Imaz. et al., Fungi Japan: 208. 1988.

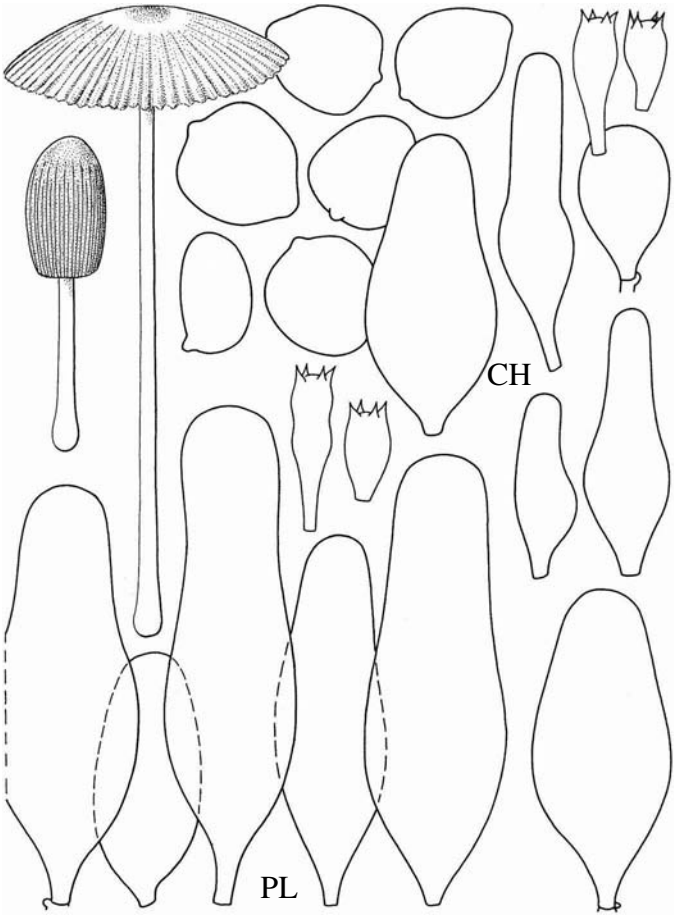


Fig. 2. *Coprinus leiocephalus*

SEL. DESCR. & FIGS. — Bender in Mittbl. Arbeitsgem. Pilzk. Niederrhein 7 (1): 37. 1989; P.D. Orton in Notes R. bot. Gdn Edinb. 29: 88. 1969; Uljé & Bas in Persoonia 13: 440, figs 2, 7, 8, 10A, C-H. 1988.

VERN. NAME — Geelbruin plooirokje.

Pileus 5–25 × 3–15 mm when still closed, 15–50 mm wide when expanded, first ellipsoid or ovoid, then campanulate to convex, finally flattened, sulcate-striate up to centre, sordid yellow-brown, cinnamon to (rarely) reddish-brownish (Mu. 7.5 YR 4/6–5/8; 10 YR 4/6, 5/5–6; 2.5 Y 6/4; K. & W. 6C4, 6D2, centre 7D/E7), usually rather pale. Lamellae, L = 21–48, l = 1–3, free, c. 1–2 mm remote from stipe, whitish, then grey-brown to blackish. Stipe up to 140 × 1–3 mm, with slightly bulbous base, whitish to pale, sordid yellowish-brownish.

Spores 8.0–12.0 × 7.0–10.5 × 5.5–7.0 µm, Q = 0.95–1.40, av. Q = 1.05–1.30, av. L = 9.0–10.7 µm, av. B = 8.1–9.8 µm, mainly 5-angular and heart-shaped with apical papilla, flattened, with convex to flattened base and rounded apex, dark red-brown; germ pore eccentric, 1.3–1.5 µm wide. Basidia 20–40 × 9.5–12 µm, 4-spored, surrounded by 4–6(7) pseudoparaphyses. Cheilocystidia 30–80 × 14–30 µm, utriform or lageniform with 6–15(18) µm wide neck, also ellipsoid or ovoid ones. Pleurocystidia 50–110 × 25–35 µm, upper part 16–23 µm, (sub)utriform or subcylindric. Pileipellis a hymeniderm, made up of sphaeropedunculate cells, 20–28 µm wide. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, in small groups, terrestrial on bare, often clayey soil or at grassy places, particularly under trees and shrub but also on lawns and meadows; moreover rather frequent on paths covered with wood-chips, in the Netherlands very common. In March-Dec. widespread in Europe and probably on other continents.

Coprinus leiocephalus can be distinguished with certainty only microscopically from most other closely related species such as *C. lilatinctus*, *C. plicatilis,* and *C. kuehneri*. The similarly shaped spores in *C. lilatinctus* are distinctly larger, those in *C. plicatilis* are more elongated, larger but not broader. In *C. kuehneri* the spores are smaller and triangular.

3. Coprinus kuehneri Uljé & Bas in Persoonia 13: 438. 1988. – Fig. 3.

Parasola kuehneri (Uljé & Bas) Redhead, Vilgalys & Hopple in Taxon 50: 235. 2001. — *Coprinus plicatilis* var. *microsporus* Kühner in Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 50: 57. 1934.

MISSAPL. — *Coprinus leiocephalus* sensu Donelli & Simonini in Boll. Gr. micol. G. Bres. 29: 115. 1986.

SEL. ICON. — Arnolds in Arnolds et al., Overz. Paddest. Nederland: pl. 4C. 1995; Bender in Mittbl. Arbeitsgem. Pilzk. Niederrhein 7 (1): 40. 1989; Donelli & Simonini in Boll. Gruppo micol. G. Bres. 29: 116. 1986 (as *C. leiocephalus*).

SEL. DESCR. & FIGS. — Bender in Mittbl. Arbeitsgem. Pilzk. Niederrhein 7 (1): 38. 1989; Donelli & Simonini in Boll. Gruppo micol. G. Bres. 29: 115. 1986 (as *C. leiocephalus*); Kühner in Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 50: 57–58, fig. 4. 1934 (as *C. plicatilis* var. *microsporus*); Uljé & Bas in Persoonia 13: 438, figs 2, 6 & 9. 1988.

VERN. NAME — Kleinsporig plooirokje.

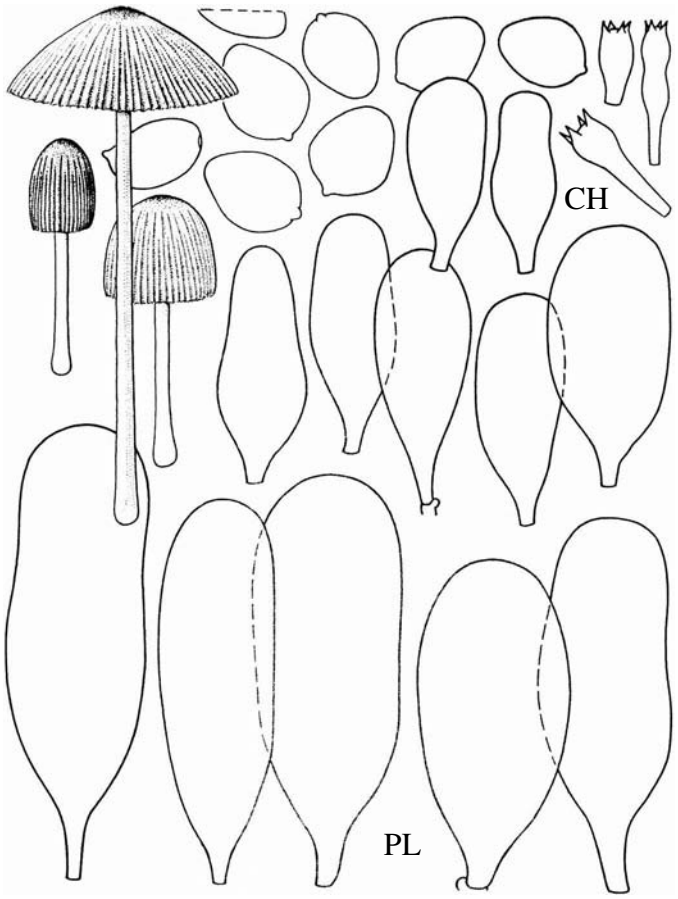


Fig. 3. *Coprinus kuehneri*

Pileus 5–25 × 3–15 mm when still closed, 15–40 mm wide when expanded, ellipsoid or ovoid, expanding to paraboloid or convex, rarely becoming flat, sulcate-striate up to centre, at first rather dark red-brown, less frequently orange- or yellow-brown, later with greyish tinges (at centre Mu. 2.5 YR 2.5/2–4, 3/2–4; 5 YR 3/2–4; 7.5 YR 3/2–4, 4/4, 5/4; 10 YR 7/4; at margin 5 YR 4/4–8, 5/4; 7.5 YR 4/2–6, 5/4, 6/5; 10 YR 4/1–3, 5/2–3, 6/2–3, 7/3–4; K. & W. 7F7, 8F4, 7E/F5, 8E/F4, 7F5, 6E6, 6E/F7, 6D4, 6C6, 5C4). Lamellae, L = 32–50, l = 1–3, free, remote from stipe, first whitish, then grey-brown (10 YR 5/3, 6/3–4), finally blackish grey. Stipe up to 100 × 1–3 mm, base clavate, sordid white to sordid yellowish brown.

Spores 6.5–11.0 × 5.5–8.0 × 5.0–6.0 µm, Q = 1.05–1.60, av. Q = 1.15–1.45, av. L = 7.9–9.9 µm, av. B = 6.3–7.7 µm, heart-shaped, tending to rhomboid or mitriform, triangular, rarely 4- or 5-angular, flattened, conical or convex at base and rounded at apex, medium to dark red-brown; germ pore eccentric, 1.2–1.4 µm wide. Basidia 19–38 × 8–12 µm, 4-spored, surrounded by (3)4–6 pseudoparaphyses. Cheilocystidia 25–80 × 10–30 µm, if with neck then 11–23 µm wide, subcylindric, ellipsoid, (sub)globose, utriform or (sometimes) sublageniform. Pleurocystidia 50–100 × 18–36 µm, subcylindric or utriform with 21–32 µm wide neck or rarely almost exclusively globose. Pileipellis smooth, hymeniform, made up of sphaeropedunculate cells up to 100 × 28 µm. Clamp-connections present.

HABITAT & DISTR. — Solitary or, less frequent, a few together in small groups, usually terrestrial on naked soil under trees or shrubs, more rarely at grassy places, rather common in the Netherlands. April-Dec. Recorded with certainty from Germany, France, and Italy but probably rather common all over Europe and in other parts of the world.

Macroscopically *C. kuehneri* can usually be distinguished from its closest relative *C. leiocephalus* by the dark red-brown colour of the pileus, which is paler and yellow-brown in the latter. Microscopically *C. kuehneri* is characterised by the narrower, triangular spores with a tendency to being rhomboid or mitriform.

4. Coprinus galericuliformis Watling in Notes R. bot. Gdn Edinb. 28: 42. 1967. – Fig. 4.

Parasola galericuliformis (Watling) Redhead, Vilgalys & Hopple in Taxon 50: 235. 2001.

SEL. DESCR. & FIGS. — Uljé & Bas in Persoonia 13: 441, fig. 10B. 1988; Watling in Notes R. bot. Gdn Edinb. 28: 42. 1966.

VERN. NAME — Rondsporig plooirokje.

Pileus 4–15 × 3–10 mm when still closed, 10–30 mm wide when expanded, first ellipsoid or ovoid, then campanulate to convex, finally flattened, sulcate-striate up to centre, rather dark grey, sordid rust, becoming paler on maturity. Lamellae, L = 20–30, l = 0–3, free, somewhat remote from stipe, whitish, then grey to blackish. Stipe up to 70 × 1–3 mm, with slightly bulbous base, whitish to pale, sordid yellowish-brownish.

Spores 8.0–11.0 × 7.5–9.5 × 7.0–7.5 µm, Q = 1.00–1.30, av. Q = 1.05–1.15, av. L = 9.3–9.5 µm, av. B = 8.4 µm, (sub)globose, sometimes tending to ellipsoid with apical papilla ("limoniform") and slightly 5-angular, flattened, with rounded base and apex, dark red-brown; germ pore slightly eccentric, c. 1.3 µm wide. Basidia 20–40 × 8–12 µm, 4-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 25–60 × 10–23 µm, usually lageniform with 6–15(18) µm wide upper part. Pleurocystidia 60–95 × 18–30, upper part 16–23 µm wide, lageniform to weakly utriform. Pileipellis smooth, hymeniform, made up of sphaeropedunculate cells. Clamp-connections present.

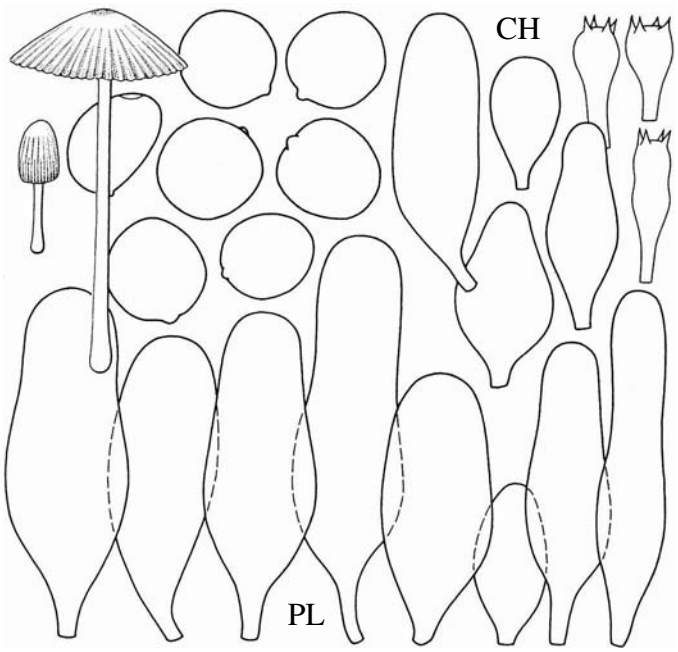


Fig. 4. *Coprinus galericuliformis*

HABITAT & DISTR. — Solitary or in small groups, terrestrial on bare, often clayey soil, also at grassy places, Very rare in the Netherlands (Groningen: Frytum, Serooskerke). Aug.-Oct. Recorded from England.

The (sub)globose spores and perhaps the darker colour distinguish *C. galericuliformis* from *C. leiocephalus.*

5. Coprinus plicatilis (Curt. :Fr.) Fr., Epicrisis: 252. 1838. – Fig. 5.

Agaricus plicatilis Curt., Fl. londin.: pl. 200. 1778; *Agaricus plicatilis* Curt. :Fr., Syst. mycol. 1: 313. 1821; *Parasola plicatilis* (Curt. :Fr.) Redhead, Vilgalys & Hopple in Taxon 50: 235. 2001.

MISSAPL. — *Coprinus leiocephalus* sensu Cetto, Gr. Pilzf. 6: pl. 2184. 1989.

SEL. ICON. — Cetto, Gr. Pilzf. 6: 63, pl. 2184. 1989 (as *C. leiocephalus*).

SEL. DESCR. & FIGS. — Donelli & Simonini in Boll. Gruppo micol. G. Bres. 29: 111. 1986; Kühner in Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 50: 55–57. 1934; Uljé & Bas in Persoonia 13: 441, figs 2, 7, 8, 13A-C. 1988.

VERN. NAME — Gewoon plooirokje.

Pileus 4–18 × 3–12 mm when still closed, 15–35 mm wide when expanded, first ellipsoid or ovoid, then campanulate to convex, finally flattened, sordid yellow- to red-brown, sulcate-striate up to centre, pale ochre (Mu. 10 YR 4/4–5, 5/5, 6/6, 7/3, 6/2, K. & W. 5B4; centre 7.5 YR 3/4, 4/4–6, 7E8), soon more greyish. Lamellae, L = 22–38, l = 0–3, free and remote from stipe, white when very young, then grey-brown (6D4) to blackish. Stipe up to 120 × 1–2.5 mm, sordid whitish to pale yellow-brown (5A2); base somewhat clavate.

Spores 10.0–14.5 × 7.0–10.5 × 6.5–8.0 µm, Q = 1.05–1.80, av. Q = 1.15–1.55, av. L = 11.1–12.8 µm, av. B = 8.1–9.5 µm, usually angularly ovoid with five rounded angles, sometimes almost ellipsoid, flattened, rarely not distinctly so, with convex or flattened base and rounded apex, dark red-brown; germ pore eccentric, 1.3–1.5 µm wide. Basidia 20–42 × 9–12 µm, 4- spored, surrounded by 4–7 pseudoparaphyses. Cheilocystidia 40–90 × 16–28 µm, utriform or sublageniform with 6–15(18) µm

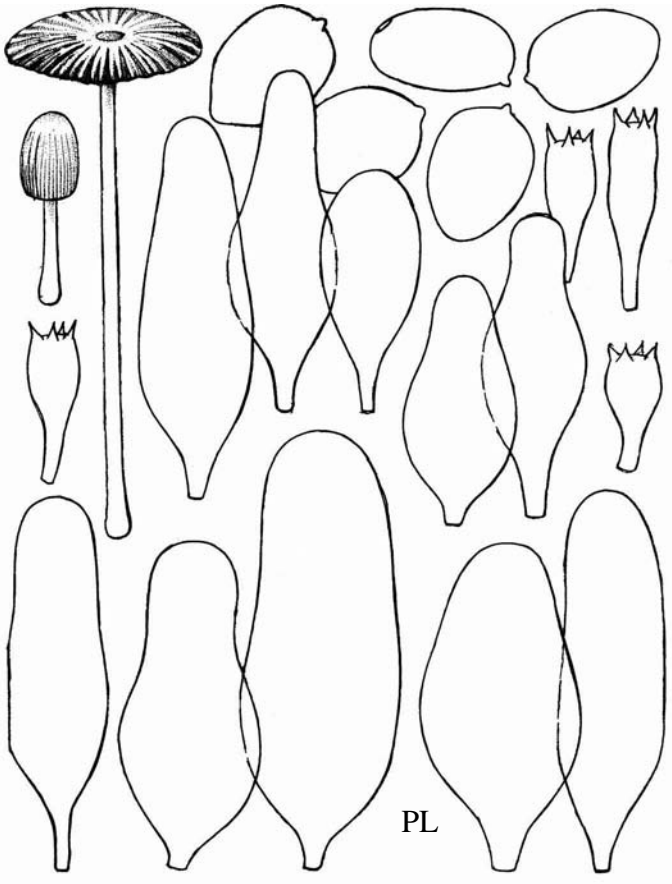


Fig. 5. *Coprinus plicatilis*

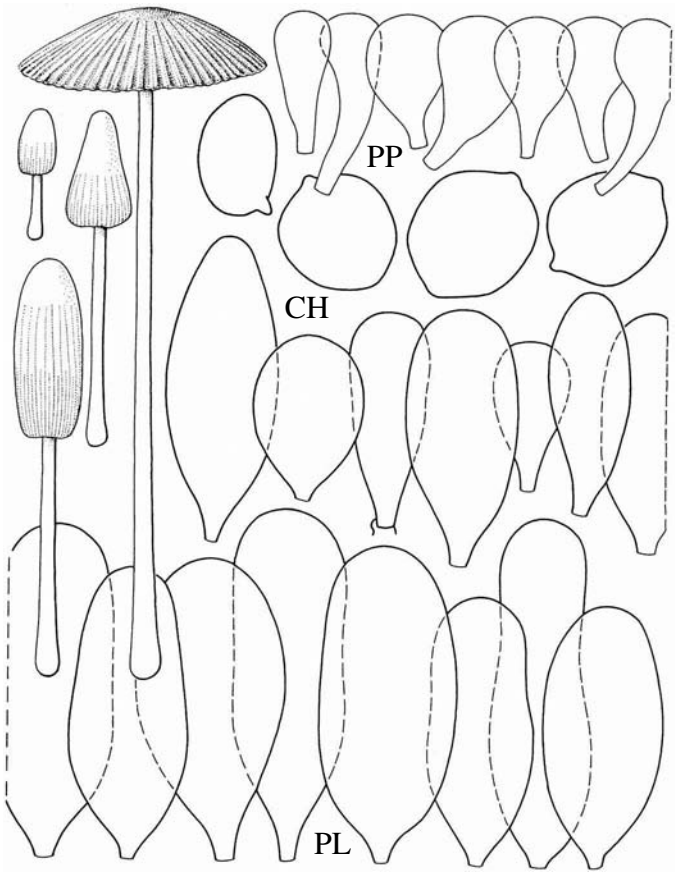


Fig. 6. *Coprinus lilatinctus*

wide neck, sometimes ellipsoid. Pleurocystidia 60–100 × 22–35 µm, upper part 17–28 µm, utriform or subcylindric. Pileipellis smooth, hymeniform, made up of sphaeropedunculate cells. Clamp-connections present.

HABITAT & DISTR. — Solitary or in small groups, rarely a few together, terrestrial in lawns and other grassy places, seldom in the shade. Rather common in the Netherlands. March-Dec. Widespread all over Europe and probably other continents.

Coprinus plicatilis differs from *C. leiocephalus* in the larger, more elongate spores, the somewhat smaller and more greyish basidiocarps, the less crowed lamellae and its habitat preference for more open, grassy places.

6. Coprinus lilatinctus Bender & Uljé in Persoonia 16: 373. 1996. – Fig. 6.

Parasola lilatincta (Bender & Uljé) Redhead, Vilgalys & Hopple in Taxon 50: 236. 2001.

SEL. ICON. — Bender & Uljé in Persoonia 16: pl. 1. 1996.

SEL. DESCR. & FIGS. — Bender & Uljé in Persoonia 16: 373–375, fig. 1. 1996.

VERN. NAME — Lilakleurig plooirokje.

Pileus 15–30 × 8–16 mm when still closed, 20–50 mm wide when expanded, cylindrical ellipsoid or conical, expanded pileus conical to convex, finally often with upturned margin, sulcate-striate up to centre, lilac when young and fresh (Mu. 10 YR 4/5; K. & W. 14D3), then lilaceous grey-brown, the lilac tinge remaining longest at centre, later pale greyish brown (10 YR 7/2; 5A2/3, centre 14C2) or in most cases greyish, especially at centre; smooth. Lamellae, L = 36–45, l = 1–3(5), free, white at first then grey to black with pale edge. Stipe up to 100 × 2–3 mm, at base somewhat swollen (5 mm), white or greyish white.

Spores 9.5–13.5 × 9.0–11.0 × 6.0–8.5 µm, Q = 1.05–1.30, av. Q = 1.10–1.20, av. L = 10.7–12.3 µm, av. B = 9.5–10.1 µm, 5-angular and heart-shaped with apical papilla, flattened, with convex to flattened base and rounded apex, dark red-brown to almost black; germ pore eccentric, 1.4–1.6 µm wide. Basidia 20–45 × 9–12 µm, 4-spored, surrounded by (4)5–8(9) pseudoparaphyses. Cheilocystidia 25–70 × 12–28 µm, globose, ellipsoid, obovoid, or subcylindric, sometimes a few utriform. Pleurocystidia 30–95 × 22–38 µm, globose, subcylindric, ellipsoid, or subutriform. Pileipellis smooth, hymeniform, made up of spheropedunculate cells. Part of all microscopical elements, especially pileipellis, cheilocystidia and basidia with yellowish grey granules, probably consisting of oil drops. Clamp-connections present.

HABITAT & DISTR. — In small groups, more or less fasciculate, on paths of clayey soil covered with wood-chips, rare, known from several places in the clay and peat areas of the Netherlands. Netherlands. June-Oct. Also known from Germany.

Coprinus lilatinctus differs from *C. leiocephalus* and *C. plicatilis*in shape, size, and colour of the basidiocarps, size of the spores, and the grey yellowish granules in the microscopical elements, though in dried material the granules are not always clear. The shape of the spores is similar to that of *C. leiocephalus*, but they are distinctly larger (average length of spores in *C. leiocephalus*: 9.0–10.7 µm; in *C. lilatinctus*:

11.3–11.5 µm). In *C. plicatilis* the spores are more elongate and on average, just as in *C. leiocephalus*, less than 9.5(9.8) µm wide (in *C. lilatinctus* 9.5–10.1). *Coprinus schroeteri* agrees in spore size, but that species is smaller, lacks lilaceous tints, and never grows on wood-chips. However, the most important difference is the shape of the spores, which is rounded triangular in *C. schroeteri* and without the papilla at the spore apex that is characteristic for *C. lilatinctus*, *C. leiocephalus* and *C. plicatilis*.

7. Coprinus schroeteri P. Karst. in *Meddn Soc. Fauna Fl. fenn.* 5: 34. 1879. – Fig. 7.

Parasola schroeteri (P. Karst.) Redhead, Vilgalys & Hopple in Taxon 50: 236. 2001. — *Coprinus longipes* Buller in Bisby et al., Fungi Manitoba: 118. 1929. — *Coprinus nudiceps* P.D. Orton in Notes R. bot. Gdn Edinb. 32: 142. 1972; *Parasola nudiceps* (P.D. Orton) Redhead, Vilgalys & Hopple in Taxon 50: 236. 2001.

SEL. ICON. — Arnolds in Arnolds et al., Overz. Paddest. Nederland: pl. 5A. 1995; Bender & Enderle in Z. Mykol. 54: opposite page 48. 1988; Cacialli et al., Schede Micol. 1: 227. 1995 (all as *C. nudiceps*).

SEL. DESCR. & FIGS. — Bender & Enderle in Z. Mykol. 54: 55–57. 1988; Uljé & Bas in Persoonia 13: 443. 1988 (both as *C. nudiceps*).

VERN. NAME — Mestplooirokje.

Pileus 5–16 × 3–10 mm when still closed, 10–30 mm wide when expanded, first ellipsoid or ovoid, then expanding to convex, finally flattened, sulcate-striate up to centre, ochraceous brown, yellow-brown, greyish red-brown (Mu. 7.5 YR 4/4; 10 YR 1–8/1 as far as 5/1–2).

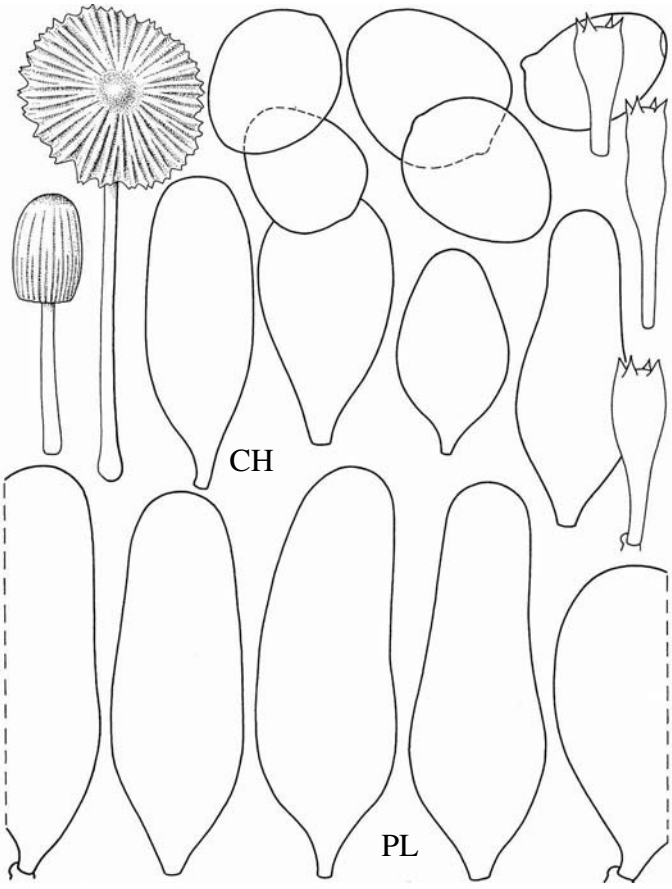


Fig. 7. *Coprinus schroeteri*

Lamellae free, L = 24–36, l = 1–3, somewhat remote from stipe, white, grey-brown to blackish. Stipe up to 80 × 1–2 mm, white to yellowish or pale greyish brown.

Spores 10.0–15.0 × 9.0–13.0 × 8.0 µm, Q = 1.05–1.30, av. Q = 1.10–1.20, av. L = 11.5–13.6 µm, av. B = 10.2–11.1 µm, rounded triangular, flattened, with convex base and rounded apex, dark to very dark red-brown; germ pore eccentric, 1.8–2.1 µm wide. Basidia 22–48 × 10–14 µm, 4-spored, surrounded by 4–7 pseudoparaphyses. Cheilocystidia 30–70 × 14–32 µm, if with neck then 11–23 µm wide, subcylindric, ellipsoid, (sub)globose, utriform, or (sometimes) sublageniform. Pleurocystidia 45–100 × 11–38 µm, subcylindric or utriform with 21–32 µm wide neck or rarely almost exclusively globose. Pileipellis smooth, hymeniform, made up of spheropedunculate cells. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on dung, also terrestrial. Rare in the Netherlands. Apr.-Dec. Widespread but also rare in Europe. Recorded and described from Manitoba (Canada).

Coprinus schroeteri differs from *C. hercules* in somewhat smaller and in particular narrower spores, larger basidiocarps, a larger number of lamellae and the preference for dung.

Coprinus schroeteri had been known under the name *C. nudiceps*. See Uljé & Bender (in Persoonia 16: 376–380. 1997) for type studies and argumentation.

8. Coprinus hercules Uljé & Bas in Persoonia 12: 483. 1985. – Fig. 8.

Parasola hercules (Uljé & Bas) Redhead, Vilgalys & Hopple in Taxon 50: 235. 2001.

SEL. ICON. — Chrispijn, Champ. Jordaan: 72. 1999; Uljé in Micologia 2000: 536. 2001.

SEL. DESCR. & FIGS. — Bender in Mittbl. Arbeitsgem. Pilzk. Niederrhein 6 (2): 101. 1988; Uljé in Coolia 29: 27. 1986; Uljé & Bas in Persoonia 12: 483. 1985.

VERN. NAME — Hercules plooirokje.

Pileus 4–7(10) × 2–5(7) mm when still closed, 8–14(18) mm wide when expanded, at first campanulate to hemispherical, conical campanulate with rounded apex to convex when expanding, finally flat, sulcate-striate up to centre, red-brown (Mu. 5YR 3/4) at centre and on ridges, later somewhat paler (from 7.5 YR 4/6 to 5/6), near margin pale grey-brown (10 YR 5/3), margin whitish, finally turning grey from margin towards centre, glabrous. Lamellae free, L = 16–24, l = 0–1(3), fairly distant, up to 2 mm wide, at first whitish, later grey-brown to almost black. Stipe up to 70 × 0.6–1.2 mm, slightly thickening towards subbulbous, up to 1.5 mm wide base, whitish, somewhat vitreous, glabrous, very fragile. Spore print blackish with faint purplish hue.

Spores 12.5–17.0 × 11.5–15.0 × 8.0–11.0 µm, Q = 1.05–1.30, av. Q = 1.05–1.20, av. L = 13.6–15.7 µm, av. B = 11.8–13.3 µm, rounded triangular to weakly 5- or even 7-angular, flattened, with convex base and rounded apex, very dark red-brown to almost black; germ pore strongly eccentric, 2.0–2.3 µm wide. Basidia 22–51 × 13–16 µm, 4-spored, surrounded by 5–8 pseudoparaphyses. Cheilocystidia 45–70 × 10–23(30) µm, from clavate or globose with short broad neck to broadly utriform or broadly cylindrical. Pleurocystidia 60–105 × 22–30 µm, subcylindrical to (sub)utriform. Pileipellis a hymeniderm of clavate to spheropedunculate cells 50–70(100) µm long and up to 23 µm wide. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, in small groups, on open, regularly mown lawns on clayey soil, not common in the Netherlands, but probably overlooked. May-Oct. Also recorded from Denmark, Germany, Italy (Sardinia), and Malta.

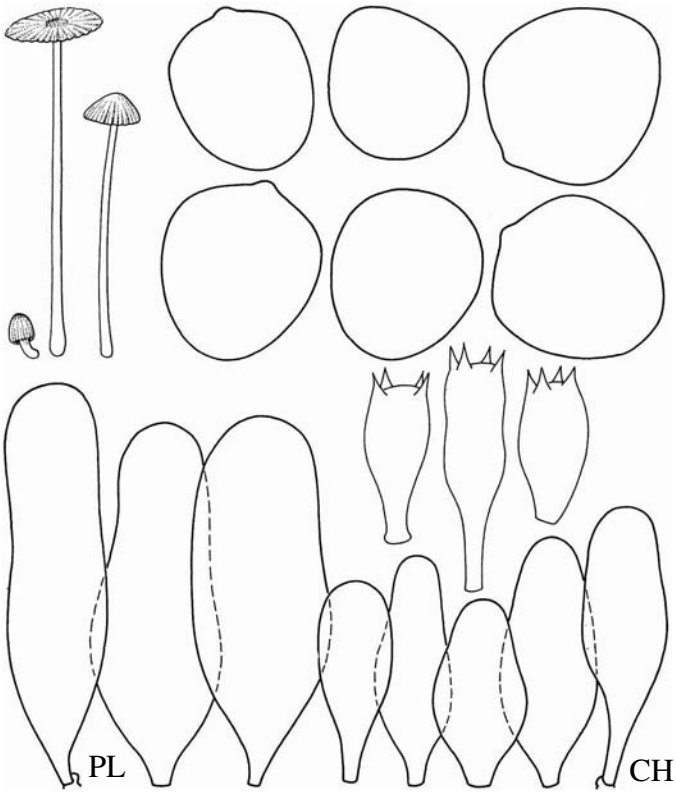


Fig. 8. *Coprinus hercules*

Coprinus hercules differs from *C. schroeteri* in having smaller basidiocarps, broader spores and more distant lamellae.

9. Coprinus miser P. Karst. in Bidr. Känn. Finl. Nat. Folk 37: 236. 1882. – Fig. 9.

Parasola miser (P. Karst.) Redhead, Vilgalys & Hopple in Taxon 50: 236. 2001.

MISSAPL. — *Coprinus subtilis* sensu Joss. in Annls Soc. linn. Lyon 77: 107. 1933.

SEL. ICON. — J. Lange, Fl. agar. dan. 4: pl. 157B. 1939.

SEL. DESCR. & FIGS. — Joss. in Bull. trimest. Soc. mycol. Fr. 78: 247–253. 1962; Uljé & Bas in Persoonia 13: 439, figs 3, 5 & 15. 1988.

VERN. NAME — Klein mestplooirokje.

Pileus 2–5 × 2–3 mm when still closed, 3–8 mm when expanded, first ellipsoid, ovoid or cylindric-ellipsoid, then campanulate to convex, finally flat, orange-brown to greyish brown, later grey-brown and transparent with brownish centre (Mu. 5 YR 4–5/6, 7.5 YR 6/8, 7/8, 8/2, 10 YR 3.5/2; K. & W. 5B2–B5, 5B7; centre 6B8). Lamellae, L = 9–16, l = 0–1, free, but reaching stipe, white to grey, then blackish spotted. Stipe up to 50 × 0.5–1 mm, whitish, glabrous but at base often with loose fibrils; base somewhat clavate.

Spores 7.0–10.5 × 6.5–10.0 µm, Q = 0.95–1.15, av. Q = 1.00–1.05, av. L = 7.7–9.6 µm, av. B = 7.5–9.2 µm, heart-shaped, triangular with rounded angles, flattened, with convex to rounded base and rounded apex, dark red-brown; germ pore eccentric, 1.3–1.5 µm wide. Basidia 16–32 × 8–10 µm, 4-spored, rarely all 2-spored (in the 2-spored variant spores not noticeably larger), surrounded by 4–6 pseudoparaphyses. Cheilocystidia 20–40 × 12–28 µm, (sub)globose or ellipsoid. Pleurocystidia absent. Pileipellis a hymeniformhymeniderm, composed of

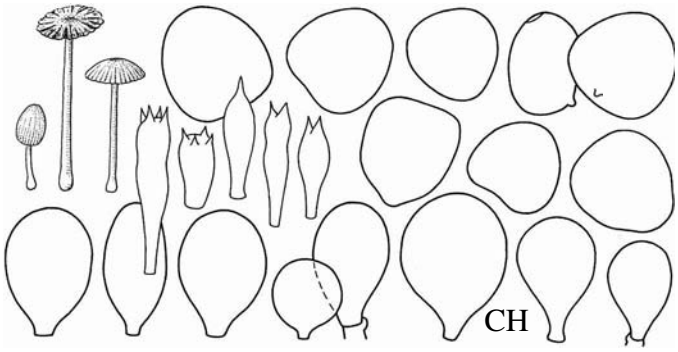


Fig. 9. *Coprinus miser*

spheropedunculate cells (20–45 × 12–25 µm) with short stalk at pileus centre and sessile globose cells at margin. Clamp-connections present.

HABITAT & DISTR. — On dung from various hebivorous animals, very common in the Netherlands. Jan.-Dec. Widespread in Europe.

Coprinus miser is easy to recognise because of the very small basidiocarps that always grow on dung, the rounded triangular spores almost as broad as they are long, the absence of pleurocystidia and the (sub)globose to ellipsoid cheilocystidia.

10. Coprinus megaspermus P.D. Orton in Notes R. bot. Gdn Edinb. 32: 141. 1972. – Fig. 10.

Parasola megasperma (P.D. Orton) Redhead, Vilgalys & Hopple in Taxon 50: 236. 2001.

SEL. DESCR. & FIGS. — Richter & Bender in Z. Mykol. 64: 73–78. 1998; Uljé & Bas in Persoonia 13: 442, fig. 14. 1988.

VERN. NAME — Groot mestplooirokje.

Pileus 5–15 × 3–10 mm when still closed, 25–30 mm wide when expanded, ellipsoid or ovoid, then campanulate to convex, finally flat, sulcate-striate up to centre, at first rusty tawny, then fulvous, sienna or cinnamon, outer part clay buff. Lamellae, L = 30–50, l = 1–3, free,

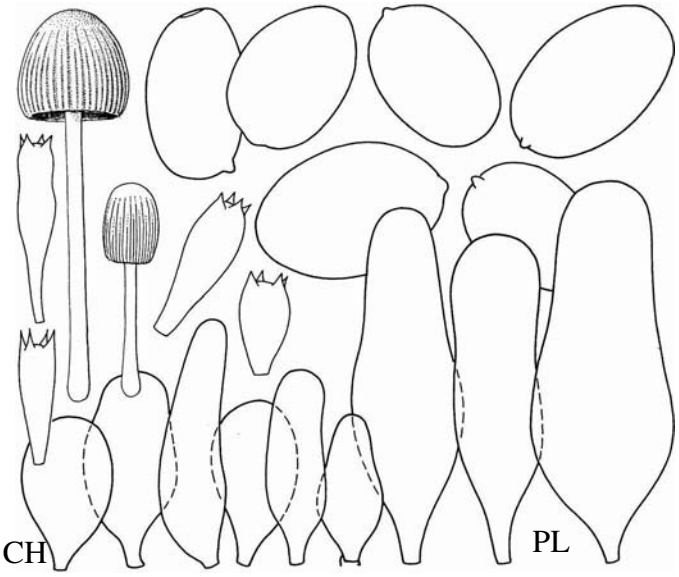


Fig. 10. *Coprinus megaspermus*

slightly remote from stipe, white to blackish. Stipe up to 100 × 1–2.5 mm, whitish to pale greyish brown; base somewhat clavate.

Spores 12.5–17.0 × 9.0–11.5 × 7.5–10.0 µm, Q = 1.30–1.70, av. Q = 1.50–1.55, av. L = 14.3–15.3 µm, av. B = 9.5–10.0 µm, more or less ellipsoid, not distinctly flattened, with rounded base and apex, very dark red-brown; germ pore eccentric, 1.8–2.1 µm wide. Basidia 20–40 × 9–12 µm, 4-spored, surrounded by 5–7 pseudoparaphyses. Cheilocystidia 40–60 × 13–24 µm, utriform, sublageniform, sometimes ellipsoid. Pleurocystidia 55–75 × 20–24 µm, utriform, subcylindrical or sublageniform. Pileipellis a hymeniderm, made up of spheropedunculate cells. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, terrestrial (from type location) but also on dung, in the Netherlands only known from Oegstgeest. Aug. Also recorded from Great Britain.

Coprinus megaspermus can be recognised easily by the large, ellipsoid spores with eccentric germ pore and the naked pileus and stipe.

Subsect. **Setulosi** J. Lange

Pileus and stem pubescent. Pileo- and caulocystidia always present, often in combination with sclerocystidia and/or globose cells; a few species with sparse veil remnants consisting of hyphae on the pileus.

11. Coprinus marculentus Britz. in Bot. Zbl. 54 (3): 70. 1893. – Fig. 11.

Coprinellus marculentus (Britz.) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001. — *Coprinus hexagonosporus* Joss. in Rev. Mycol. 13: 82. 1948 (invalid, no Latin diagnosis).

SEL. ICON. — Cetto, Gr. Pilzf. 7: pl. 2607. 1993; Enderle et al. in Z. Mykol. 52: opposite 128. 1986; Lanconelli & Lanzoni in Riv. Micol. 31: 232. 1988.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 52: 118. 1986; M. Lange in Dansk bot. Ark. 14 (6): 108. 1952 (as *C. hexagonosporus*); M. Lange & A.H. Smith in Mycologia 45: 753. 1953 (as *C. hexagonosporus*); Uljé & Bas in Persoonia 14: 282, fig. 1. 1991.

VERN. NAME — Hoeksporige donsinktzwam.

Pileus 6–13 × 4–10 mm when still closed, 15–25 mm when expanded, first subglobose, ellipsoid, or ovoid, then obtusely conical, finally flat, yellow-brown to date-brown, more frequent dark red-brown at centre (Mu. 2.5–5 YR 2.5/2, 7.5 YR 3/3 to 6/6, K. & W. 5E7 to 5D8), paler towards margin (5 YR 4/3), covered with granular-flocculose veil, especially at centre. Lamellae, L = 16–24, l = 1–3, narrowly adnate or almost free, white in very young stage, blackish at maturity. Stipe 40–80 × 1–2 mm, whitish, pubescent; base clavate.

Spores 9.5–14.5 × 6.5–8.5 × 6.0–7.5 µm, Q = 1.30–1.70, av. Q = 1.45–1.55, av. L = 10.7–12.0 µm, av. B = 7.4–7.7 µm, hexagonal with rounded base and conical apex, dark red-brown; germ pore eccentric, c. 1.8 µm wide. Basidia 16–38 × 9–12 µm, 4-spored, surrounded by (3)4–5(6) pseudoparaphyses. Cheilocystidia 20–70 × 17–40 µm, ellipsoid to globose. Pleurocystidia 60–90 × 20–35 µm, oblong, ellipsoid to subglobose. Pileocystidia 50–100 × 12–20 µm, lageniform with cylindrical, 6–10 µm wide neck and equal to slightly broader, up to 12 µm wide apex. Sclerocystidia absent. Velar globose cells on pileipellis up to c. 40 µm in diam., globose. Caulocystidia 40-56 × 8.0–13 µm, subcylindrical with broadened apex and base. Clamp-connections present.

HABITAT & DISTR. — Subfasciculate, on dung, mixtures of straw and dung, and decaying grass, rather rare in the Netherlands. March–Oct. Throughout Europe, also known from America and Japan.

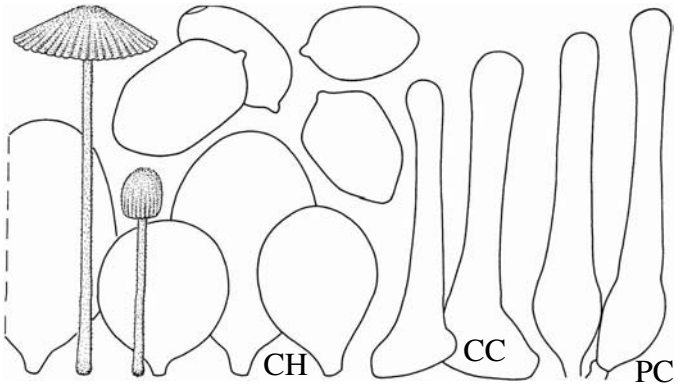


Fig. 11. *Coprinus marculentus*

Coprinus marculentus is easy to recognise by its 6-angled spores and the pileocystidia having a widened apex.

12. Coprinus curtus Kalchbr. in Flora 59: 424. 1876. – Fig. 12.

Coprinellus curtus (Kalchbr.) Vilgalys, Hopple & Johnson in Taxon 50: 233. 2001. *Coprinus plicatiloides* Buller in Trans. Br. mycol. Soc. 6: 364. 1920.

SEL. ICON. — Bender et al. in Z. Mykol. 50: opposite 16. 1984.

SEL. DESCR. & FIGS. — Bender et al. in Z. Mykol. 50: 24. 1984; Joss. in Annls. Soc. linn. Lyon 77: 109. 1933; Uljé & Bas in Persoonia 14: 284, fig. 2. 1991.

VERN. NAME — Paardenmestdonsinktzwam.

Pileus 3–7 × 2–5 mm when still closed, 6–13 mm wide when expanded, first (sub)globose, ellipsoid or ovoid, then obtusely conical, finally flat, cream coloured, at centre with yellow-brown to ochre-brown granular-flocculose veil. Lamellae, L = c. 20, l = 0–1, almost free or free, first whitish, then grey to blackish. Stipe 30–60 × 0.5–1 mm, whitish, vitreous, sparsely pubescent; base clavate.

Spores 9.5–14.0 × 6.5–9.0 × 6.0–8.0 µm, Q = 1.35–1.70, av. Q = 1.50–1.55, av. L = 11.0–12.0 µm, av. B = 7.3–8.0 µm, ellipsoid to slightly ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 2 µm wide. Basidia 11–28 × 8–12 µm, 4-spored, surrounded by 5–7 pseudoparaphyses. Cheilocystidia globose, up to 35 µm in diam. to subglobose, the latter up to 40 × 35 µm. Pleurocystidia absent. Pileocystidia 40–90(110) × 10–20 µm, lageniform to nettle hair-shaped with cylindrical to slightly tapering, 3–7 µm wide neck and subcapitate to capitate, up to 12(15) µm wide apex. Sclerocystidia absent. Velar globose cells on pileipellis up to 40 µm in diam., rather strongly

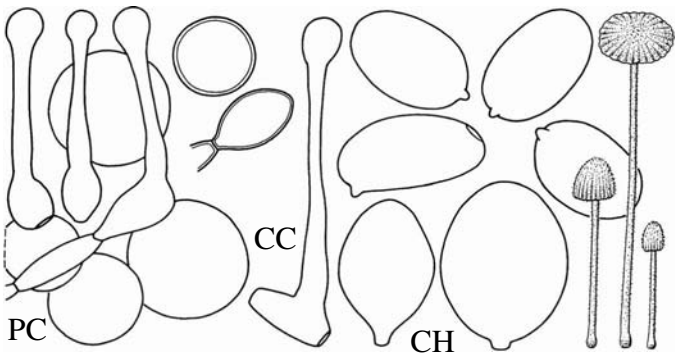


Fig. 12. *Coprinus curtus*

encrusted, often brown. Caulocystidia 27–50 × 4–5 µm, cylindrical-capitate to tibiiform with up to 7 µm wide capitulum and base. Clamp-connections not seen.

HABITAT & DISTR. — Solitary or subfasciculate, on horse dung; rather rare in the Netherlands. Apr.-Oct. Widespread in Europe, America and Japan.

Coprinus curtus has brown, thick-walled globose cells and (sub)capitate pileocystidia.

13. Coprinus heptemerus M. Lange & A.H. Smith in Mycologia 45: 751. 1953. – Fig. 13.

Coprinellus heptemerus (M. Lange & A.H. Smith) Vilgalys, Hopple & Johnson in Taxon 50: 234. 2001. *Coprinus curtus* f. *macrosporus* Romagn. in Rev. Mycol. 6: 126. 1941.

SEL. ICON. — Cetto, Gr. Pilzf. 6: pl. 2181. 1989; Lanconelli & Lanzoni in Riv. Micol. 31: 233. 1988.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 108. 1952; M. Lange & A.H. Smith in Mycologia 45: 751–752. 1953; Uljé & Bas in Persoonia 14: 284, fig. 3. 1991.

VERN. NAME — Bruine mestinktzwam.

Pileus 4–8 × 2–5 mm when still closed, 5–10 mm wide when expanded, first ellipsoid, ovoid, or oblong, then obtusely conical, finally flat, yellow-brown to dark-brown at centre (Mu. 10 YR 3/3 to 6/6, K. & W. 5E7, 5D8), paler towards margin covered with brownish granular-flocculose veil, especially at centre. Lamellae, L = 16–22, l = 1–3, free, first white, then brown to blackish. Stipe 25–50 × 0.5–1 mm, whitish, vitreous, sparsely pubescent; base clavate.

Spores 12.5–16.5 × 7.0–8.5 µm, Q = 1.70–2.10, av. Q = 1.90, av. L = 14.7 µm, av. B = 7.8 µm, ellipsoid to oblong, with rounded base and apex, dark red-brown; germ pore strongly eccentric, 2.0–2.3 µm wide. Basidia 14–38 × 9–11 µm, 4-spored. Pseudoparaphyses not noted. Cheilocystidia 25–55 µm in diam., globose. Pleurocystidia absent. Pileocystidia 50–120 × 8–21 µm, ventricose-lageniform with narrow, tapering neck and 2.5–4 µm wide apex. Sclerocystidia absent. Velar globose cells on pileipellis 20–35 µm in diam., hyaline to yellow-brown and often with long spine-like projections. Caulocystidia 20–40 × 8.0–10 µm, lageniform with attenuated apex. Clamp-connections absent.

HABITAT & DISTR. — Subfasciculate, on dung of various animals; rather common in the Netherlands. Jan.-Dec. Widespread in Europe and America, also known from Japan.

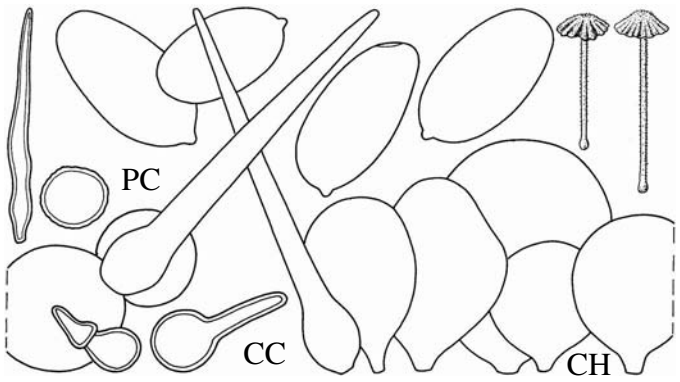


Fig. 13. *Coprinus heptemerus*

The spine-like projections of the velar globose cells, typical for *C. heptemerus,* the tapering pileocystidia and a preference for dung are characters to identify the species.

14. Coprinus pyrrhanthes Romagn. in Rev. Mycol. 16: 128. 1951. – Fig. 14.

Coprinellus pyrrhanthes (Romagn.) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. ICON. — Bender in Beitr. Kenntn. Pilze Mitteleur. 1: opposite 32. 1984.

SEL. DESCR. & FIGS. — Bender in Beitr. Kenntn. Pilze Mitteleur. 1: 27. 1984; Romagn. in Rev. Mycol. 16: 128. 1951; Uljé & Bas in Persoonia 14: 288, fig. 5. 1991.

VERN. NAME — Oranjebruine poederinktzwam.

Pileus 3–5 × 2–4 mm when still closed, 5–8(11) mm when expanded, first (sub)globose or ovoid, then hemispherical or obtusely conical to convex, rarely flat, yellow-brown to orange-brown (Mu. 7.5 YR 4–5/6–8, 10 YR 7/6) at centre, distinctly paler towards margin (10 YR 7/2–8/1), with granular, dark brown (7.5 YR 4/6) flocks (globose cells). Lamellae, L = 11–21, l = 0–3, narrowly adnate or almost free, rather broad and distant, first white, then brown to blackish. Stipe 10–30 × 0.5–1.0 mm, white, somewhat vitreous, pubescent.

Spores 6.5–9.5 × 5.0–7.0 µm, Q = 1.40–1.60, av. Q = 1.50, av. L = 7.7–8.2 µm, av. B = 5.8–6.4 µm, ovoid to ellipsoid with rounded base and apex, medium to dark red-brown; germ pore eccentric, 1.3–1.5 µm wide. Basidia 14–26 × 8–10.5 µm, 4-spored. Pseudoparaphyses 5–7 per basidium. Cheilocystidia 20–50 × 10–30 µm, globose or broadly ellipsoid. Pleurocystidia absent. Pileocystidia 40–75(90) × 14–27 µm, lageniform to nettle hair-shaped with 5–8 µm wide neck and equal or clavate to capitate, (6)8–12 µm wide apex (see note). Sclerocystidia absent. Velar globose cells on pileipellis globose, up to 35 µm in diam. or ovoid and up to 40 × 30 µm, hyaline to thick-walled and incrusted, yellow-brown; walls up to almost 2 µm thick. Caulocystidia 22–50 × 7.0–9.0 µm, lageniform. Clamp-connections absent.

HABITAT & DISTR. — Fasciculate or solitary in small groups, on large compost heaps, on small chips of wood, and on dead leaves; rather rare in the Netherlands. May-Oct. Rather rare in Europe.

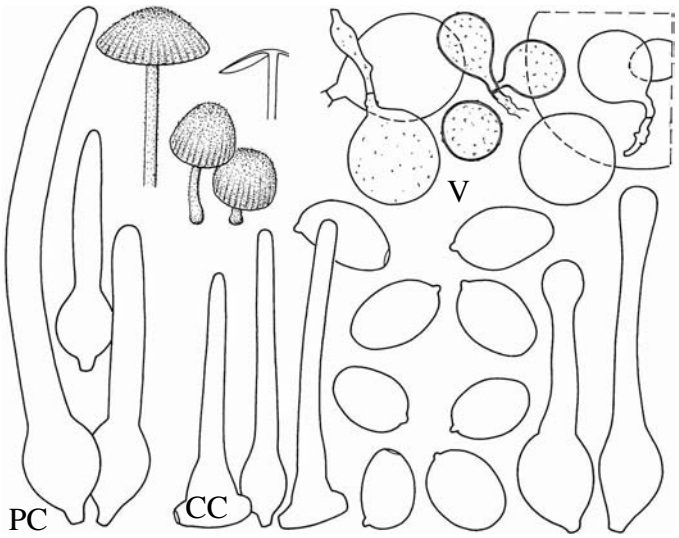


Fig. 14. *Coprinus pyrrhanthes*

The presence of globose cells, pileocystidia with tapering apex and the habitat on compost heaps, vegetable refuse, or rotting wood-chips are characters to identify *C. pyrrhanthes*. Usually the apex of the pileocystidia is equal but in one collection found on a compost heap, the pileocystidia have a distinctly broadened apex, although this record agreed in all other respects.

15. Coprinus disseminatus (Pers. :Fr.) S.F. Gray, Nat. Arr. Br. Pl. 1: 634. 1821. – Fig. 15.

Agaricus disseminatus Pers., Syn. meth. Fung.: 403. 1801; *Agaricus disseminatus* Pers. :Fr., Syst. mycol. 1: 305. 1821; *Coprinellus disseminatus* (Pers. :Fr.) J. Lange in Dansk. bot. Ark. 9 (6): 93. 1938; *Pseudocoprinus disseminatus* (Pers. :Fr.) Kühner in Botaniste 20: 156. 1928.

SEL. ICON. — Cetto, Gr. Pilzf. 1: pl. 39. 1975; Lanconelli & Lanzoni in Riv. Micol. 31: 235. 1988; R. Phillips, Paddest. Schimm.: 181. 1981; J. Lange, Fl. agar. dan. 4: pl. 156A. 1939; M. Lange, Paddestoelengids: 141. 1964.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 128. 1952; M. Lange & A.H. Smith in Mycologia 45: 776-777. 1953; Uljé & Bas in Persoonia 14: 290, fig. 6. 1991.

VERN. NAME — Gewone zwerminktzwam.

Pileus 5–8 × 4–7 mm when still closed, up to 15(20) mm when expanded, first (sub)globose or ovoid, then hemispherical or obtusely conical to convex, rarely flat, usually pale brown, yellow-brown, ochre, (Mu. 10 YR 4–6/6, 7/4, K. & W. 5C3–4, 5C/D5, 5D8) at centre, paler towards margin (10 YR 6/4 to 8/2), sometimes almost white. Whitish to brown granular-flocculose veil present on pileus. Lamellae, L = 16–32, l = 0–3, narrowly adnate to almost free, first white, then brown, finally blackish. Stipe 20–40(60) × 1–1.5 mm, white to greyish-white, often somewhat vitreous, pubescent.

Spores 6.5–9.5 × 4.0–6.0 µm, Q = 1.45–1.90, av. Q = 1.55–1.75, av. L = 7.7–9.2 µm, av. B = 4.7–5.5 µm, ovoid, obconical at base and truncate at apex, medium to dark red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 16–40 × 5–8 µm, 4-spored. Pseudoparaphyses 4–6 per basidium. Cheilocystidia absent (pileocystidia continuing along edge of lamellae over short distance). Pleurocystidia absent. Pileocystidia 50–200 × 15–24 µm, lageniform with cylindrical, 6–15(17) µm wide neck and rounded apex. Sclerocystidia absent. Velar globose cells on pileipellis up to 40 µm in diam., usually numerous. Caulocystidia 40–70 × 5.0–14 µm, subcylindrical to lageniform. Clamp-connections not found (short side-branches of hyphae near septa, resembling clamp-connections, often observed).

HABITAT & DISTR. — Gregarious or fasciculate, on and near wood, often in large quantities, very common in in the Netherlands. Jan.-Dec. Common in Europe, America, and Japan and probably all over the world.

Coprinus disseminatus is one of the best known inkcaps. It generally grows with numerous basidiocarps on and around stumps of trees or on soil mixed with fragments of wood. The velar globose cells, absence of cheilocystidia, and typical spore-shape together with the long pileocystidia with broad, cylindrical neck and rounded apex make this species easily recognisable. Macroscopically, *C. disseminatus* may be mistaken for *Psathyrella pygmaea* (Quél.) Sing., which has a similar habit (fasciculate or gregarious) and more or less the same appearance. See also under *C. coniophorus* and *C. hiascens*.

Ko et al. (in *Mycol. Res.* 105: 1519-1526. 2001) showed that there are molecular differences in collections from different geographical regions of the world, which might indicate that there is more than one species involved.

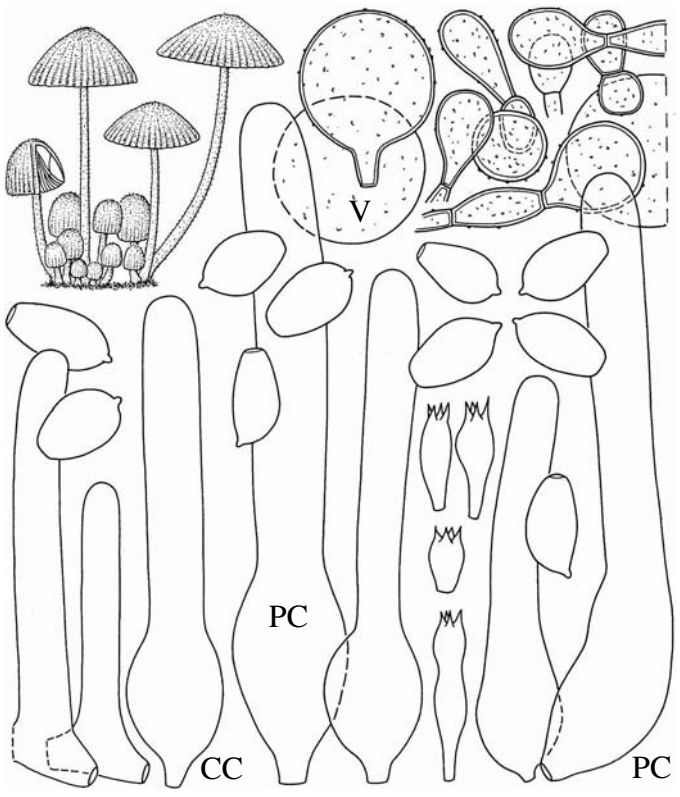


Fig. 15. *Coprinus disseminatus*

16. Coprinus hiascens (Fr. :Fr.) Quél., Fl. mycol. Fr.: 42. 1888. – Fig. 16.

Agaricus hiascens Fr. :Fr., Syst. mycol. 1: 303. 1821; *Coprinellus hiascens* (Fr. :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. ICON. — Cetto, Gr. Pilzf. 5: pl. 1723. 1987; Enderle et al. in Z. Mykol. 52: opposite 112. 1986; J. Lange, Fl. agar. dan. 4: pl. 157C. 1939; Lanconelli & Lanzoni in Riv. Micol. 31: 259. 1988.

SEL. DESCR. & FIGS. — Enderle et al. in Z. Mykol. 52: 113. 1986; M. Lange in Dansk bot. Ark. 14 (6): 126. 1952; M. Lange & A.H. Smith in Mycologia 45: 775. 1953; Uljé & Bas in Persoonia 14: 292, fig. 7. 1991.

VERN. NAME — Bundelinktzwam.

Pileus 10–15 × 6–12 mm when still closed, up to c. 40 mm when expanded, first (sub)globose, ovoid or ellipsoid, then obtusely conical to convex, finally flat, usually ochre-brown (Mu. 7.5 YR 4/6, 10 YR 3–4/3, 4/4, 4–5/6, K. & W. 6E5, 5D7) at centre, paler (10 YR 5/3–6, 6/4, 8/5, 2.5 Y 5/2;5D6, 5C/D3) towards margin, only rarely entirely flattened. Veil present, visible at small, whitish, radially fibrillose flocks. Lamellae, L = 24–36, l = 1–3, free or almost free, first white, then brown-grey to blackish. Stipe 40–100 × 1–3(4) mm, white to greyish white, pubescent, with slightly clavate, up to 5 mm wide base.

Spores 7.5–11.5 × 4.5–6.0 µm, Q = 1.60–2.10, av. Q = 1.70–1.90, av. L = 8.8–9.7 µm, av. B = 4.8–5.5 µm, ovoid to ellipsoid, obconical at base and truncate at apex, dark red-brown; germ pore central, 1.6–1.8 µm wide. Basidia 14–38 × 7–8 µm, 4-spored. Pseudoparaphyses 3–5 per basidium. Cheilocystidia 30–50(75) × 10–18 µm, lageniform with 3.5–7 µm wide, tapering neck. Pleurocystidia absent. Pileocystidia slender, 50–200(250) × 13–24 µm, lageniform, with 4–10 µm wide, tapering neck. Sclerocystidia absent. Veil on pileus consisting of cyl-

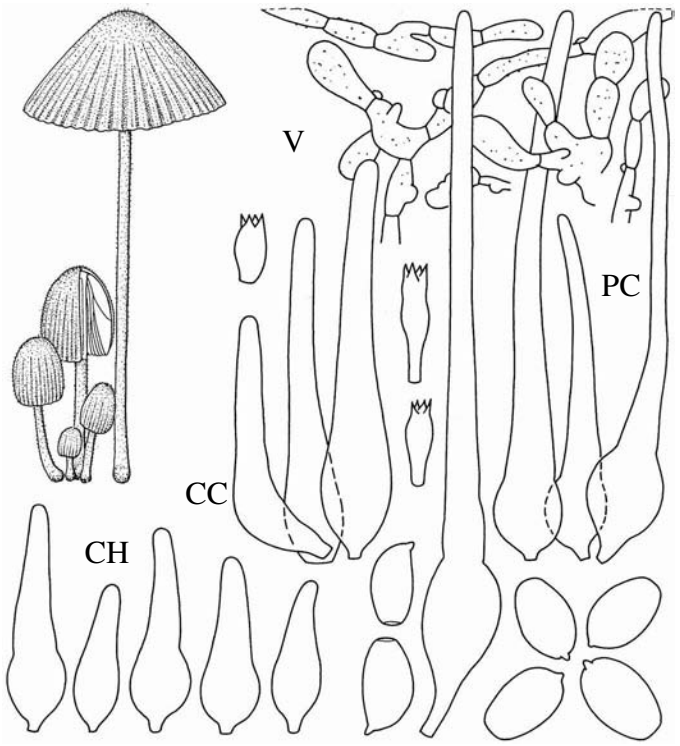


Fig. 16. *Coprinus hiascens*

indrical or somewhat inflated hyphae, with terminal cells 2–15 µm wide. Caulocystidia 40-64 × 8.0-11.0 µm, subcylindrical with broadened base to lageniform. Clamp-connections present.

HABITAT & DISTR. — Fasciculate, on naked soil or grassy places, usually in bundles of more than 10 specimens. Rather common in the Netherlands and in Europe. Apr.-Nov. Also known from America and Japan.

Coprinus hiascens is easily recognisable by the tapering, long pileocystidia in combination with the spore-shape, which is more or less similar to that of *C. disseminatus,* but in that species the spores are slightly smaller and cylindrical veil elements are lacking from the pileus. Moreover, *C. disseminatus* has pileocystidia with a broad, cylindrical, not tapering neck and velar globose cells on the pileus.

17. Coprinus heterothrix Kühner in Kühn. & Romagn. in Bull. Soc. Nat. Oyonnax 10–11: 3. 1957 (*Compl. Fl. anal*. 7). – Fig. 17.

C*oprinellus heterothrix* (Kühner) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. ICON. — Enderle et al. in Z. Mykol. 52: opposite 112. 1986; Lanconelli & Lanzoni in Riv. Micol. 31: 238. 1988.

SEL. DESCR. & FIGS. — Enderle et al. in Z. Mykol. 52: 111. 1986; Uljé & Bas in Persoonia 14: 292, 295, fig. 9. 1991.

VERN. NAME — Velumdonsinktzwam.

Pileus 6–10 × 5–8 mm when still closed, up to 20 mm when expanded, first ellipsoid or ovoid, then obtusely conical to convex, finally flat, first red-brown (Mu. 5 YR 2.5/2, 3/4, K. & W. 6E6), then somewhat more dull brown (7.5 YR 4/6 to 5–6/4;6D/E6), finally more greyish brown (10 YR 5–6/3–4) to greyish. Veil present on pileus visible as small, whitish, radially fibrillose flocks. Lamellae, L = 9–18, l = 0–3, narrowly adnate, relatively distant, first white, soon dark brown to blackish. Stipe 20–50 × 0.5–1.5 mm, at base up to 2 mm wide, whitish, pubescent.

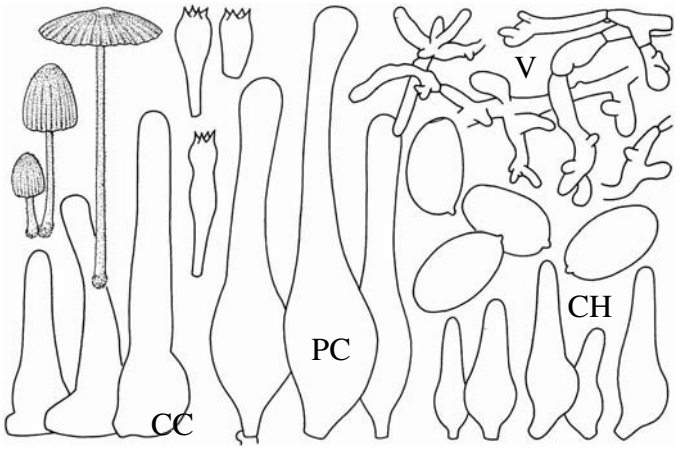


Fig. 17. *Coprinus heterothrix*

Spores 8.5–10.0(12.0) × 5.0–6.0 µm, Q = 1.55–1.80, av. Q = 1.65–1.70, av. L = 8.8–9.6 µm, av. B = 5.3–5.6 µm, ovoid, with rounded base and apex, dark red-brown; germ pore slightly eccentric to almost central, 1.3–1.5 µm wide. Basidia 16–30 × 6–9 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia 20–45 × 9–13 µm, lageniform with rather thick, tapering to cylindrical neck and in part somewhat enlarged apex, 3–6 µm wide. Pleurocystidia absent. Pileocystidia lageniform, 50–110 × 11–20 µm, usually with slightly enlarged, subclavate, 6–11 µm wide apex. Sclerocystidia absent. Veil on pileus consisting of cylindrical, somewhat diverticulate, thin-walled, in part slightly thick-walled (< 1 µm, seldom up to 1.5 µm thick) hyphae with often clavate, up to 7 µm thick terminal cells, usually with granular incrustations. Caulocystidia 35–50 × 7.0–10 µm, subcylindrical with broadened base to lageniform. Clamp-connections present.

HABITAT & DISTR. — Subfasciculate, on naked, often mossy soil and on mossy branches, rather common in the Netherlands and in Europe. Apr.–Sept. Also known from America.

This species can be distinguished from *C. hiascens* by its ellipsoid spores with a slightly eccentric germ pore and the somewhat widened apex of the pileocystidia. *Coprinus velatopruinatus* possesses globose cheilocystidia, by which it differs from *C. heterothrix*.

18. Coprinus minutisporus Uljé in Uljé & Noordel. in Persoonia18: 260. 2003. – Fig. 18.

SEL. DESCR. & FIGS. — Uljé & Bas in Persoonia 14: 295, fig. 9. 1991 (as *Coprinus species* [Uljé 926]).

VERN. NAME — Houtsnipperdwergje.

Pileus 2–4 × 2–3 mm when still closed, up to c. 7 mm wide when expanded, at centre cinnamon, towards margin paler, soon grey. Veil present on pileus, visible as small, whitish, radial fibrillose flocks. Lamellae, L = 8–13, l = 0–1, narrowly adnate. Stipe 8–20 × 0.1–0.5 mm, whitish, vitreous, with widely dispersed setulae.

Spores 7.0–8.5 × 5.0–6.0 µm, av. L = 7.4–8.1, av. B = 5.5–5.7 µm, Q = 1.25–1.60, av. Q = 1.35–1.40, broadly ellipsoid, ellipsoid to ovoid; germ pore central, 1.6 µm wide. Basidia 16–40 × 8–11 µm, 4-spored. Pseudoparaphyses not noted. Cheilocystidia 20–50 × 20–30 µm, (sub)globose. Pleurocystidia absent. Pileocystidia 50–100 × 14–22 µm, (broadly) lageniform with 7–12 µm wide, equal to slightly subcapitate apex. Sclerocystidia absent. Veil on pileus made up of somewhat diverticulate 2–8(–10) µm broad hyphae. Caulocystidia 40–50 × 7.0–10 µm, subcylindrical with broadened base. Clamp-connections present.

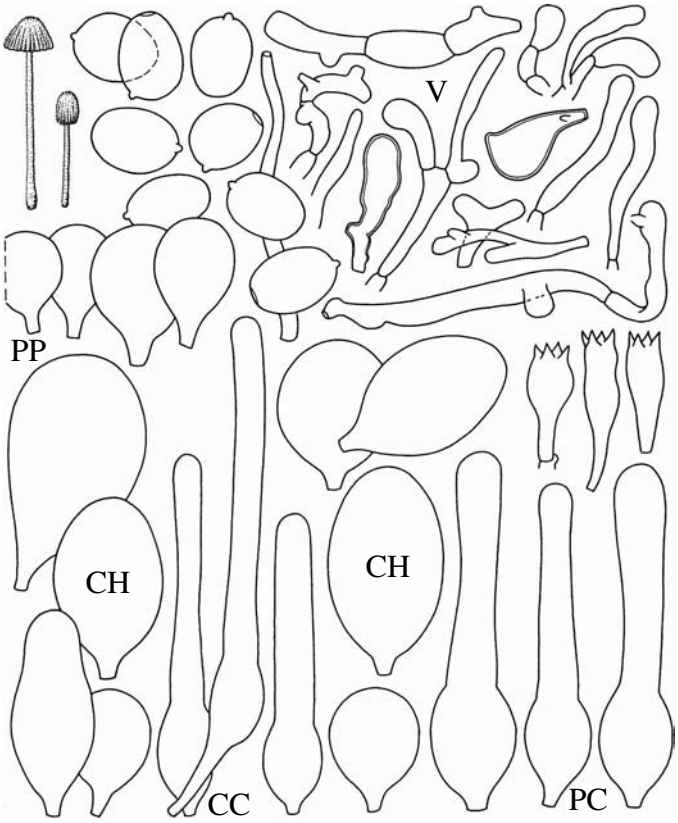


Fig. 18. *Coprinus minutisporus*

HABITAT & DISTR. — Solitary or subfasciculate, on sandy-clayey soil, among or on wood-chips; very rare, only known from Alphen aan den Rijn. July. Not yet known from outside the Netherlands.

In this species particularly the shape and the size of the spores are characteristic. None of the other species with cylindrical veil elements has spores as small as *C. minutisporus*. The central germ pore is the most important difference with other species (except *C. hiascens*) that possess cylindrical veil elements. *Coprinus hiascens*, however, has spores with a conical apex, lageniform cheilocystidia, and tapering pileocystidia, whereas *C. minutisporus* has spores with a rounded apex, (sub)globose cheilocystidia, and pileocystidia that are broadened at the apex. Because of the very small size of the basidiocarps and the greyish colour of the pileus this species is very inconspicuous and difficult to find.

19. Coprinus allovelus Uljé in Uljé & Noordel. in Persoonia 18: 261. 2003. – Fig. 19.

SEL. DESCR. & FIGS. — Uljé & Bas in Persoonia 14: 297, fig. 10. 1991 (as *Coprinus species* (Uljé 952).

VERN. NAME — Kleidwergje.

Pileus 3–6 × 2–4 mm when still closed, up to c. 12 mm in diam. when expanded, ochre-brown at centre, somewhat paler towards margin. Veil present, visible as small, whitish, radially fibrillose flocks on pileus. Lamellae, L 18, l = 0–1(3), narrowly adnate. Stipe 15–30 × 0.5–1 mm, whitish, vitreous, pubescent.

Spores 9.0–11.5 × 5.0–5.5 µm, av. L = 10.4, av. B = 5.3 µm, Q = 1.70–2.15, av. Q = 1.95, subcylindric to narrowly ovoid; germ pore distinctly eccentric, c. 1.6 µm wide. Basidia 17–36 × 7–9 µm, 4-spored.

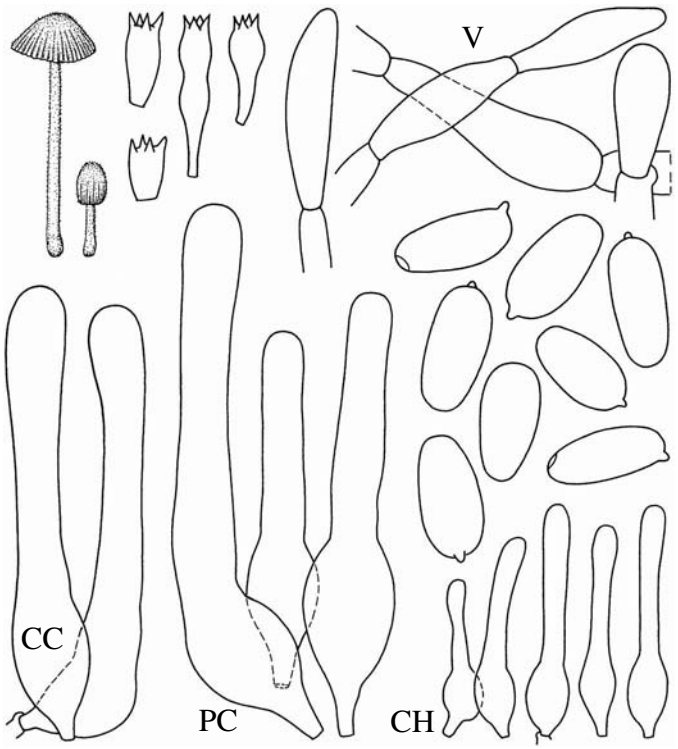


Fig. 19. *Coprinus allovelus*

Pseudoparaphyses (3)4–5(6) per basidium. Cheilocystidia 30–50 × 8–10 µm, lageniform with 3–5 µm wide neck often slightly enlarged towards (up to 6.5 µm wide) apex. Pleurocystidia absent. Pileocystidia 70–120 × 13–18 µm, broadly lageniform with 7–11 µm wide neck and equal to subclavate, 9–13(15) µm wide apex. Sclerocystidia absent. Veil consisting of inflated, fusiform, 6–16 µm thick hyphae present on pileus. Caulocystidia 20–70 × 6.0–10 µm, subcylindrical with broadened base or lageniform. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate on bare, rich river-clay; subfasciculate, very rare, only known from Linschoten. Aug. Not yet recorded from outside the Netherlands.

Coprinus allovelus is only known from one collection, consisting of only a few basidiocarps. The veil on the pileus consists of hyphae made up of elongate elements and fusiform to clavate terminal cells. The elements of this veil are larger and broader than in other species of subsect. *Setulosi* with velar hyphae on the pileus. Moreover, this taxon can be distinguished from those species by its slender, (sub)cylindrical spores.

20. Coprinus velatopruinatus Bender in Beitr. Kenntn. Pilze Mitteleur. 5: 80. 1989. – Fig. 20.

C*oprinellus velatopruinatus* (Bender) Redhead, Vilgalys & Moncalvo in Taxon 50: 235. 2001

SEL. ICON. — Bender in Beitr. Kenntn. Pilze Mitteleur. 5: 80. 1989.

SEL. DESCR. & FIGS. — Bender in Beitr. Kenntn. Pilze Mitteleur. 5: 79. 1989; Uljé & Bas in Persoonia 14: 297. 1991.

VERN. NAME — Vlokjesdonsinktzwam.

Pileus 6–10 × 8–20 mm when still closed, up to 35 mm when expanded, first ovoid or ellipsoid, then obtusely conical to convex, finally flat, cinnamon-brown to ochre (Mu. 7.5 YR 3/2–3/4, 4/4–4/6, 5/6, 10 YR

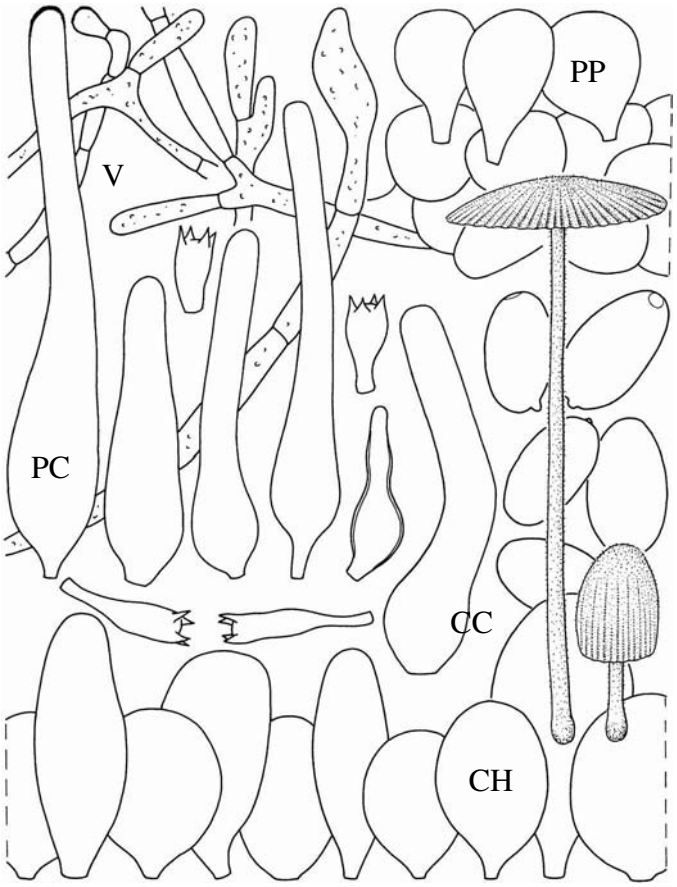


Fig. 20. *Coprinus velatopruinatus*

7/4–7/6). Veil present on pileus, visible as small, whitish, radially fibrillose flocks. Lamellae narrowly adnate, crowded, white to blackish. Stipe 35–65 × 1.2–2 mm, whitish, pubescent, somewhat white-felted at clavate base when young.

Spores 11.0–13.5 × 7.0–7.5 × 6.0–7. µm, Q = 1.55–1.85, av. Q = 1.70, av. L = 12.1 µm, av. B = 7.2 µm, ovoid with rounded base and apex, in part with slightly apical papilla, dark red-brown; germ pore eccentric, 1.5–1.8 µm wide. Basidia 18–36 × 8–10 µm, 4–spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 15–40 µm broad, first globose, later ellipsoid to broadly (sub)cylindrical, up to 70 µm in length. Pleurocystidia absent. Pileocystidia 65–115(140) × 10–30 µm, lageniform with cylindrical neck and equal to slightly broadened, 5–10 µm wide apex. Sclerocystidia absent. Veil on pileus consisting of 2.5 to 5.5 µm wide, somewhat diverticulate, encrusted hyphae. Clamp-connections present.

HABITAT & DISTR. — Usually fasciculate, on old sawdust and small pieces of wood mixed with soil; very rare in the Netherlands (Alphen aan den Rijn). June–Sept. Also recorded from Germany.

Coprinus velatopruinatus has a veil on the pileus that consists of cylindrical hyphae . Microscopical differences with *C. heterothrix* are the shape of the cheilocystidia, which are always lageniform, and the smaller spores in the latter species.

21. Coprinus subimpatiens M. Lange & A.H. Smith in Mycologia 45: 772. 1953. – Fig. 21.

C*oprinellus subimpatiens* (M. Lange & A.H. Smith) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. ICON. — Cetto, in Gr. Pilzf. 7: pl. 2611. 1993; Krieglst. et al. in Z. Mykol. 48: opposite 78. 1982; Lanconelli & Lanzoni in Riv. Micol. 31: 255. 1988.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 123. 1952; M. Lange & A.H. Smith in Mycologia 45: 772. 1953; Uljé & Bas in Persoonia 14: 300, fig. 12. 1991.

VERN. NAME — Donkere donsinktzwam.

Pileus 10–23 × 7–18 mm when still closed, up to 40 mm when expanded, ovoid or ellipsoid, then obtusely conical to convex, finally flat, dark reddish brown to yellow-brown or leather- to cinnamon-coloured at centre (Mu. 2.5 YR 2.5/4, 5 YR 3/2–3, 5/8, 7.5 YR 4–5/6, 10 YR 5–6/5–6), paler towards margin (7.5 YR 4–5/6, 10 YR 6/7, 7/6, 5–7/4, 5–6/2, 5/1). Lamellae, L = 26–28, l = 1–3, narrowly adnate to free, first white, then grey-brown to blackish. Stipe 40–100 × 1–3 mm, white to greyish-white, pubescent; base clavate.

Spores 9.5–14.0 × 6.0–8.0 µm, Q = 1.40–1.85, av. Q = 1.50–1.65, av. L = 10.3–12.3 µm, av. B = 6.3–7.6 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.5–1.8 µm wide. Basidia 18–43 × 9–10 µm, 4-spored, surrounded by (4)5–6(7) pseudoparaphyses. Cheilocystidia from globose and up to c. 50 µm in diam. to lageniform and 40–70(100) × 13–17 µm with somewhat tapering neck and 4–8 µm wide apex. Pleurocystidia 50–75 × 20–40 µm, (sub)globose to utriform, not always present. Pileocystidia 60–120 × 13–24 µm, lageniform with cylindrical to somewhat tapering neck and 5–10 µm wide, equal to slightly broader apex. Sclerocystidia in most collections present (not found in type material). Caulocystidia 30–80 × 7.0–10 µm, subcylindrical with broadened base or lageniform. Clamp-connections present.

HABITAT & DISTR. — Subfasciculate on often clayey soil, rather common in the Netherlands and in Europe. Apr.–Nov.

Coprinus subimpatiens resembles *C. callinus*. The most important differences between these two species are the shape of the cheilocystidia and the breadth of the spores. The cheilocystidia in *C. callinus* are exclusively globose, in *C. subimpatiens* intermixed lageniform and globose. The spores are somewhat narrower in *C. callinus*.

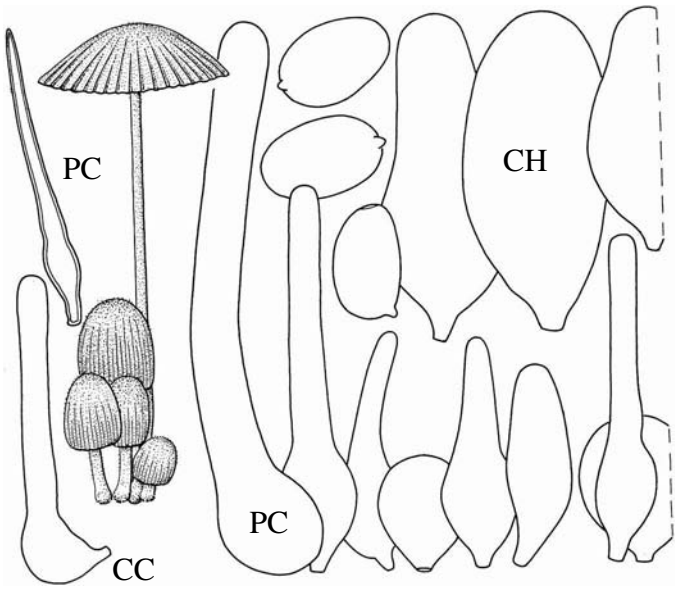


Fig. 21. *Coprinus subimpatiens*

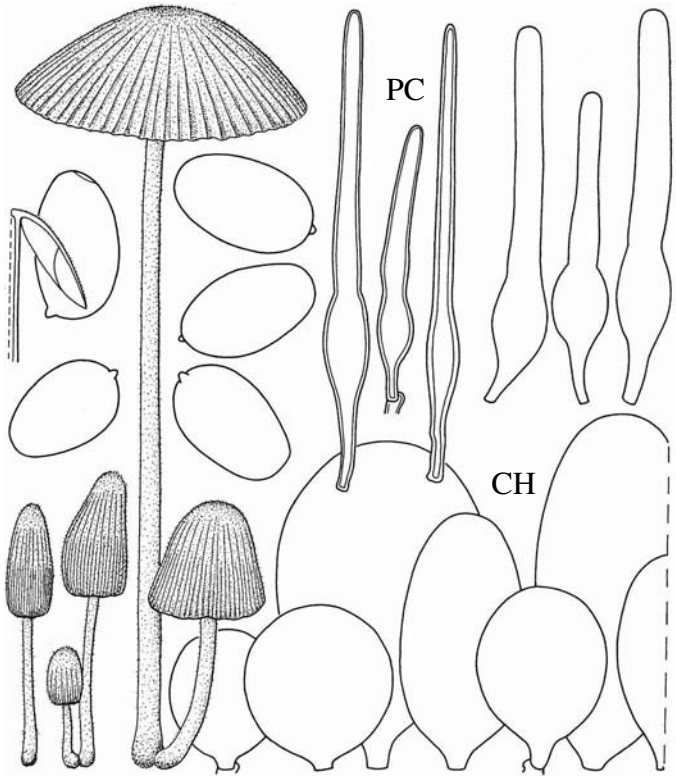


Fig. 22. *Coprinus sclerocystidiosus*

22. Coprinus sclerocystidiosus M. Lange & A.H. Smith in Mycologia 45: 769. 1953. – Fig. 22.

C*oprinellus sclerocystidiosus* (M. Lange & A.H. Smith) Vilgalys, Hopple & Johnson in Taxon 50: 234. 2001.

SEL. ICON. — Lanconelli & Lanzoni in Riv. Micol. 31: 251. 1988.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 121. 1952; M. Lange & A.H. Smith in Mycologia 45: 772. 1953; Uljé & Bas in Persoonia 14: 302, fig. 13. 1991.

VERN. NAME — Bruindonzige inktzwam.

Pileus 12–22 × 8–16 mm when still closed, up to 35 mm when expanded, ellipsoid or ovoid, then obtusely conical to convex, finally flat, yellow-brown to ochre-brown at centre (Mu. 10 YR 4/6, 2.5 Y 6/8, K. & W. 5D5 to 4A/B7), paler towards margin. Lamellae, L = 36, l = 1–3(5), free, narrow, first white, then grey-brown to blackish. Stipe 40–100 × 1–3(4) mm, white to greyish-white, pubescent; base clavate.

Spores 10.5–14.0 × 6.5–8.5 µm, Q = 1.35–1.80, av. Q = 1.55–1.70, av. L = 12.1–12.6 µm, av. B = 7.4–7.9 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.5–1.9 µm wide. Basidia 18–38 × 8–10 µm, 4-spored, surrounded by 4–6(7) pseudoparaphyses. Cheilocystidia 20–60 × 20–50 µm, globose, ellipsoid, ovoid to obovoid. Pleurocystidia absent. Pileocystidia 40–120 × 8–16, lageniform with cylindrical to sometimes slightly tapering neck and equal, 3–8 µm wide apex. Sclerocystidia 40–75 × 4.0–7.0 µm, lageniform, usually numerous. Clamp-connections present.

HABITAT & DISTR. — Terrestrial on lawns and on *wood-chips*; rare (Leiden, Alphen aan den Rijn). June–Sept. Widespread, but apparently rare in Europe and North America.

Coprinus callinus can be distinguished from *C. sclerocystidiosus* by its tapering pileocystidia and its somewhat smaller spores. The density of the sclerocystidia is not always the same in every species that has them.

In *C. sclerocystidiosus* they are usually abundant, but in *C. callinus* they can sometimes be abundant. The main differences between *C. sclerocystidiosus* and *C. subpurpureus* are the colour of the pileus (yellow-brown to ochre-brown versus red-brown to purple-brown) and the abundant versus scarce sclerocystidia. In addition the pileocystidia of *C. sclerocystidiosus* are not or very rarely enlarged at the apex as they often are in *C. subpurpureus*.

23. Coprinus callinus M. Lange & A.H. Smith in Mycologia 45: 770. 1953.

C*oprinellus callinus* (M. Lange & A.H. Smith) Vilgalys, Hopple & Johnson in Taxon 50: 233. 2001.

KEY TO THE VARIETIES

1. Pileocystidia up to 150(180) µm long; pileus up to 35 mm wide, often growing fasciculate; sclerocystida normally present 23a. var. **callinus**
1. Pileocystidia less than 100 µm long; pileus up to 20 mm wide, usually growing solitary; sclerocystida absent . . . . . .23b. var. **limicola**

23a. var. **callinus** – Fig. 23.

SEL. ICON. — Enderle & Bender in Z. Mykol. 56: oppostie 24. 1990

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 122. 1952; M. Lange & A.H. Smith in Mycologia 45: 770. 1953; Uljé & Bas in Persoonia 14: 302, 305, fig. 14. 1991.

VERN. NAME — Geelbruine donsinktzwam.

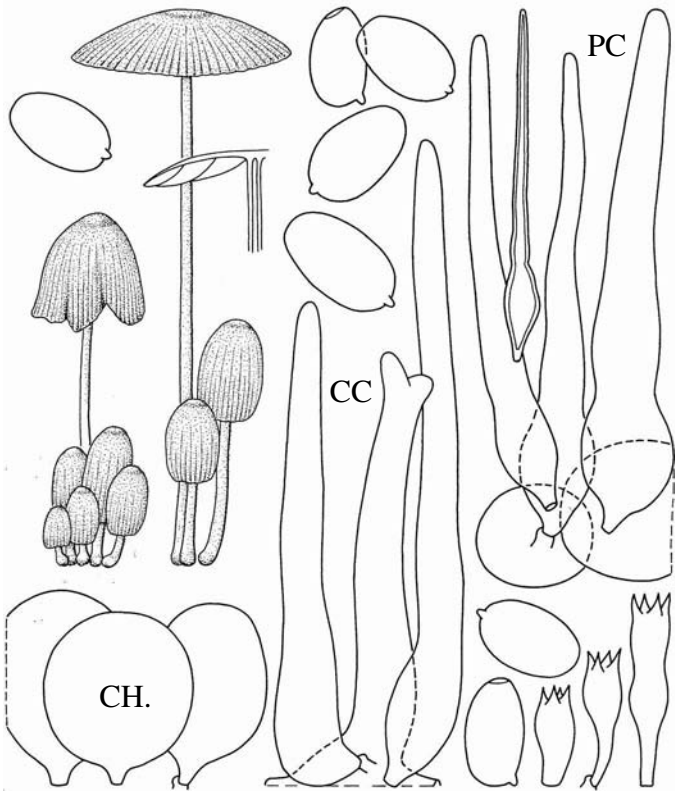


Fig. 23. *Coprinus callinus* var. *Callinus*

Pileus 8–18 × 6–12 mm when still closed, up to 35 mm when expanded, first ellipsoid or ovoid, then obtusely conical, finally flat, dirty red-brown, cinnamon, ochre to rather pale (yellow-)brown (Mu. 7.5 YR 3/2, 4/6, 10 YR 5/3, 5/6, 6–8/6 to 2.5 Y 5/4, K. & W. 6D6, 5D5, 4A4) at centre, paler towards margin (7.5 YR 6/5, 10 YR 5/5, 6/2–3, 7/3, 5/2, 2.5 Y 7–8/4, 6/2;6C4–5, 5D6–7 to 3–4, 5B3, 4B4, 4A3). Lamellae free, L = 18–36, l = 0–3, white to black. Stipe 50–120 × 1–3, white to greyish-white, with base up to 4 mm wide, pubescent; base clavate.

Spores 9.5–13.0 × 5.5–7.5 µm, Q = 1.50–1.95, av. Q = 1.65–1.90, av. L = 10.3–12.1 µm, av. B = 6.1–6.9 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore weakly to rather strongly eccentric, 1.5–1.8 µm wide. Basidia 14–38 × 8–10 µm, 4-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia globose and 20–50 µm in diam., to ellipsoid and 20–60 × 15–40 µm. Pleurocystidia absent. Pileocystidia 60–150(200) × 6–25 µm, lageniform with 4–8(10) µm wide, tapering neck. Sclerocystidia usually present. Caulocystidia 50–90 × 6.0–10 µm, subcylindrical with broadened base, often slightly atteuated towards apex. Clamp-connections present.

HABITAT & DISTR. — Subfasciculate, terrestrial, usually at or near wood fragments, particularly on paths covered with wood-chips; common in the Netherlands. Apr.–Nov. Widespread in Europe and America.

The colour of the pileus is in general not very dark without much red. Usually it is yellow-brown to ochre-brown or cinnamon. The tapering pileocystidia together with the presence of sclerocystidia, which are usually present, sometimes even numerous, but sometimes absent, and the 10–13 µm long spores, are the most important characters of this species.

23b. var. **limicola** Uljé in Uljé & Noordel. in Persoonia 18: 259. 2003 – Fig. 24.

SEL. DESCR. & FIGS. — Uljé & Bas in in Persoonia 14: 305, fig. 15. 1991 (as *Coprinus species* [Uljé 1009]).

VERN. NAME — Modderinktzwam.

CHARACTERISTICS — Pileus 6–10 × 5–9 mm when still closed, up to 22 mm wide when expanded, dark red-brown to ochre-brown at centre (Mu. 7.5 YR 3-4/4, 4/6, 10 YR 4/4, 5/3-4, 6/5, K. & W. 6E/F8, 6E7, 5C4), paler towards margin (7.5 YR 4/4, 10 YR 4-5/3, 6/4-6, 7/2-4, 2.5 Y 7.5/4 to 5 Y 6/1, 5C/D4, 4A3); lamellae free, up to 2 mm broad, white to blackish; L = 16–21, l = 1–3; stipe 20–50 × 1.5–2.5 mm, whitish, pubescent.

Spores 9.5–13.0 × 6.0–7.5 µm, av. L = 11.1, av. B = 6.7 µm, Q = 1.55–1.80, av. Q = 1.65, ellipsoid to ovoid; germ pore eccentric, c. 1.8 µm wide; basidia 18–40 × 8.5–10.5 µm, 4-spored; pseudoparaphyses 3–6 per basidium; cheilocystidia mostly globose, up to 40 µm in diam., but also broadly ellipsoid, up to 40 × 25 µm; pleurocystidia absent; pileocystidia 50–90 × 13–20 µm, lageniform with tapering neck, 5–7 µm wide at apex; sclerocystidia absent; caulocystidia 40–80 × 16–25 µm, lageniform with tapering to cylindrical neck and equal, sometimes slightly enlarged, 5–8.5 µm wide apex; clamp-connections present.

HABITAT & DISTR. — Solitary or gregarious in dry ditch, on humus and fallen branches; in the Netherlands very rare, only known from Ter Aar. Aug. Not yet recorded from other countries.

Macroscopically this taxon resembles *C. callinus* var. *callinus*, but the basidiocarps are smaller than in var. *callinus* and they grow (sub)solitary. Microscopically this variety deviates in the absence of sclerocystidia, which are almost always present in var. *callinus*. The other microscopical characters are practically the same, with exception of the length of the pileo- and caulocystidia, which is greater in var. *callinus*.

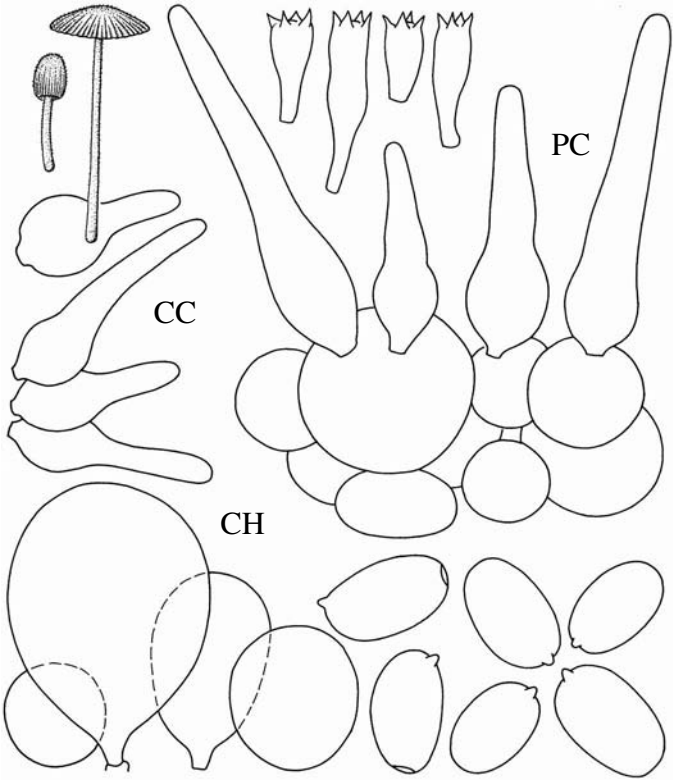


Fig. 24. *Coprinus Callinus* var. *limicola*

24. Coprinus plagioporus Romagn. in Rev. Mycol. 6: 121. 1941. – Fig. 25.

C*oprinellus plagioporus* (Romagn.) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. ICON. — Lanconelli & Lanzoni in Riv. Micol. 31: 253. 1988.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 118. 1952; M. Lange & A.H. Smith in Mycologia 45: 766. 1953; Uljé & Bas in Persoonia 14: 307, fig. 17. 1991.

VERN. NAME — Paarsbruine donsinktzwam.

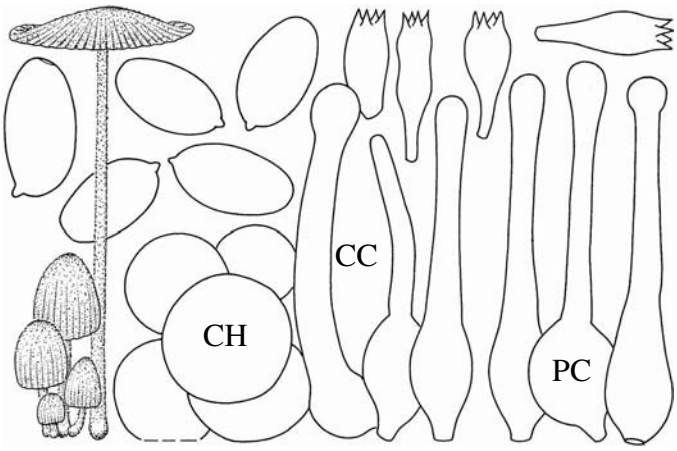


Fig. 25. *Coprinus plagioporus*

Pileus 10–16 × 8–12 mm when still closed, up to 30 mm when expanded, first ellipsoid or ovoid, then obtusely conical to convex, finally flat, red-brown to purple-brown, in young specimens often very dark (Mu. 5 YR 2.5/2, K. & W. 9F4) at centre, paler towards margin (7.5 YR 4/2, 7D/E4). Lamellae free or almost free. Stipe 40–80 × 1–3 mm, white to greyish-white, pubescent; base clavate.

Spores 10.5–14.0 × 6.0–7.5 µm, Q = 1.70–1.90, av. Q = 1.75–1.85, av. L = 11.7–12.6 µm, av. B = 6.3–7.0 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.5–1.8 µm wide. Basidia 18–38 × 8–9 µm, 4-spored surrounded by (3)4–6 pseudoparaphyses. Cheilocystidia globose, up to c. 40 µm wide. Pleurocystidia absent. Pileocystidia 60–150 × 10–18 µm, lageniform with cylindrical neck and clavate to (sub)capitate 7–12 µm wide apex. Sclerocystidia absent. Caulocystidia 20–50 × 6.0–10 µm, lageniform with blunt apex. Clamp-connections present.

HABITAT & DISTR. — Fasciculate, terrestrial, often on clayey soil, also on paths covered with wood-chips; rather common in the Netherlands and in Europe. May–Oct. Also known from America.

In young and fresh stages *C. plagioporus* has a dark purple pileus. Microscopically, the combination of subcapitate to capitate pileo- and caulocystidia and globose cheilocystidia is usually characteristic. But unfortunately the tips of the pileocystidia and caulocystidia are sometimes only slightly enlarged and in these cases confusion with *C. subpurpureus* is possible.

25. Coprinus subpurpureus A.H. Smith in Mycologia 40: 684. 1948.

C*oprinellus subpurpureus* (A.H. Smith) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 119. 1952; M. Lange & A.H. Smith in Mycologia 45: 768. 1953; Uljé & Bas in Persoonia 14: 310, fig. 18. 1991.

CHARACTERISTICS — Pileus 10–18 × 8–14 mm when still closed, up to 35 mm when expanded, first ellipsoid or ovoid, then obtusely conical, finally flat, dark vinaceous brown at centre, paler towards margin. In age dark purple drab over disk and dark grey to blackish over margin. Lamellae narrowly adnate, whitish to black. Stipe 40–100 × 1–3 mm, dull lilac umber when young, rarely pallid, becoming paler in age, densely pubescent, but soon glabrescent; base white-strigose.

Spores 9.0–11.5 × 5.5–7.0 µm, Q = 1.45–1.65, av. Q = 1.60, av. L = 10.2 µm, av. B = 6.5 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.5–1.8 µm wide. Basidia 16–40 × 8–10 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 40–85 × 25–45 µm, broadly utriform. Pleurocystidia absent. Pileocystidia 45–100 × 7–14 µm, lageniform with (sub)cylindrical neck and even to clavate, 4.5–9 µm wide apex. Sclerocystidia absent. Caulocystidia 20–40 × 7.0–10 µm, lageniform. Clamp-connections present.

HABITAT & DISTR. — Solitary or a few together, in moist leaves or on wet black muck; not known from the Netherlands. In Europe only known from Germany, described from North America.

The macroscopical description has been taken from Smith (in Mycologia 40: 684. 1948).*Coprinus subpurpureus* is very similar to *C. plagioporus*. It is recognisable by its pileocystidia with a cylindrical neck and weakly enlarged but not capitate apex and its more purple colour. In *C. plagioporus* the apex of the pileocystidia is enlarged.

26. Coprinus subdisseminatus M. Lange in M. Lange & A.H. Smith in Mycologia 45: 777. 1953. – Fig. 26.

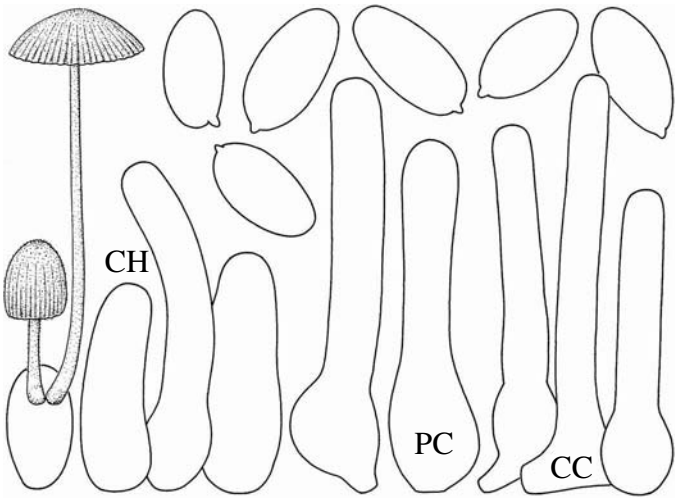


Fig. 26. *Coprinus subdisseminatus*

C*oprinellus subdisseminatus* (M. Lange) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 125. 1952; M. Lange & A.H. Smith in Mycologia 45: 777–778. 1953; Uljé & Bas in Persoonia 14: 314, fig. 20. 1991.

VERN. NAME — Slanke donsinktzwam.

Pileus 5–8 × 4–6 mm when still closed, up to 15 mm when expanded, first ellipsoid or ovoid, then obtusely conical, finally flat, pale brown, at centre somewhat darker. Lamellae, L = 16–24, l = 0–1, free or almost free, white to blackish. Stipe 20–40 × 0.5–1 mm, whitish, vitreous, sparsely pubescent; base clavate.

Spores 9.0–13.5 × 5.5–6.5 µm, Q = 1.70–2.05, av. Q = 1.85–1.95, av. L = 10.8–11.7 µm, av. B = 5.8–6.3 µm, oblong to elongate ellipsoid or ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.4–1.7 µm wide. Basidia 18–36 × 8.5–11 µm, 4-spored; pseudoparaphyses not noted. Cheilocystidia 30–55 × 15–23 µm, ellipsoid to oblong, some of them (sub)cylindrical or slightly utriform, but also pileocystidia-like cheilocystidia sparsely present on the edge of the lamellae. Pleurocystidia absent. Pileocystidia 60–90(120) × 10–22 µm, lageniform with (sub)cylindrical neck and equal, sometimes somewhat broadened, 8–14 µm wide apex. Sclerocystidia absent. Caulocystidia 30–70 × 7.0–10 µm, subcylindrical with broadened base or lageniform. Clamp-connections probably present.

HABITAT & DISTR. — Solitary or subfasciculate, on or near branches, on very wet places; very rare in the Netherlands (Alphen aan den Rijn, Nieuwveen). March–Oct. Known from Europe and America.

The main character of this species is the rather broad, cylindrical neck of the pileocystidia. They resemble the pileocystidia of *C. disseminatus* very much, but are distinctly shorter.

27. Coprinus impatiens (Fr. :Fr.) Quél., Fl. mycol. France: 42. 1888. – Fig. 27.

Agaricus impatiens Fr. :Fr., Syst. mycol. 1: 302. 1821; *Coprinellus impatiens* (Fr. :Fr.) J. Lange in Dansk bot. Ark. 9 (6): 93. 1938.

SEL. ICON. — Enderle et al. in Z. Mykol. 52: opposite 112. 1986; J. Lange, Fl. agar. dan. 4: pl. 156B. 1939; R. Phillips, Paddest. Schimm.: 179. 1981.

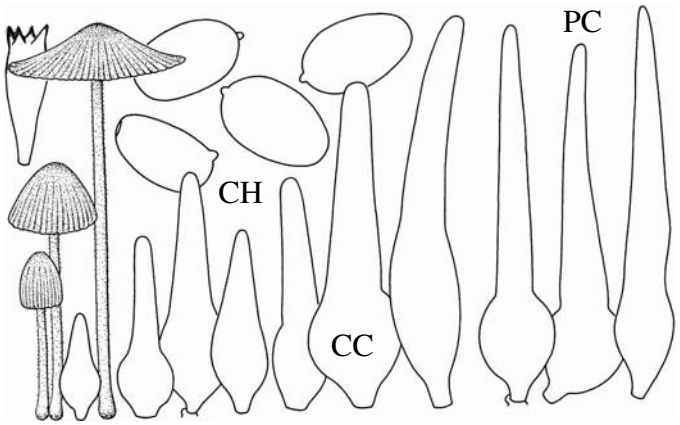


Fig. 27. *Coprinus impatiens*

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 126. 1952; M. Lange & A.H. Smith in Mycologia 45: 779. 1953; Uljé & Bas in Persoonia 14: 316, fig. 22. 1991.

VERN. NAME — Spitscellige donsinktzwam.

Pileus 8–16 × 5–12 mm when still closed, up to 30 mm when expanded, first ellipsoid or ovoid, then obtusely conical, finally flat, dark red-brown to ochre-brown at centre, paler towards margin. Lamellae, L = 14–21, l = 0–3, narrowly adnate, rather distant, first white, then brown to black. Stipe 30–80 × 0.5–2 mm, whitish, pubescent; base clavate.

Spores 10.5–11.5 × 6.0–7.5 µm, Q = 1.45–1.75, av. Q = 1.55–1.65, av. L = 10.7–10.9 µm, av. B = 6.7–6.9 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore weakly eccentric to almost central, 1.3–1.5 µm wide. Basidia 20–40 × 9–10 µm, 4-spored, surrounded by 4–6(7) pseudoparaphyses. Cheilocystidia 25–50 × 8–15 µm, lageniform with distinctly tapering neck and 2–6 µm wide apex. Pleurocystidia absent. Pileocystidia 50–100(125) × 12–22 µm, lageniform with tapering neck, 3–6 µm wide at apex. Sclerocystidia absent. Caulocystidia 25–60 × 8.0–11 µm, subcylindrical with broadened base or lageniform. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, terrestrial, often at grassy places; rather common in the Netherlands. Apr.–Nov. Known from Europe and America.

Microscopically *C. impatiens* closely resembles *C. heterothrix*. The differences are the presence of veil remnants consisting of hyphae at the centre of the pileus and the more ovoid spores of the latter species.

28. Coprinus congregatus (Bull.) Fr., Epicrisis: 249. 1838. – Fig. 28.

Agaricus congregatus Bull., Herb. Fr.: pl. 94. 1781–1782; *Coprinellus congregatus* (Bull.) P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 543. 1879.

SEL. ICON. — Cacialli et al., Schede Micol. 1: 187. 1995; Cetto, Gr. Pilzf. 5: pl. 1718. 1987; Lanconelli & Lanzoni in Riv. Micol. 31: 245. 1988; R. Phillips, Paddest. Schimm.: 179. 1981.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 114. 1952; M. Lange & A.H. Smith in Mycologia 45: 759–760. 1953; Uljé & Bas in Persoonia 14: 319, fig. 24. 1991; Cacialli et al., Schede Micol. 1: 187. 1995.

VERN. NAME — Gezellige donsinktzwam.

Pileus 10–18 × 8–14 mm when still closed, up to 25 mm when expanded, first ellipsoid or ovoid, then obtusely conical, finally flat, cream-coloured with ochre-brown to cinnamon-coloured centre (Mu. 7.5 YR 4/6, K. & W. 6E6) when young, at mature greyish-yellow (10 YR 7/6; 4A/B4). Lamellae, L = 18–34, l = 0–3, free or almost free, first white, then brown to blackish. Stipe 30–80 × 0.5–2.5 mm, whitish, pubescent; base clavate.

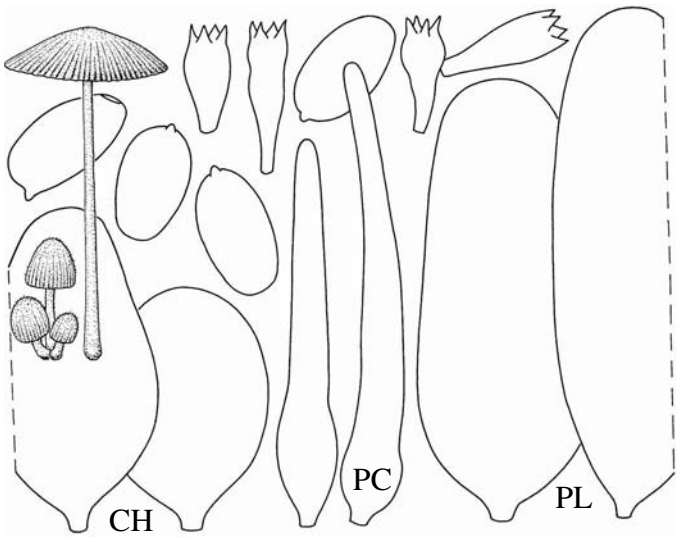


Fig. 28. *Coprinus congregatus*

Spores 10.0–14.0 × 5.5–7.5 µm, Q = 1.55–1.95, av. Q = 1.75–1.85, av. L = 11.1–12.4 µm, av. B = 6.1–7.0 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore strongly eccentric, 1.5–1.8 µm wide. Basidia 16–36 × 9–12 µm, 4-spored, surrounded by (3)4–5(6) pseudoparaphyses. Cheilocystidia 30–90 × 20–45 µm, ellipsoid to broadly utriform. Pleurocystidia 30–140 × 20–50 µm, ellipsoid, oblong to slightly utriform. Pileocystidia 30–120 × 8–18 µm, lageniform with tapering neck and 3–8 µm wide apex. Sclerocystidia absent. Caulocystidia 30–60 × 9.0–13 µm, lageniform with rather broad base. Clamp-connections absent.

HABITAT & DISTR. — Usually fasciculate, on dung, especially dung mixed with straw; common in the Netherlands. Feb.–Nov. Known from Europe and America.

Coprinus congregatus is very similar to *C. ephemerus*. It differs from that species only in the absence of clamp-connections and the somewhat smaller spores.

29. Coprinus ephemerus (Bull. :Fr.) Fr., Epicrisis: 252. 1838. – Fig. 29.

Agaricus ephemerus Pers., Syn. meth. Fung.: 406. 1801; *Agaricus ephemerus* Pers. :Fr., Syst. Mycol. 1: 313. 1821; *Coprinellus ephemerus* (Bull. :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 233. 2001.

SEL. ICON. — Lanconelli & Lanzoni in Riv. Micol. 31: 249. 1988; J. Lange, Fl. agar. dan. 4: pl. 160H. 1939; Cacialli et al., Schede Micol. 1: 193. 1995.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 111. 1952; M. Lange & A.H. Smith in Mycologia 45: 757. 1953; Uljé & Bas in Persoonia 14: 319, fig. 25. 1991.

VERN. NAME — Vluchtige inktzwam.

Pileus 8–16 × 6–12 mm when still closed, up to 20(25) mm wide when expanded, ovoid or ellipsoid, then obtusely conical, finally flat, ochre-brown to cinnamon-brown at centre (Mu. 10 YR 6–7/6, K. & W. 5B5) paler towards margin. Lamellae, L. 26–38, l = 0–3, narrowly adnate,

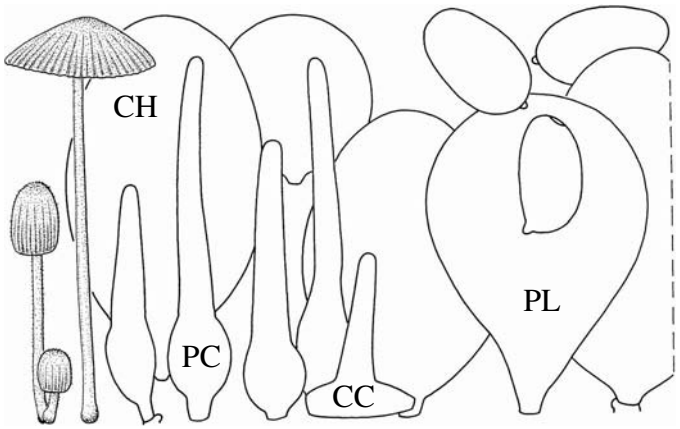


Fig. 29. *Coprinus ephemerus*

almost free, white to blackish. Stipe 30–80 × 1–3 mm, whitish, pubescent; base clavate.

Spores 11.5–16.0 × 6.0–8.0 µm, Q = 1.80–2.00, av. Q = 1.90, av. L = 13.8 µm, av. B = 6.9 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.5–1.8 µm wide. Basidia 18–40 × 9–13 µm, 4-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 20–60 × 20–30 µm, (sub)globose, (broadly) ellipsoid, obovoid, but some lageniform cheilocystidia are present as well. Pleurocystidia 60–120 × 20–45 µm, subglobose, broadly ellipsoid, obovoid to broadly cylindrical. Pileocystidia 30–110 × 10–21 µm, lageniform with tapering neck and 4–8 µm wide apex. Sclerocystidia absent. Caulocystidia 20–60 × 6.0–10 µm, subcylindrical with broadened base or lageniform. Clamp-connections present.

HABITAT & DISTR. — More or less fasciculate, on cow-dung, but also on decaying straw; rather rare in the Netherlands. Feb.–Nov. Recorded from Europe, America, and Japan.

Coprinus ephemerus is characterised by the combination of pleurocystidia, 4-spored basidia, spores with an eccentric germ pore, clamp-connections, and its preference for dung. *Coprinus congregatus* differs from *C. ephemerus* in the absence of clamp-connections and the slightly smaller spores.

30. Coprinus brevisetulosus Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 309. ('1982') 1983. – Fig. 30.

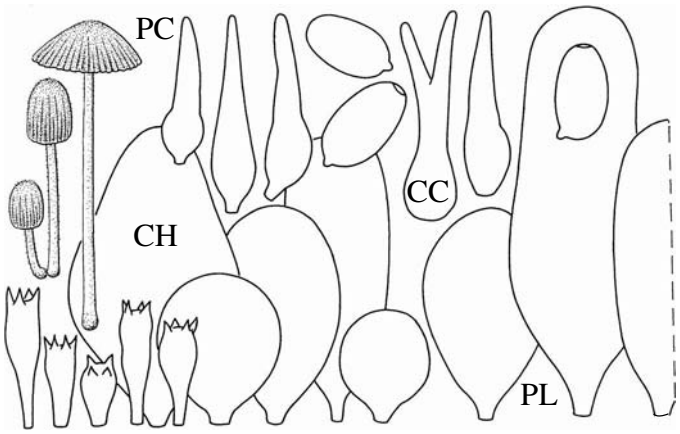


Fig. 30. *Coprinus brevisetulosus*

C*oprinellus brevisetulosus* (Arnolds) Redhead, Vilgalys & Moncalvo in Taxon 50: 233. 2001.

MISSAPL. *Coprinus stellatus* sensu M. Lange in Dansk bot. Ark. 14(6): 119. 1952; sensu Cacialli et al., Schede Micol. 1: 183. 1995.

SEL. ICON. — Cacialli et al., Schede Micol. 1: 183. 1995 (as *C. stellatus*).

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 309–311, fig. 127. ('1982') 1983; Enderle & Bender in Z. Mykol. 56: 22. 1990; M. Lange & A.H. Smith in Mycologia 45: 762. 1953 (as *C. stellatus*); Uljé & Bas in Persoonia 14: 322, fig. 26. 1991 (as *C. stellatus*); Cacialli et al., Schede Micol. 1: 183. 1995 (as *C. stellatus*).

VERN. NAME — Tengere mestinktzwam.

Pileus up to 5–10 × 4–7 mm when still closed, up to 18 mm wide when expanded, subglobose, ovoid, or ellipsoid, then obtusely conical, finally flat, ochre-brown or dark brown at centre, paler towards margin. Lamellae free, L = 12–20, l = 0–1(3), narrow, white to blackish. Stipe 30–70 × 0.5–2 mm, whitish, pubescent; base often clavate.

Spores 8.0–11.5 × 5.0–6.5 µm, Q = 1.50–1.90, av. Q = 1.65–1.70, av. L = 8.7–9.2 µm, av. B = 5.3–5.4 µm, ovoid or ellipsoid with rounded base and apex, the latter somewhat truncate, dark red-brown; germ pore central, 1.2–1.4 µm wide. Basidia 16–30 × 8–11 µm, 4-spored, surrounded by (3)4–5(6) pseudoparaphyses. Cheilocystidia 40–60 × 20–30 µm, globose to ellipsoid, ovoid or oblong. Pleurocystidia 60–120 × 15–35 µm, ellipsoid, ovoid, obovoid, oblong, (sub)cylindrical or slightly utriform. Pileocystidia 20–65 × 7–14 µm, lageniform with tapering neck, 2.5–5 µm wide at apex. Sclerocystidia absent. Caulocystidia 20–60 × 7–14 µm, subcylindrical with broadened base or lageniform. Clamp-connections absent.

HABITAT & DISTR. — Solitary or subfasciculate, on dung; very common in the Netherlands. Feb.–Dec. In Europe, America, Japan, probably all over the world.

The main characters separating this species from others in subsect. *Setulosi* are the roundish apex of the spores and the central germ pore. The other species with this character is *C. pellucidus*, but that species has no pleurocystidia and its cheilocystidia are more globose and smaller. Moreover, *C. pellucidus* has very small basidiocarps.

31. Coprinus pellucidus P. Karst. in Bidr. Känn. Finl. Nat. Folk 37: 236. 1882. – Fig. 31.

C*oprinellus pellucidus* (P. Karst.) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. ICON. — Lanconelli & Lanzoni in Riv. Micol. 31: 243. 1988.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 318, fig. 135. ('1982') 1983; M. Lange & A.H. Smith in Mycologia 45: 763. 1953; Uljé & Bas in Persoonia 14: 325, fig. 27. 1991.

VERN. NAME — Bleek mestdwergje.

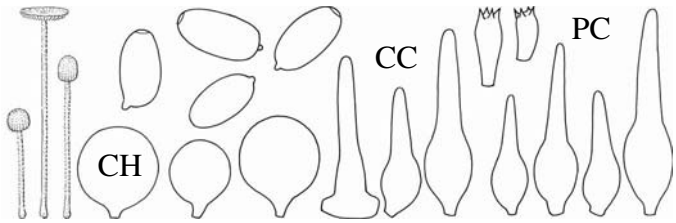


Fig. 31. *Coprinus pellucidus*

Pileus 2–3(5) × 1.5–3(4) mm when still closed, up to 7 mm wide when expanded, subglobose, ovoid, or ellipsoid, then hemispherical or obtusely conical, finally flat, whitish with pale yellow-brown, ochre-brown to grey-brown at centre (Mu. 10 YR 6/4, K. & W. 5D5). Lamellae free, L = 12–20, l = 0–1, whitish to blackish. Stipe 15–70 × 0.1–0.5 mm, whitish, vitreous, sparsely pubescent; base somewhat clavate.

Spores 6.5–9.5 × 3.0–4.0 µm, Q = 1.80–2.20, av. Q = 1.95–2.10, av. L = 7.3–7.9 µm, av. B = 3.6–3.9 µm, oblong to ovoid, often somewhat cylindrical, with rounded baser and slightly truncate apex, medium to dark red-brown; germ pore central, 1.1–1.3 µm wide. Basidia 10–26 × 5–7 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia 20–30 × 15–23 µm, (sub)globose. Pleurocystidia absent. Pileocystidia 25–50 × 7–12 µm, lageniform with tapering neck, 3–4 µm wide at apex. Sclerocystidia absent. Caulocystidia 20–50 × 7–11 µm, subcylindrical with broadened base or lageniform. Clamp-connections absent.

HABITAT & DISTR. — Solitary or subfasciculate, on cow dung; common in the Netherlands. Jan.–Dec. Known from Europe, America, and Japan.

The spores of *C. pellucidus* are slightly smaller and somewhat more (sub)cylindrical than in *C. brevisetulosus* and that species has pleurocystidia, which *C. pellucidus* has not. In addition the basidiocarps of *C. pellucidus* are very small and usually cream-coloured, whereas those of *C. brevisetulosus* are larger and more ochraceous brown.

32. Coprinus heterosetulosus Watling in Notes R. bot. Gdn Edinb. 35: 153. 1976. – Fig. 32.

Coprinus heterosetulosus Locq. in Bull. trimest. Soc. mycol. Fr. 63: 78. 1947 (invalid, no Latin diagnosis); C*oprinellus heterosetulosus* (Watling) Vilgalys, Hopple & Johnson in Taxon 50: 234. 2001.

SEL. ICON. — Lanconelli & Lanzoni in Riv. Micol. 31: 241. 1988.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 317, fig. 133. ('1982') 1983; M. Lange in Dansk bot. Ark. 14 (6): 113. 1952; Locq. in Bull. trimest. Soc. mycol. Fr. 63: 78–79, figs 2 & 3. 1947; Uljé & Bas in Persoonia 14: 325, fig. 28. 1991.

VERN. NAME — Donker mestdwergje.

Pileus 3–5 × 2–4 mm when still closed, up to 7(10) mm when expanded, oblong, ovoid, or ellipsoid, then obtusely conical, finally flat, date-brown, umbra-brown (Mu. 7.5 YR 3/6, K. & W. 5E5), paler towards margin. Lamellae free, L = 8–13, l = 0–1, narrow, white to blackish. Stipe 15–50 × 0.25–0.75 mm, whitish, vitreous, sparsely pubescent; base somewhat clavate.

Spores 8.0–11.0 × 5.0–6.5 µm, Q = 1.50–1.80, av. Q = 1.65–1.70, av. L = 9.1–9.7 µm, av. B = 5.5–5.8 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.3–1.5 µm wide. Basidia 16–32 × 8.5–10 µm, 4-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 13–25 × 12–18 µm, (sub)globose to ovoid. Pleurocystidia absent. Pileocystidia 30–95 × 8–21 µm, lageniform with tapering neck, 2–5 µm wide at apex. Sclerocystidia present. Caulocystidia 20–40 × 5.0–8.0 µm, subcylindrical with broadened base or lageniform. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on horse dung; rather common in the Netherlands. Feb.–Dec. Known from Europe and America.

Coprinus heterosetulosus is easily recognisable because of its usually numerous sclerocystidia, its habitat on dung, and its spores with an eccentric germ pore. It has very small basidiocarps, like *C. pellucidus*, but that species has no sclerocystidia and has spores with a central germ pore. The colour of *C. heterosetulosus* is a rather dark brown in fresh, young specimens.

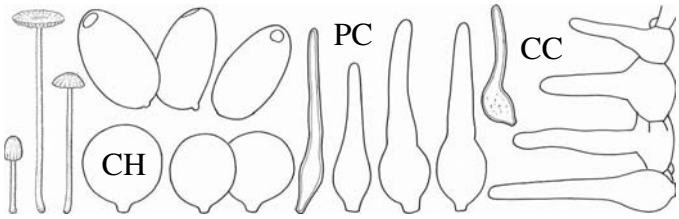


Fig. 32. *Coprinus heterosetulosus*

33. Coprinus angulatus Peck in Bull. Buffalo Soc. nat. Sci. 1: 54. 1873. – Fig. 33.

C*oprinellus angulatus* (Peck) Redhead, Vilgalys & Moncalvo in Taxon 50: 232. 2001. — *Coprinus boudieri* Quél. in Bull. Soc. bot. France 24: 321. 1877.

EXCL. — *Coprinus angulatus* sensu J. Lange, Fl. agar. dan. 4: 115. 1939. (= *C. patouillardii*)

SEL. ICON. — Cetto, Gr. Pilzf. 4: pl. 1285. 1983; Lanconelli & Lanzoni in Riv. Micol. 31: 240. 1988; Papeti in Boll. Circ. micol. Carini 15: 18 + 2 pg. 1988.

SEL. DESCR. & FIGS. — M. Lange in Dansk bot. Ark. 14 (6): 117. 1952; M. Lange & A.H. Smith in Mycologia 45: 764–765. 1953; Uljé & Bas in Persoonia 14: 326–328, fig. 29. 1991.

VERN. NAME — Brandplekinktzwam.

Pileus 12–20 × 10–15 mm when still closed, up to 30 mm when expanded, subglobose, ovoid, or ellipsoid, then hemispherical or obtusely conical to convex, finally flat, dark rust-brown to ochre-brown (Mu. 7.5 YR 3/6 to 6/6, K. & W. 6E7 to 5C/D7), remaining campanulate rather long. Lamellae narrowly adnate, L = 22–34, l = 0–3, rather broad and distant, white to blackish. Stipe 30–60 × 1–3 mm, usually relatively short, whitish, pubescent; base somewhat clavate.

Spores 7.5–10.5 × 6.0–8.0 × 5.5 µm, Q = 1.15–1.60, av. Q = 1.25–1.35, av. L = 8.7–9.6 µm, av. B = 6.8–7.2 µm, (sub)mitriform in front view with conical or convex base and truncate apex, ellipsoid in side view, dark red-brown; germ pore central, 1.3–1.6 µm wide. Basidia 15–36 × 8–10 µm, 4-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 30–80 × 25–40, (sub)globose to narrowly ellipsoid,

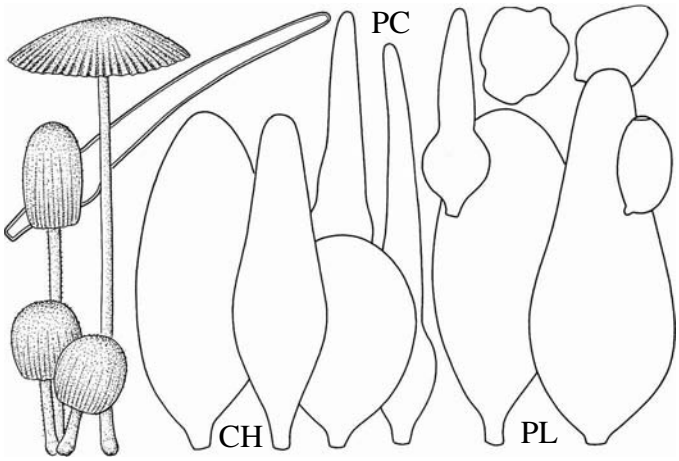


Fig. 33. *Coprinus angulatus*

sometimes slightly utriform intermixed with lageniform ones, 30–60 × 8–20 µm, with tapering neck and 2–5 µm wide at apex. Pleurocystidia 60–100(120) × 25–60 µm, (sub)globose to ellipsoid or utriform. Pileocystidia 50–100 × 12–15 µm, lageniform with tapering neck, 3.5–6 µm wide at apex. Sclerocystidia present. Caulocystidia 20–40 × 5.0–8.0 µm, lageniform. Clamp-connections present.

HABITAT & DISTR. — Fasciculate, on burnt ground; rather common in the Netherlands. Apr.–Nov. Known from Europe and North America.

The peculiar shape of the spores makes *C. angulatus* easy to recognise. Macroscopically, the roundish shape of the young basidiocarps, usually rather dark brown, and the habitat on burnt places, are indications that one is dealing with this species.

34. Coprinus bisporiger P.D. Orton in Notes R. bot. Gdn Edinb. 35: 147. 1976. – Fig. 34.

Coprinus bisporiger Buller in Trans. Brit. mycol. Soc. 3: 350. 1912 (invalid, not definitely accepted); C*oprinellus bisporiger* (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 233. 2001.

MISSAPL. — *Coprinus bisporus* sensu Buller in Trans. Brit. mycol. Soc. 6: 363. 1920.

SEL. ICON. — Lanconelli et al., Funghi Lughese: 197. 1998.

SEL. DESCR. & FIGS. — Bender in Z. Mykol. 53: 219. 1987; Uljé & Bas in Persoonia 14: 328, fig. 30. 1991.

VERN. NAME — Takjesdonsinktzwam.

Pileus 8–12 × 6–9 mm when still closed, up to 25 mm when expanded, ovoid or ellipsoid, then obtusely conical to convex, finally flat, ochre-brown to cinnamon-brown (Mu. 10 YR 5/6 to 6/8, K. & W. 5C5 to 5A6, 5B5). Lamellae, L = 32, l = 1–3, free or almost free, up to 2 mm broad, white to blackish. Stipe 40–80 × 1–3 mm, whitish, pubescent; base somewhat clavate.

Spores 10.5–13.5 × 6.5–8.5 µm, Q = 1.45–1.70, av. Q = 1.55–1.60, av. L = 11.4–12.2 µm, av. B = 7.0–7.9 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.5–1.8 µm wide. Basidia 16–32 × 7–9 µm, 2-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 25–55 × 20–35 µm, globose to ellipsoid. Pleurocystidia 40–65 × 28–37 µm, subglobose to ellipsoid. Pileocystidia 50–110 × 12–25 µm, lageniform with tapering neck, 5–8 µm wide at apex. Sclerocystidia absent. Caulocystidia 40–100 × 7.0–12 µm, lageniform. Clamp-connections absent.

HABITAT & DISTR. — Solitary or subfasciculate, in woods, among leaves and on fallen branches; very rare in the Netherlands, known only from Kudelstaart. July. Also recorded from England, Germany, and North America.

Coprinus bisporiger is very similar to *C. bisporus* but grows on fallen branches and among leaves, whereas *C. bisporus* is fimicolous. According to Bender *C. bisporiger* should have pleurocystidia, too.

35. Coprinus bisporus J. Lange in Dansk bot. Ark. 2 (3): 50. 1915. – Fig. 35.

C*oprinellus bisporus* (J. Lange) Vilgalys, Hopple & Johnson in Taxon 50: 233. 2001.

EXCL. — *C. bisporus* sensu Buller in Trans. Brit. mycol. Soc. 6: 363. 1920 (= *C. bisporiger*).

SEL. ICON. — Cetto, Gr. Pilzf. 6: pl. 2182. 1989; Lanconelli & Lanzoni in Riv. Micol. 31: 247. 1988; J. Lange, Fl. agar. dan. 4: pl. 160E. 1939; M. Lange, Paddestoelengids: 139. 1964.

SEL. DESCR. & FIGS. — M. Lange & A.H. Smith in Mycologia 45: 761. 1953; Uljé & Bas in Persoonia 14: 330, fig. 31. 1991.

VERN. NAME — Tweesporige donsinktzwam.

Pileus 9–14 × 7–10 mm when still closed, up to 20 mm when expanded, ovoid or ellipsoid, then obtusely conical to convex, finally flat, ochre to cinnamon at centre (Mu. 10 YR 6–7/6, 2.5 Y 5.5/4, K. & W. 5D5, 4A5), paler towards margin (2.5 Y 5/5–7/3). Lamellae, L = 24–30, l = 1–3, free or almost free, up to 2 mm broad, white to blackish. Stipe 40–80 × 1–2 mm, whitish, pubescent; base somewhat clavate.

Spores 9.5–13.5 × 6.0–8.5 µm, Q = 1.40–2.10, av. Q = 1.55–1.80, av. L = 10.9–12.2 µm, av. B = 6.5–7.4 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.5–1.8 µm wide. Basidia 15–28 × 6–8 µm, 2-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 20–55 × 15–32 µm, globose, ellipsoid or broadly utriform. Pleurocystidia absent. Pileocystidia 60–120 × 10–22 µm, lageniform with tapering neck, 5–10 µm wide at apex. Sclerocystidia absent. Caulocystidia 30–50 × 7.0–10 µm, subcylindrical with broadened base or lageniform. Clamp-connections absent.

HABITAT & DISTR. — Fasciculate on dung, on mixtures of straw and dung, and also on decaying straw; common in the Netherlands. Jan.–Dec. Recorded from Europe and America.

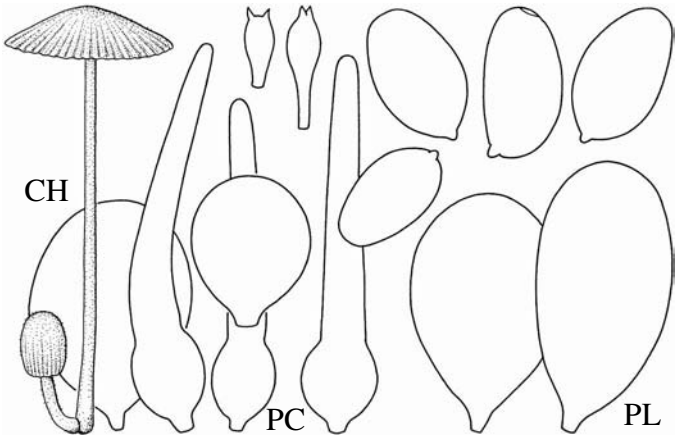


Fig. 34. *Coprinus bisporiger*

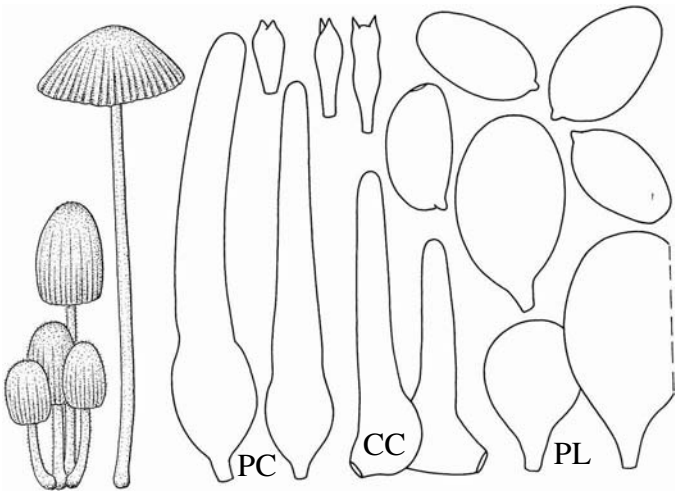


Fig. 35. *Coprinus bisporus*

Coprinus bisporus is easily recognisable by its 2-spored basidia, and its globose to ellipsoid cheilocystidia, by the absence of sclerocystidia and clamp-connections, and by its preference for dung. *Coprinus bisporiger* grows on sticks and among leaves and perhaps has also some morphological differences (see under that species).

36. Coprinus amphithallus M. Lange & A.H. Smith in Mycologia 45: 774. 1953. – Fig. 36.

C*oprinellus amphithallus* (M. Lange & A.H. Smith) Redhead, Vilgalys & Moncalvo in Taxon 50: 232. 2001. — *Coprinus disseminatoides* Kühner in Kühner & Romagn., Fl. anal. Champ. Sup.: 391. 1953 (invalid).

SEL. ICON. — Bender et al. in Z. Mykol. 50: opposite 32. 1984.

SEL. DESCR. & FIGS. — Bender & Enderle in Z. Mykol. 54: 45–46. 1988; M. Lange & A.H. Smith in Mycologia 45: 774–775. 1953; Uljé in Coolia 27: 82. 1984; Uljé & Bas in Persoonia 14: 330, fig. 32. 1991.

VERN. NAME — Vlakke donsinktzwam.

Pileus 5–8 × 3–5 mm when still closed, up to 18 mm when expanded, ovoid or ellipsoid, then obtusely conical to convex, finally flat, cream with dark brown to cinnamon-coloured centre (Mu. 7.5 YR 3–4/4 to 4–5/6, K. & W. 6D6), later more grey (10 YR 5–6/1, 5C/D2); disc and radial stripes staying brown for a rather long time. Lamellae, L = 20, l = 0–1, free or almost free, up to 1.5 mm broad, whitish, then grey to blackish. Stipe 30–80 × 1–1.5 mm, whitish, somewhat vitreous, sparsely pubescent base somewhat clavate.

Spores 12.5–15.5(19.0) × 6.5–8.5(9.5) µm, Q = 1.65–1.90, av. Q = 1.75–1.80, av. L = 13.2–14.2 µm, av. B = 7.4–7.9 µm, ellipsoid to ovoid with rounded base and apex, dark red-brown; germ pore eccentric, 1.6–1.8 µm wide. Basidia 21–34 × 8–11 µm, 2-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 25–40(50) × 10–16 µm, lageniform with tapering neck, 2–3(5) µm wide at apex. Pleurocystidia absent. Pileocystidia 40–85 × 10–16 µm, lageniform with tapering neck, 4–7 µm wide at apex. Sclerocystidia absent. Caulocystidia 30–60 × 7.0–10 µm, subcylindrical with broadened base or lageniform. Clamp-connections present.

HABITAT & DISTR. — Solitary or subgregarious, at clayey-sandy roadsides, often among grasses; rather rare in the Netherlands. Apr.–Aug. Known from Europe and America.

Coprinus amphithallus is a terrestrial, 2-spored species with lageniform cheilocystidia.

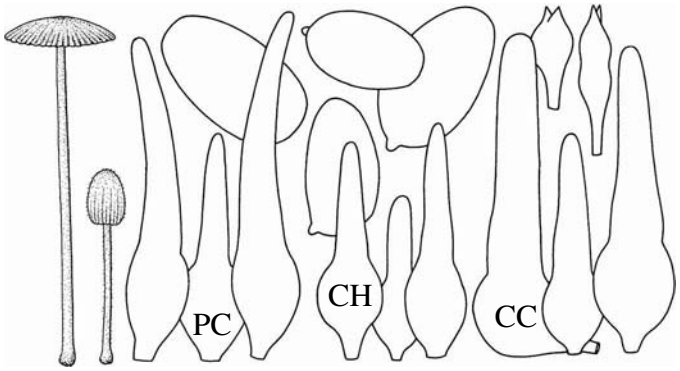


Fig. 36. *Coprinus amphithallus*

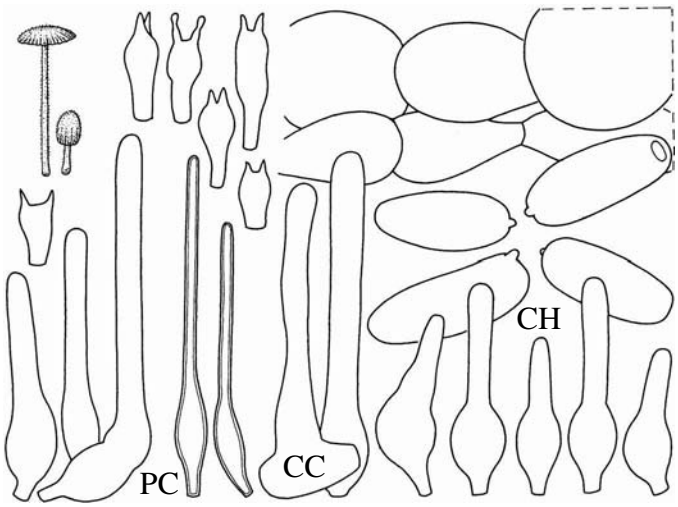


Fig. 37. *Coprinus pseudoamphitallus*

37. Coprinus pseudoamphithallus Uljé in Uljé & Noordel. in Persoonia 18: 259. 2003 – Fig. 37.

VERN. NAME — Minidonsinktzwam.

Pileus 2–4 × 1–3 mm when still closed, up to 7 mm when expanded, first globose or ellipsoid, then hemispherical to convex, finally almost flat, at first pale ochre-brown, soon becoming cream to pale grey, pruinose when young. Lamellae, L = c. 14, l = 0–1, free or almost free, first white, then pale grey. Stipe up to 15 × 0.75 mm, white, pruinose.

Spores 9–12.5(–15.0) × 4.5–5.5 × 4.55–.5 µm, QB = 1.75–2.40, av. QB = 2.10, QW = 2.10–2.90, av. QW = 2.25–2.55, av. L = 10.9–11.4(–12.8) µm, av. B = 5.2 µm, av. W = 5.1 µm, oblong to cylindrical, in side view often somewhat phaseoliform, dark red-brown, with large, c. 2 µm wide, eccentric germ pore. Basidia 14–28 × 7–9 µm, 2–spored, some 1-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 23–50 × 7.5–14 × 3–5.5 µm, lageniform with cylindrical neck and rounded apex. Pleurocystidia absent. Pileocystidia 50–90 × 6–12 × 4–7 µm, lageniform with cylindrical neck and equal to slightly widened apex. Sclerocystidia 70–100 × 5–7 × 1.5–4 µm, numerous, slightly thick-walled and yellow-brown. Caulocystidia 40–100 × 7–14 × 5–8 µm, similar to pileocystidia. Pileipellis a hymeniderm made up of spheropedunculate to (sub)globose elements, the latter up to 36 µm in diametre. Clamp-connections absent.

HABITAT & DISTR. — Solitary on grassy roadsides, often on naked soil; very rare in the Netherlands, only known from one locality (Ter Aar). May. Not yet known from outside the Netherlands.

Differs from *C. amphithallus* in smaller, narrower spores with relatively large germ pore, cystidia with cylindrical neck, presence of sclerocystidia and absence of clamp-connections.

38. Coprinus singularis Uljé in Persoonia 13: 486. 1988. – Fig. 38.

C*oprinellus singularis* (Uljé) Redhead, Vilgalys & Moncalvo in Taxon 50: 234. 2001.

SEL. DESCR. & FIGS. — Uljé & Bas in Persoonia 14: 333, fig. 33. 1991.

VERN. NAME — Dwergdonsinktzwam.

Pileus 2–4(6) × 1.5–3(4) mm when still closed, up to 8(11) mm when expanded, subglobose, ovoid, or ellipsoid, then obtusely conical to convex, finally flat, pale brown to ochre-brown (Mu. 10 YR 7/3 to

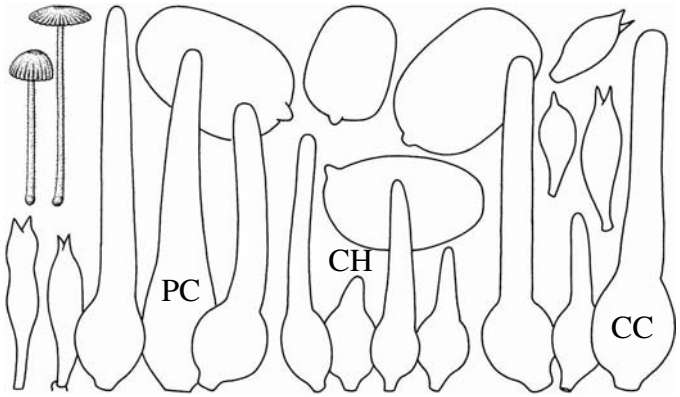


Fig. 38. *Coprinus singularis*

7.5 YR 5/6, K. & W. 4A3), with somewhat darker radial striation. Lamellae, L = 8–16, l = 0–3, free or almost free, whitish, then grey to blackish. Stipe 20–35 × 0.5–1 mm, whitish, vitreous, sparsely pubescent; base somewhat clavate.

Spores 9.5–17.0 × 7.0–11.0 µm, Q = 1.20–1.70, av. Q = 1.35–1.50, av. L = 11.4–14.4 µm, av. B = 8.5–9.1 µm, broadly cylindrical or cylindrical ovoid with rounded base and apex, very dark red-brown; germ pore central, 1.8–2.1 µm wide. Basidia 15–34 × 8–10 µm, 2-spored, but often also 1-spored in part, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 30–50 × 12–17 µm, lageniform with tapering to (sub)cylindrical neck and 3–5 µm wide apex. Pleurocystidia absent. Pileocystidia 50–85 × 11–18 µm, lageniform with tapering or (sub)cylindrical neck and 3.5–8 µm wide apex. Sclerocystidia absent. Caulocystidia 20–60 × 7–11 µm, lageniform. Clamp-connections present.

HABITAT & DISTR. — Solitary or subgregarious, on lawns and grassy roadsides; rare in the Netherlands, only known from Alphen aan den Rijn. May–Sept. Not yet recorded from other countries.

Coprinus singularis can be recognised by the 2-spored basidia and the large, cylindrical-ovoid spores with rounded base and apex.

39. Coprinus silvaticus Peck in Rep. N. Y. St. Mus. Nat. Hist. 24: 71. 1871. – Fig. 39.

Coprinus tardus P. Karst. Ryssl, Finl. Skand. Halföns Hattsvamp.: 266. 1879; *Coprinellus tardus* (P. Karst.) P. Karst. in Meddn Soc. Fauna Fl. fenn. 5: 34. 1880.

MISSAPL. — *Coprinus tergiversans* sensu Rick, Blätterpilze: 63. 1915.

SEL. ICON. — J. Lange, Fl. agar. dan. 4: pl. 160F. 1939; M. Lange, Paddestoelengids: 139. 1964; R. Phillips, Paddest. Schimm.: 181. 1981.

SEL. DESCR. & FIGS. — Bas in Coolia 13: 125–126. 1967; M. Lange in Dansk bot. Ark. 14 (6): 127. 1952; M. Lange & A.H. Smith in Mycologia 45: 754. 1953; Uljé & Bas in Persoonia 14: 337, fig. 34. 1991

VERN. NAME — Ruwsporige inktzwam.

Pileus 10–25 × 8–22 mm when still closed, up to 40 mm when expanded, (sub)globose, ovoid, then hemispherical or obtusely conical to convex, seldom flat, ochre-brown (Mu. 7.5 YR 4.5/4 to 10 YR 6/4, K. & W. 6D4.5 to 5D4) with dark reddish brown centre (5 YR 3/4, 7E5). Lamellae, L = 20–36, l = 0–3, narrowly adnate or almost free, whitish, then brown to blackish. Stipe 40–80 × 2–5 mm, whitish, pubescent; base somewhat clavate.

Spores 10.0–15.0 × 7.0–10.0 µm, Q = 1.40–1.70(1.90), av. Q = 1.50–1.65, av. L = 12.1–12.9 µm, av. B = 7.3–8.4 µm, ovoid in front

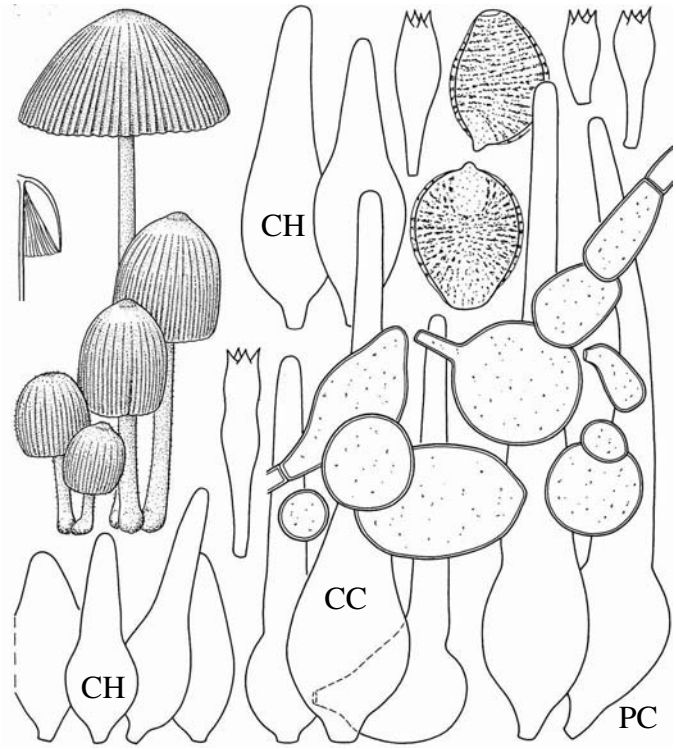


Fig. 39. *Coprinus silvaticus*

view, amygdaliform in side view, ornamented with rows of small warts or with larger, more isolated warts, with rounded base and truncate apex, very dark red-brown; germ pore central, 2.0–2.2 µm wide. Basidia 20–60 × 8–11 µm, 4-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 45–90 × 16–30 µm, lageniform or conical to fusiform with tapering neck and 5–8 µm wide apex. Pleurocystidia absent. Pileocystidia 60–150 × 20–35 µm, lageniform with tapering neck, 6–8.5 µm wide at apex. Velar globose cells on pileipellis globose to ovoid, up to 45 µm long. Sclerocystidia absent. Caulocystidia 40–60 × 10–15 µm, lageniform. Clamp-connections not found.

HABITAT & DISTR. — Usually fasciculate, on rich, clayey soil; rather rare in the Netherlands. Apr.–Nov. Known from Europe and America.

Coprinus silvaticus is recognised by the verrucose, amygdaliform spores in combination with the 4-spored basidia. It has comparatively large basidiocarps. *Coprinus verrucispermus*, the other species in subsect. *Setulosi* with verrucose spores, has distinctly smaller basidiocarps and 2-spored basidia. Moreover, the spores in that species are more ellipsoid to only slightly amygdaliform. The warty appearance of the spores of *C. verrucispermus* disappears in KOH; that of *C. silvaticus* does not.

40. Coprinus verrucispermus Joss. & Enderle in Z. Mykol. 54: 67. 1988. – Fig. 40.

Coprinus verrucispermus Joss. in Bull. trimest. Soc. mycol. Fr. 60: 9. 1944 (invalid, no Latin).

VERN. NAME — Schijnwratsporige inktzwam.

Pileus 8–15 × 7–12 mm when still closed, up to 30 mm when expanded, (sub)globose, ovoid, then hemispherical or obtusely conical to convex, seldom flat, first dark (red-)brown (Mu. 7.5 YR 4/4–5/6, K. & W. 6C4–6D6), soon paler, especially outside centre (7.5 YR 5/6–5/8 to

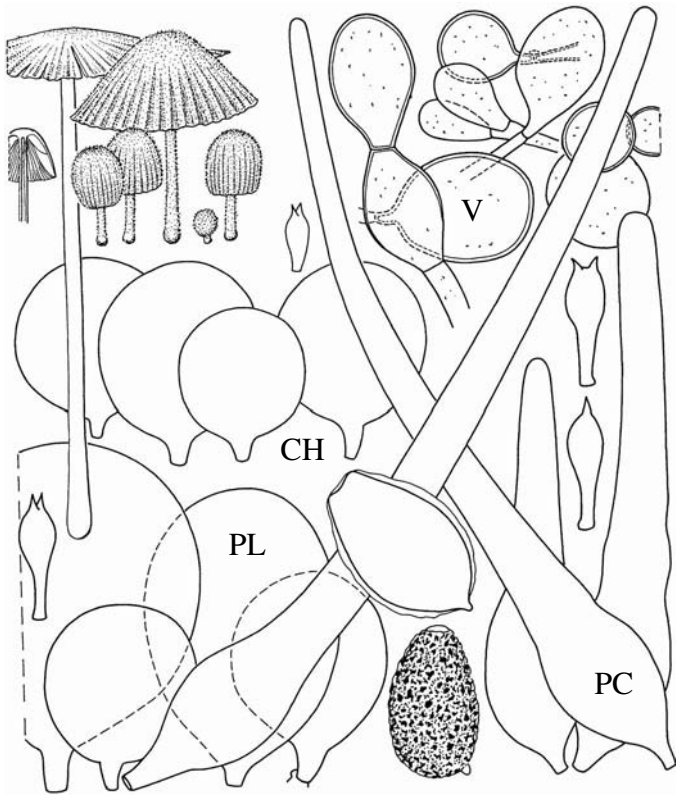


Fig. 40. *Coprinus verrucispermus*

10 YR 7/4, 5C4–5, 5D4, 6C6), entirely covered with brown, flocculose-granular remnants of veil. Lamellae, L = 22–38, l = 0–3, narrowly adnate or almost free, whitish, then brown to blackish. Stipe 30–70 × 1–3 mm, whitish, pubescent; base somewhat clavate.

Spores 11.0–17.0 × 7.0–9.5 µm, Q = 1.40–1.80, av. Q = 1.50–1.70, av. L = 13.4–14.5 µm, av. B = 7.9–8.9 µm, ovoid in front view, ellipsoid to slightly amygdaliform in side view, ornamented, with wrinkled-folded myxosporium giving spores a warty appearance, but after some hours in KOH becoming smooth because of swelling of myxosporium, with rounded base and truncate apex, very dark red-brown; germ pore central, 2 µm wide. Basidia 18–35 × 8–10 µm, 2-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 20–50 µm in diam., (sub)globose to ellipsoid. Velar globose cells on pileipellis globose, 10–25 µm in diam. to ellipsoid, up to 15–35 × 8–25 µm. Pleurocystidia 30–65 µm broad, (sub)globose, ellipsoid or broadly utriform. Pileocystidia 80–210 × 18–25 µm, lageniform with tapering neck, 5–8 µm wide at apex. Sclerocystidia absent. Caulocystidia 70–100 × 17–23 µm, lageniform. Clamp-connections small and difficult to find.

HABITAT & DISTR. — Gregarious on naked, clayey soil; rare in the Netherlands. Aug.–Nov. Recorded from Europe and America.

This species is characterised by its warty spores in combination with 2-spored basidia. *Coprinus silvaticus* has 4-spored basidia, no pleurocystidia, lageniform cheilocystidia, and usually much larger basidiocarps.

41. Coprinus parvulus Keizer & Uljé in Persoonia 18: 281. – Fig. 41.

SEL. DESCR. & FIGS. — Keizer & Uljé in Persoonia 18: 281–283, fig. 1. 2003.

VERN. NAME — Kleine inktzwam.

Pileus 0.3–1 mm when young, expanding 0.5–2(3) mm, young ovoid then conico-convex, finally applanate, not translucently striate, when young white, then very pale greyish cream, with age greyish and only slightly deliquescent; when young covered by white fine-granular veil, with age granular velar remnants only in centre. Lamellae L = 3–8, l = 0–1, distant, broadly adnate, emarginate, sometimes with decurrent tooth, segmentiform, up to 0.5 mm broad, whitish when young then purplish with white edge. Stipe 3–7 × 0.2–0.5 mm, cylindrical, subbulbose at base, greyish hyaline, minutely hairy, in lower part with sparse remnants of veil in form of small white squamules. Smell indistinct, taste not tested. Spore print dark purplish brown.

Spores 5.5–7.0 × 2.5–3.5 µm, Q = 1.75–2.30, av. Q = 1.90–2.05, av. L = 6.1–6.8, av. B = 3.1–3.4, cylindrical ellipsoid, ellipsoid or ovoid, medium red-brown, with central, c. 0.6 µm wide germ pore. Basidia 10–20 × 5.5–6.5 µm, 4-spored, surrounded by 4–5 pseudoparaphyses. Cheilocystidia 15–25 × 5–8.5 × 1.2–3 µm, fusiform or lageniform. Pleurocystidia absent. Pileipellis a layer of (sub)globose elements, covered with pileocystidia and veil. Veil made up of (sub)globose to clavate cells, the globose ones 15–35 µm wide, connected by often irregular, 2.5–6 µm wide elements. Pileocystidia 25–45 × 6–11 × 1.5–3 µm, lageniform or fusiform. Caulocystidia 22–40 × 6–12.5 × 1.5–3.5 µm, lageniform or fusiform. Clamp-connections absent.

HABITAT & DISTR. — Solitary or subfasciculate, on old dung, presumably from wild boar, covered with algae, in pine forest; only known from the type locality in the Netherlands (Planken Wambuis). Sept.

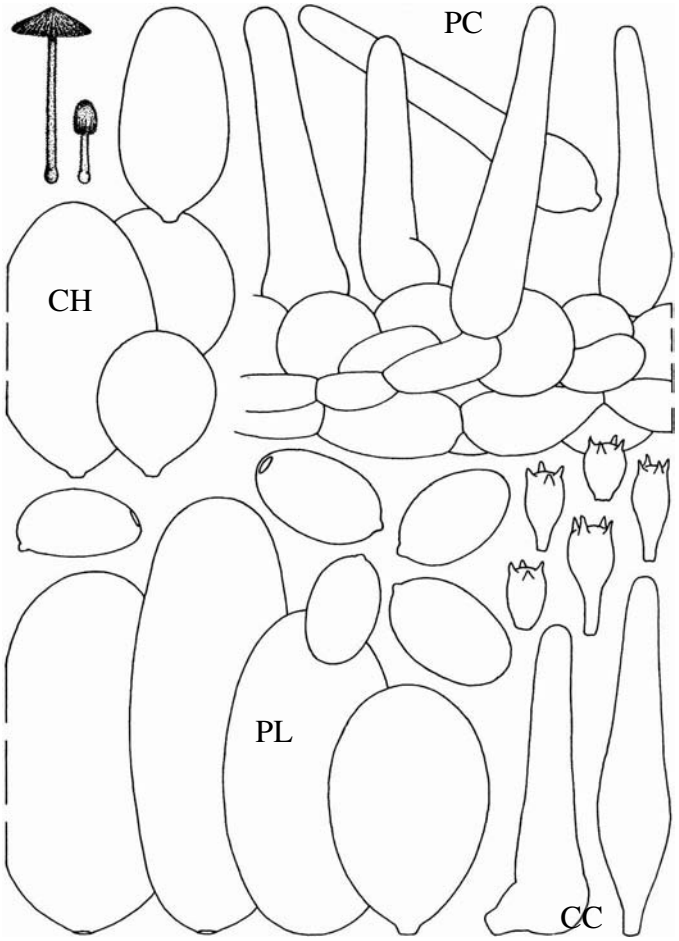


Fig. 41. *Coprinus parvulus*

The presence of lageniform pileocystidia places *C. parvulus* in subsection *Setulosi*. In that subsection only *C. pellucidus*, another small dung inhabiting *Coprinus* species, is rather similar to *C. parvulus*. That species, however, lacks veil consisting of globose cells on the pileus, has larger spores and globose cheilocystidia. Cacialli et al. (Schede Micol. 1: 234. 1995) mention another taxon close to *C. pellucidus*, having some lageniform cheilocystidia between the globose ones, but with much larger spores, similar to these in *C. pellucidus*. Other species of the subsection have considerably larger spores, often with eccentric germ pores, larger basidiocarps or a non-coprophilous habitat.

42. Coprinus canistri Uljé & Verbeken in Persoonia 18: 143. 2002 – Fig. 42.

SEL. DESCR. & FIGS. – Uljé & Verbeken in Persoonia 18: 143–145, fig. 1. 2002.

VERN. NAME — Houtdwergje.

Pileus 3.5–7 × 3–5 mm, up to 16 mm when expanded, cream to pale ochre-brown to ochre-brown at centre (Mu. 7.5 YR 4/6, 10 YR 4–5/4, 6/5), paler towards margin (10 YR 4–5/3, 6/6, 7/2), when young entirely pruinose, becoming smooth on age. Lamellae, L = 16–24, l = 1–3, narrowly adnate to almost free, white to blackish. Stipe 20–30 × 0.5–1.5 mm, whitish, pubescent, base slightly clavate, up to 2 mm.

Spores 9.5–13.5 × 6.0–8.5 × 6.0–7.0 µm, av. L = 11.8–12.7 µm, av. B = 6.5–7.7 µm, av. W = 6.2–6.7 µm, QB = 1.50–1.90, av. QB = 1.65–1.70, QW = 1.85–2.05, av. QW = 1.85–1.95, ellipsoid to ovoid; germ pore eccentric, 1.8 µm wide. Basidia 14–28 × 8.5–10.5 µm, 4-spored. Pseudoparaphyses 4–6 (7) per basidium. Cheilocystidia 30–70 × 17–42 µm (sub)globose, ellipsoid, oblong, a few slightly broadly utriform. Pleurocystidia 50–110 × 27–45 µm, ellipsoid, oblong to slightly utriform. Pileocystidia 60–90 × 11–20 µm, lageniform, less frequent (sub)fusiform, with tapering neck, 4–7.5 µm wide at apex. Sclerocystidia absent. Caulocystidia 60–95(110) × 14–21, lageniform or fusiform, with tapering neck, 4–8 µm wide at apex. Clamp-connections absent.

HABITAT & DISTR. — Fasciculate, found under shrubs on branches embedded in mud taken from ditch and on a woven reed basket; very rare in the Netherlands, only known from Oegstgeest. July. Also known from one locality in Belgium (Wingene).

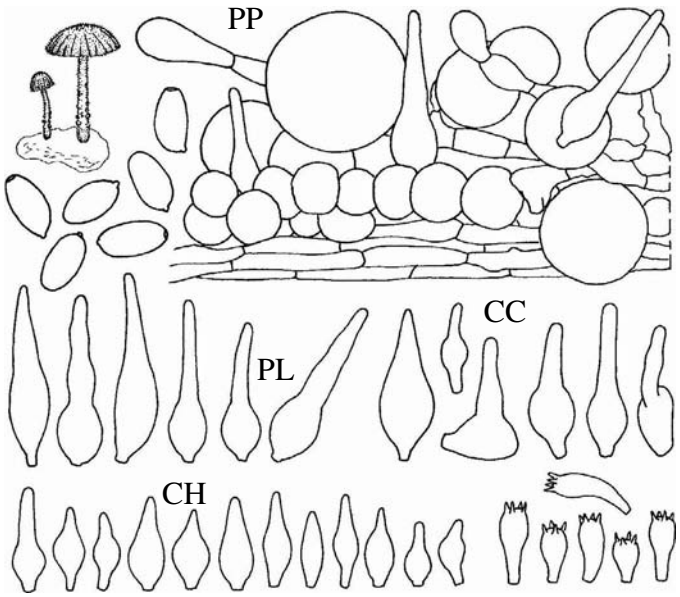


Fig. 42. *Coprinus canistri*

Coprinus subimpatiens, another species with pleurocystidia, differs in terrestrial growth and has usually larger basidiocarps. The pileocystidia in *C. subimpatiens* are larger, up to 140 µm long with (sub)cylindrical neck, slightly broadened at apex in majority. The (sub)globose to ellipsoid cheilocystidia are mixed with lageniform ones.

The species also reminds of *C. congregatus* in both macro- and microscopical characters, but differs in the habitat preference because *C. congregatus* is a (strictly) coprophilous species. Furthermore, *C. canistri* has smaller basidiocarps, smaller and less narrow spores (average Q ≥ 1.7 in *C. congregatus*; average Q < 1.7 in *C. canistri*), shorter pileocystidia, and smaller cheilo- and pleurocystidia.

Sect. **Coprinus**

SELECTED LITERATURE — Citérin in Doc. mycol. 22 (86): 21–28. 1992; Citérin in Doc. mycol. 24 (95): 5–13. 1994; P.D. Orton & Watl. in Br. Fung. Fl. 2: 29–53. 1979.

Pileus small to rather large, always covered with veil, in subsect. *Atramentarii* often seemingly smooth, the veil presenting itself in form of hairy-floccose covering of the basidiocarp or in patches scattered over the surface. Veil consisting of elongate, filamentous elements, which are smooth, thin-walled or diverticulate and then often thick-walled. In some species of subsection *Lanatuli* a few globose or ellipsoid cells may also be present in the veil. Pileipellis a cutis, made up of repent, elongate, often inflated hyphae, which are smooth or branched and diverticulate.

Subsect. **Atramentarii** (Fr.) Konr. & M.

Pileus medium-sized, 30–80 × 20–60 mm, ochre-brown, grey-brown or grey, squamulose only at centre, often seemingly smooth. Growing fasciculate, on wood, trunks, or wood-chips. Spores < 10 µm long when smooth, if larger then spores warty.

43. Coprinus atramentarius (Bull. :Fr.) Fr., Epicrisis: 243. 1838. – Fig. 43.

Agaricus atramentarius Bull., Herb. Fr.: pl. 164. 1784; *Agaricus atramentarius* Bull. :Fr., Syst. Mcol. 1: 308. 1821; *Coprinopsis atramentaria* (Bull. :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 226. 2001.

SEL. ICON. — R. Phillips, Paddest. Schimm.: 178. 1981; Michael et al., *Handb. Pilzfr.* 1, Ed. 3: 180, pl. 38. 1978; M. Lange, Paddestoelengids: 137. 1964; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 265. 1995.

SEL. DESCR. & FIGS. — Romagn. in Rev. Mycol. 16: 120.; Michael et al., Handb. Pilzfr. 1, Ed. 3: 180. 1978; P.D. Orton & Watl. in Br. Fung. Fl. 2: 31. 1979.

VERN. NAME — Grote kale inktzwam.

Pileus 40–80 × 30–60 mm when still closed, subglobose, ellipsoid or ovoid, expanding to campanulate or somewhat conical and then up to 100 mm wide, at first grey-brown or grey, adpressed squamulose at centre only or almost smooth. Lamellae, L = > 50, l = 3–7, first white, then greyish-brown to black. Stipe 70–150 × 8–15 mm, white; base clavate or globose, often slightly marginate.

Spores 6.5–10.5 × 4.0–6.5 µm, Q = 1.40–1.95, av. Q = 1.50–1.75, av. L = 7.9–9.3 µm, av. B = 4.6–5.9 µm, ellipsoid or ovoid, with rounded

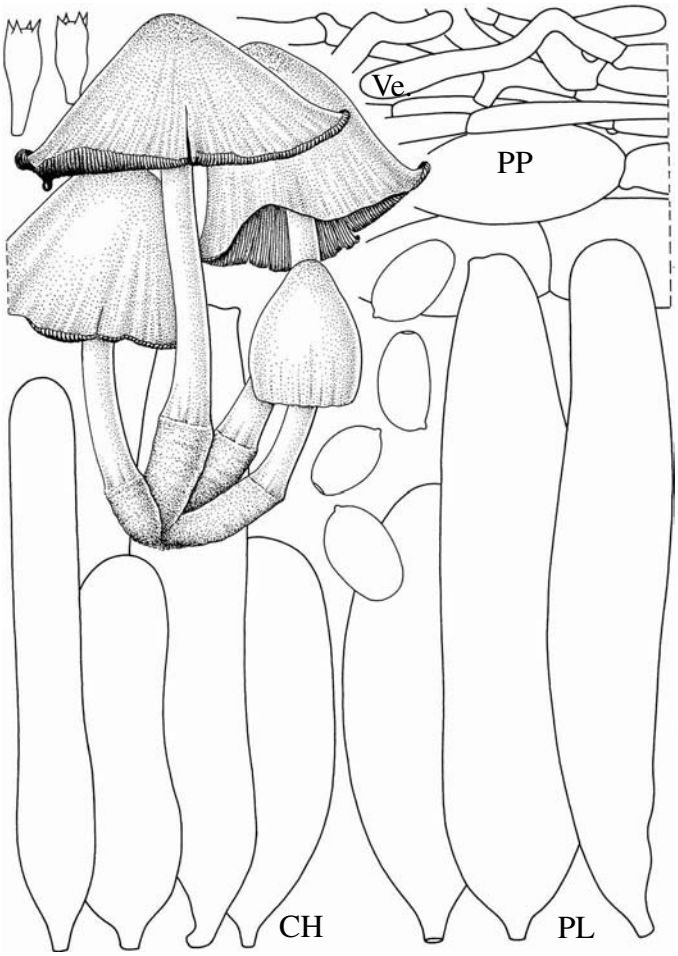


Fig. 43. *Coprinus atramentarius*

base and apex, dark red-brown; germ pore central, 1.1–1.2 µm wide. Basidia 14–32 × 8–10 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 50–180 × 17–35 µm, rather narrowly cylindrical or slightly utriform. Pleurocystidia 60–210 × 30–40(55) µm, rather narrowly cylindrical or slightly utriform. Elements of veil 50–100 × 2–8(10) µm, branched and partly slightly diverticulate, hyphal. Clamp-connections present.

HABITAT & DISTR. — Fasciculate, on stumps of trees, sometimes seemingly terrestrial; very common in the Netherlands. Jan.–Dec. Widespread and common throughout Europe, America, and Asia.

Coprinus acuminatus differs from *C. atramentarius* in an ochre-brown colour, a more conical shape of the usually smaller basidiocarps and somewhat narrower spores. *Coprinus romagnesianus* differs in the orange-brown colour and the more abundant squamulose veil.

Coprinus atramentarius, and possible also related species, can be eaten only with precaution. Consumption in combination with alcohol may lead to severe disease symptoms, known as the coprin-syndrome (Bresinsky & Besl, *Giftpilze*: 119–129. 1985).

44. Coprinus acuminatus (Romagn.) P.D. Orton in Notes R. bot. Gdn Edinb. 29: 86. 1969. – Fig. 44.

Coprinus atramentarius var. *acuminatus* Romagn. in Rev. Mycol. 16: 120. 1951; C*oprinopsis acuminata* (Romagn.) Redhead, Vilgalys & Moncalvo in Taxon 50: 226. 2001.

SEL. ICON. — Jamoni in Funghi Amb. 47: 37, pl. 111. 1988.

SEL. DESCR. & FIGS. — Romagn. in Rev. Mycol. 16: 120–122, fig. 4. 1951; P.D. Orton & Watl. in Br. Fung. Fl. 2: 32. 1979.

VERN. NAME — Kleine kale inktzwam.

Pileus 20–30 × 15–25 mm when still closed, more or less narrowly conical, expanding to conical and then up to 50 mm wide, at first greyish ochre to ochre-brown, fibrillose-squamulose at centre, later grey-brown and almost smooth. Lamellae, L = > 50, l = 3–7, first white, then greyish-brown to black. Stipe 60–130 × 3–5 mm, white; base clavate.

Spores 6.0–9.0(10.5) × 4.0–5.5 µm, Q = 1.40–1.85(2.10), av. Q = 1.55–1.60(1.90, av. L = 7.4–7.7(9.3) µm, av. B = 4.4–5.0(5.2) µm, ellipsoid or ovoid, with rounded base and apex, dark red-brown; germ pore central, 1.1–1.2 µm wide. Basidia 14–26 × 6.5–8 µm, 4-spored, surrounded by 3–5(6) pseudoparaphyses. Cheilocystidia 60–100 × 18–28 µm, rather narrowly cylindrical or slightly utriform. Pleurocystidia 80–140 × 18–28 µm, rather narrowly cylindrical or slightly utriform. Elements of veil not studied. Clamp-connections present.

HABITAT & DISTR. — Fasciculate, on stumps of broad-leaved trees or wood-chips; rather rare in the Netherlands, but distribution is general poorly known. July–Dec.

Characters to separate *C. acuminatus* from *C. atramentarius* are the ochre-brown colour, the more conical shape of the usually smaller basidiocarps, and the somewhat narrower spores.

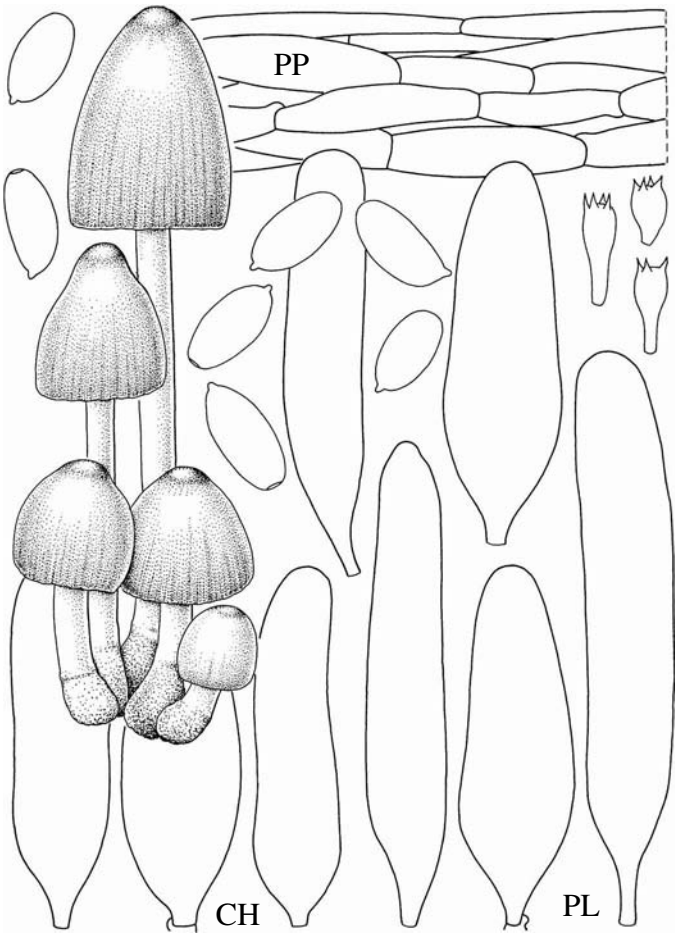


Fig. 44. *Coprinus acuminatus*

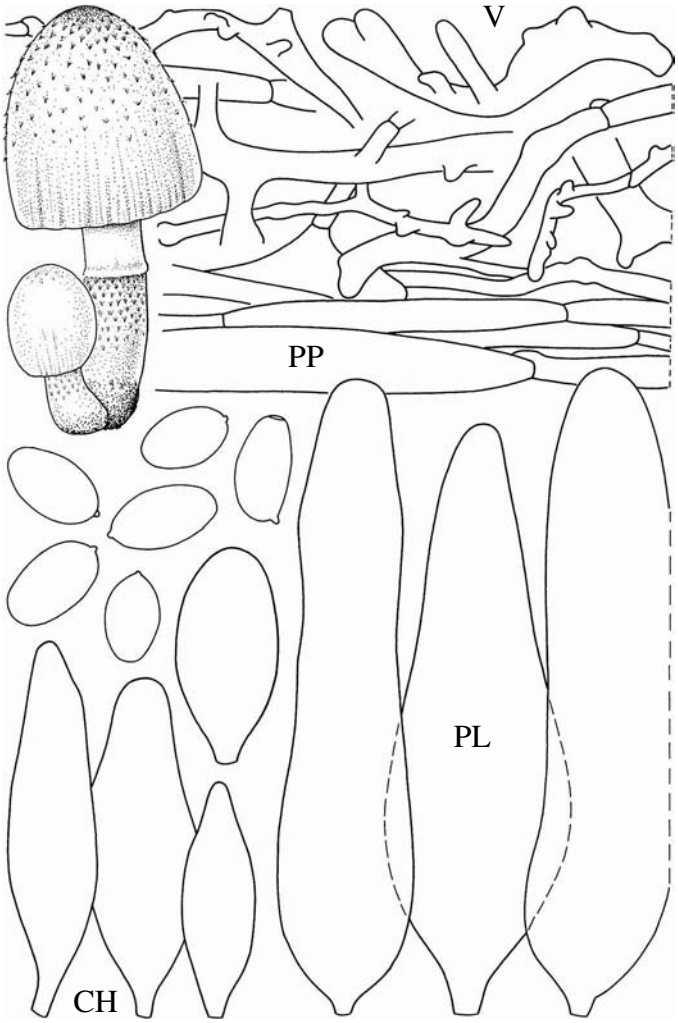


Fig. 45. *Coprinus romagnesianus*

45. Coprinus romagnesianus Sing. in *Lilloa* 22: 459. ('1949') 1951. – Fig. 45.

C*oprinopsis romagnesiana* (Sing.) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001. *Coprinus atramentarius* var. *squamosus* Bres., Iconogr. mycol. 18: pl. 878. 1931.

SEL. ICON. — Cetto, Gr. Pilzf. 3: pl. 878. 1979; Mos. & Jül., Farbatl. Basidiomyc., Coprinus: pl. 2. 1988.

SEL. DESCR. & FIGS. — P.D. Orton & Watl. in Br. Fung. Fl. 2: 33. 1979.

VERN. NAME — Bruine kale inktzwam.

Pileus 30–50 × 30–45 mm when still closed, subglobose, ellipsoid or ovoid, expanding to campanulate or almost flat and then up to 90 mm wide, at first beige or pale brown, soon darker, orange- or red-brown and squamulose, especially at centre, the scales often upturned at tips. Lamellae, L = > 50, l = 3–7, first white, then greyish-brown to almost black. Stipe 60–100 × 5–13 mm, white but brown squamulose above clavate, often slightly marginate base.

Spores 10.0–11.5 × 5.5–6.5 µm, Q = 1.55–1.95, av. Q = 1.80, av. L = 7.9–9.3 µm, av. B = 4.6–5.9 µm, ellipsoid or ovoid, with rounded base and apex, dark red-brown; germ pore central, 1.1–1.2 µm wide. Basidia 18–32 × 7–9.5 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 50–100 × 15–30 µm, rather narrowly cylindrical or slightly utriform. Pleurocystidia 100–170 × 20–40 µm, rather narrowly cylindrical or slightly utriform. Elements of veil 50–100 × 4–20 µm, somewhat thick-walled in places, branched and slightly diverticulate, hyphal. Clamp-connections present.

HABITAT & DISTR. — Fasciculate, on stumps of trees; rare in the Netherlands. Feb.–Dec. Occurring in Europe and North America

Coprinus romagnesianus differs from *C. atramentarius* in the orange-brown to red-brown colour and the more abundant squamulose veil.

Subsect. **Lanatuli** J. Lange

Pileus small to medium, entirely covered with hairy-floccose veil, white, greyish, orange or yellowish, made up of elongate elements forming chains, usually abundant, sometimes scarce.

46. Coprinus insignis Peck in *Bull. Buffallo Soc. nat. Sci.* 1: 54. 1873. – Figs. 46, 47.

C*oprinopsis insignis* (Peck) Redhead, Vilgalys & Moncalvo in Taxon 50: 227. 2001.

MISSAL. — *Coprinus alopecia* sensu auct.

SEL. ICON. — Cetto, Gr. Pilzf. 4: pl. 1286. 1983; Michael et al., *Handb. Pilzfr.* 4: pl. 296. 1981; Monti, *Fungi Cenosi Aree bruciate*: 79. 1992 (all as *C. alopecia*).

SEL. DESCR. & FIGS. — Huijsman in Coolia 22: 12–21. 1979; P.D. Orton & Watl. in *Br. Fung. Fl.* 2: 33. 1979; Michael et al., *Handb. Pilzfr.* 4: 442. 1981 (as *C. alopecia*).

VERN. NAME — Zijige inktzwam.

Pileus 40–70 × 20–50 mm when still closed, subglobose, ellipsoid or ovoid, expanding to conical and then up to 100 mm wide, at first white and silvery fibrillose from veil, then greyish to grey with pale brown, dirty ochraceous centre. Lamellae, L = > 50, l = 3–7, first white, then greyish brown to black. Stipe 80–150 × 4–12 mm, white; base up to 15 mm, clavate and white tomentose.

Spores 11.0–14.5 × 6.5–8.5 µm, Q = 1.50–1.95, av. Q = 1.70, av. L = 12.3–12.5 µm, av. B = 7.3–7.4 µm, amygdaloid, warty, with rounded to slightly conical base and apical papilla, very dark red-brown; germ pore narrow, 1 µm wide. Basidia 25–42 × 8–10 µm, 4-spored, surrounded

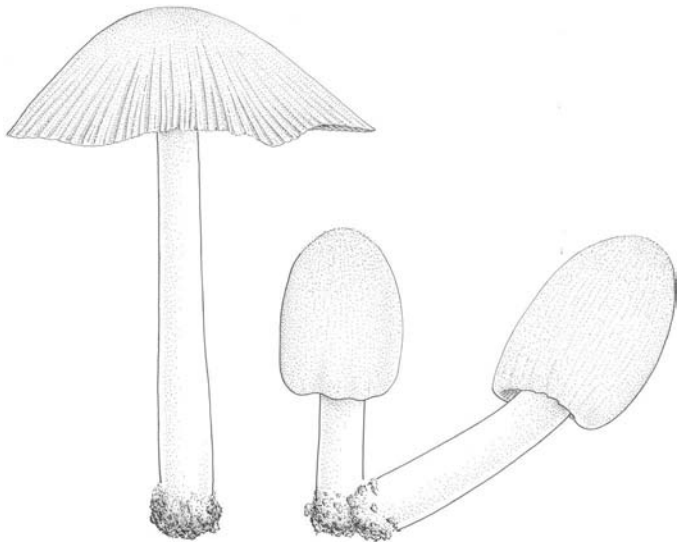


Fig. 46. *Coprinus insignis*

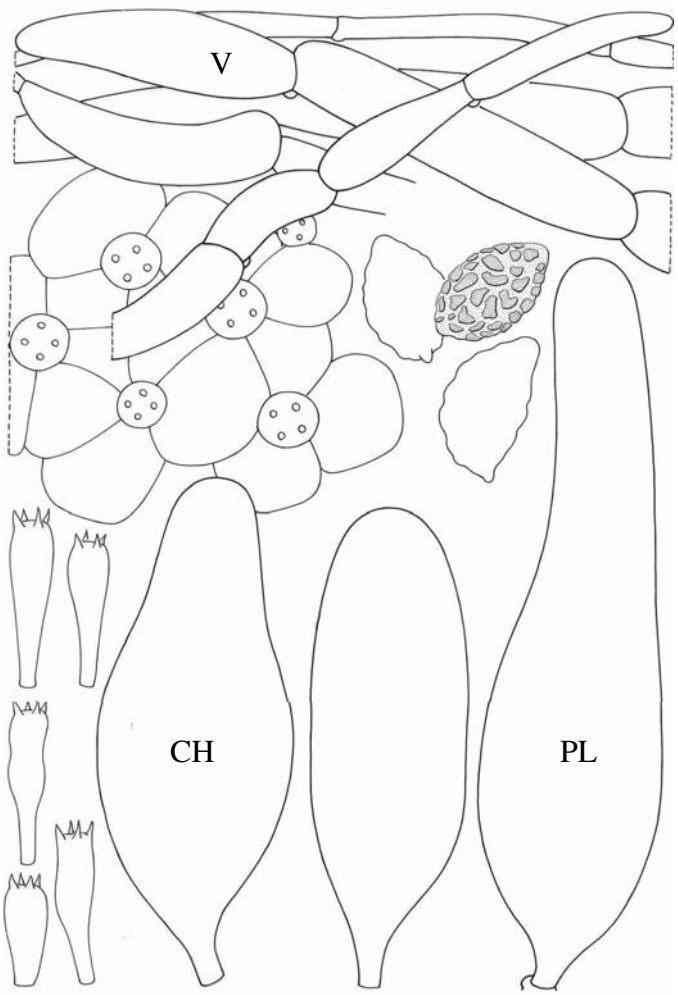


Fig. 47. *Coprinus insignis*

by 3–6 pseudoparaphyses. Cheilocystidia 50–160 × 30–60 µm, utriform to subcylindrical. Pleurocystidia 80–180 × 35–50 µm, utriform to subcylindrical. Elements of veil 20–125 × 7–14 µm, hyphal. Clamp-connections present.

HABITAT & DISTR. — Fasciculate, on stumps of broad-leaved trees, sometimes on the ground; very rare in the Netherlands (Domburg, Hulst, Eindhoven, Den Haag). June–Sept. Known from Europe and America.

Coprinus insignis can be easily identified by the hyphal veil, the warty, amygdaloid spores and the medium-sized, fasciculate growing basidiocarps.

47. Coprinus ochraceolanatus Bas in Uljé & Bas in Persoonia 15: 362. 1993. – Fig. 48.

Coprinopsis ochraceolanata (Bas) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001. — *Coprinus citrinovelatus* Ludwig & Roux in Z. Mykol. 61: 34. 1995.

SEL. ICON. — Ludwig & Roux in Z. Mykol. 61: 35. 1995 (as *C. citrinovelatus*).

SEL. DESCR. & FIGS. — Bas in Uljé & Bas in Persoonia 15: 362, fig. 2. 1993; Uljé & Noordel. in Persoonia 17: 185. 1999.

VERN. NAME — Geelvezelig hazenpootje.

Pileus 30 × 20 mm when still closed, up to 50 mm when expanded, ovoid, sometimes with truncate apex and irregular somewhat lobed margin, rather pale grey (Mu. 5 Y 6/1) at margin to somewhat darker near apex (5 Y 5/1), but slightly more brownish although not as brown as 2.5 Y 6/2 to 5/2, rather more brown (7.5 YR 3/2 to 10 YR 4/3), deeply and densely sulcate at margin, sulcate striate near centre, with appressed (but in young buds suberect), long, thin, fibrillose, ochraceous to salmon-ochraceous (10 YR 7/4 to 7/6) velar scales, condensed to a thin felted salmon-ochraceous patch at centre; margin of cap in early stages losing contact with stem. Lamellae, L = 36–41, l = 1–3(5), crowded, free, rather narrow (up to 4 mm wide), already in young buds fairly dark chocolate-brown (7.5 YR 3/2), finally dark greyish purple-brown (5 YR 2/2) with thin, pale ochraceous subflocculose edge; pleurocystidia visible with handlens. Stipe up to 80 × 5.5 mm, tapering upwards, hollow, subfasciculate to fasciculate, in some specimens with thin, up to 12 mm long pseudorhiza, slightly greyed whitish, densely fibrillose, with ochraceous tinge because of rather deeply ochraceous yellow superficial fibrils (under lens), especially near base, sometimes with a few incomplete, pale ochraceous, floccose girdles or many small, similarly coloured scales. Context chocolate brown in centre of pileus, slightly more greyish purple-brown in base of stipe, and paler along

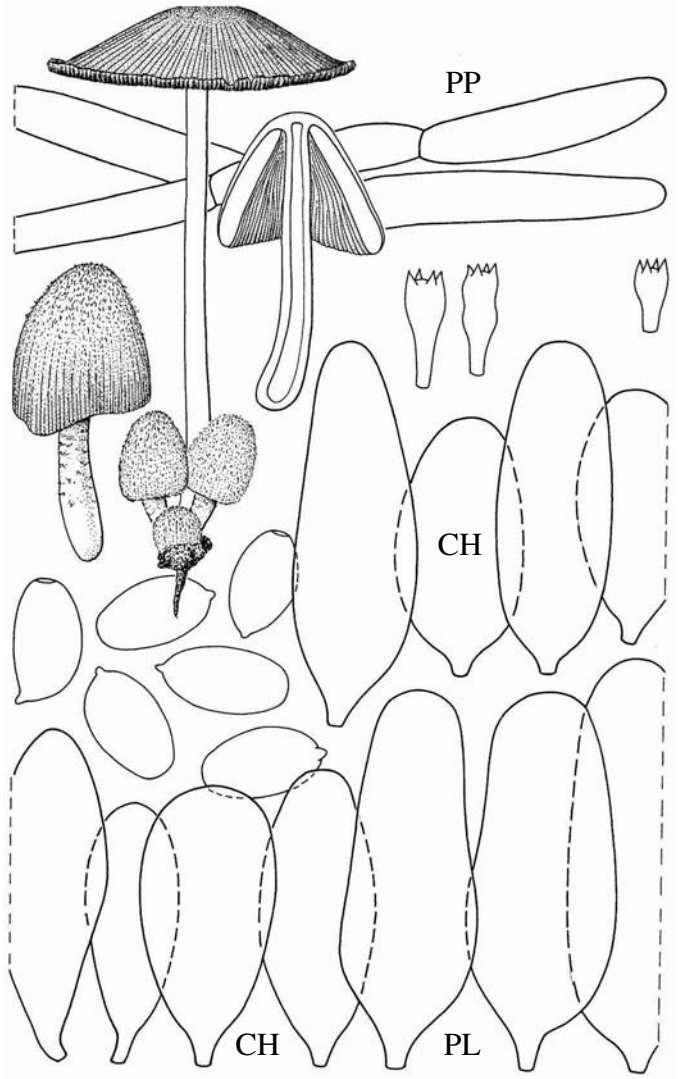


Fig. 48. *Coprinus ochraceolanatus*

cavity of stipe; rest pale. Smell indistinct, weakly fungoid. Taste subraphanoid with somewhat bitterish, unpleasant aftertaste.

Spores 8.5–13.5 × 5.5–7.7 µm, Q = 1.45–2.10, av. Q = 1.55–1.85, av. L = 9.4–12.3 µm, av. B = 6.1–6.8 µm, ellipsoid to ovoid, with rounded base and apex, dark red-brown; germ pore central, 1.5–1.8 µm wide. Basidia 15–38 × 8–11 µm, 4-spored. Pseudoparaphyses 3–5(6) around each basidium. Cheilocystidia 30–120 × 15–50 µm, in very young pileus subglobose or (sub)globose, later rather more elongate or ellipsoid, clavate, oblong, (sub)globose or cylindrical. Pleurocystidia 50–140 × 20–50 µm, elongate ellipsoid, subglobose, cylindrical or broadly fusiform. Pileipellis consisting of repent radial chains of cylindrical to inflated cells, 8–26 µm wide. Veil made up of parallel, yellowish, granular-incrusted hyphae of 45–200 × 7–20 µm large elements, often somewhat fusiform, not or only slightly constricted at septa. Incrustations on velar hyphae persistent in HCl 10% and alcohol, loosening in KOH and NH_4OH and dissolving in Melzer's reagent. Clamp-connections present.

HABITAT & DISTR. — Fasciculate or gregarious, especially on wood-chips or near tree trunks, also found on old mud taken out of ditch one year earlier in old deciduous forest and on sandy clay with much humus and forest litter; very rare in the Netherlands (Maarseveen, Ter Aar, and Voorschoten). May. Also known from Germany.

Coprinus ochraceolanatus differs from *C. lagopus* in having more slender and densely incrusted velar cells (up to 20 µm wide), whereas *C. lagopus* has smooth velar cells that are much more inflated (up to 40 µm wide). Macroscopically the colour of the veil of *C. ochraceolanatus* is yellowish ochre, in *C. lagopus* whitish or greyish, more rarely pale yellow, but then the hyphal walls are not incrusted.

48. Coprinus erythrocephalus (Lév.) Fr., Hymenomyc. eur.: 327. 1874. – Fig. 49.

Agaricus erythrocephalus Lév. in *Ann. Sci. nat.*, Series II, 16: 237. 1841; *Coprinopsis erythrocephala* (Lév.) Redhead, Vilgalys & Moncalvo in Taxon 50: 228. 2001.

MISSAPL. — *Coprinus dilectus* sensu J. Lange in Dansk bot. Ark. 2 (3): 36, 40. 1915 and Fl. agar. dan. 4: 109. 1939.

SEL. ICON. — Bender & Enderle in Z. Mykol. 54: between 48 and 49. 1988; Cetto, Funghi Vero 6, Ed. 1: pl. 2170. 1989; Donelli & Simonini in Riv. Micol. 38: 126. 1995; J. Lange, Fl. agar. dan. 4: pl. 157A. 1939 (as *C. dilectus*?).

SEL. DESCR. & FIGS — Bender & Enderle in Z. Mykol. 54: 48. 1988; Uljé & Noordel. in Persoonia 17: 189–190, fig. 12. 1999.

VERN. NAME — Oranje inktzwam.

Pileus 10–20(25) × 5–10 mm when still closed, up to 30(40) mm when expanded, first ellipsoid or ovoid, then campanulate to convex, finally flat, brown (Mu. 7.5 YR 4/2–5/2) beneath the rust-coloured or orange-red veil (5 YR 5/8, 7.5 YR 5/8–4/6), that disappears soon and often forms a slimy layer in wet conditions. Lamellae (number of lamellae not noted) first whitish with rust-coloured edge, soon brown to blackish. Stipe up to 100 × 2–4 mm, white, hollow, sometimes with pinkish tinge, upper part white floccose, lower part covered with orange, rust-coloured veil, dense at base; base up to 5 mm, somewhat rooting and with white mycelium. Smell weak, indistinct or somewhat after apricot.

Spores 7.5–13.0 × 5.0–8.0 µm; Q = 1.45–1.90, av. Q = 1.55–1.70; av. L = 8.7–12.0, av. B = 5.3–7.6 µm, ellipsoid or ovoid with conical or (sometimes) rounded base and rounded or somewhat truncate apex, dark red-brown, and central, 1.8 µm wide germ pore. Basidia 16–34 × 8–10 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–50 × 15–25 µm, subglobose, ellipsoid, less frequent oblong, subcylindrical or (sub)utriform. Pleurocystidia 80–130 × 25–40 µm, ellipsoid, oblong, subcylindrical or (sub)utriform. Pileipellis a cutis, made up of cylindrical, more or less parallel, repent hyphae. Veil made up of cylindrical, 3–20 µm wide, strongly incrusted elements. Incrustations of veil and cystidia yellowish or orange-brown pigmented. Clamp-connections present.

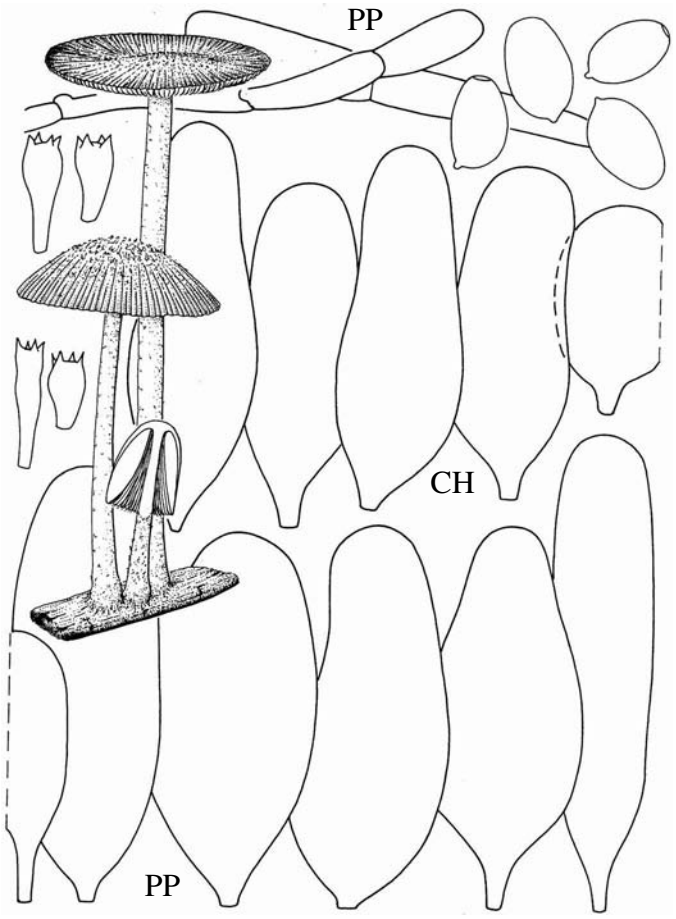


Fig. 49. *Coprinus erythrocephalus*

HABITAT & DISTR. — Usually gregarious on heaps of wood-chips or vegetable refuse, often at pieces of wood or in grass amidst *Urtica*; rather rare in the Netherlands. May–Nov. Widespread, but rare all over Europe.

Coprinus erythrocephalus can easily be recognised by the beautiful, orange veil, that, however, quickly disappears, but remains visible at the base of the stipe for a rather long time.

49. Coprinus scobicola P.D. Orton in Notes R. bot. Gdn Edinb. 32: 147. 1972.

Coprinopsis scobicola (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 17: 195, fig. 15. 1999.

VERN. NAME — Kashazenpootje.

CHARACTERISTICS — Pileus 5–20 × 3–14 mm when still closed, expanded up to 35 mm in diam., first grey to grey-brown, later at centre becoming pale and greyish or yellowish grey-brown; lamellae very crowded,

white to dark grey-brown, finally black; stipe up to 100 × 2–5 mm, white, hairy-floccose, slightly broadening towards somewhat bulbous base.

Spores 9.5–14.0(16.5) × 7.0–10.0(10.5) µm, Q = 1.25–1.60, av. Q = 1.30–1.50, av. L = 10.6–13.3 µm, av. B = 8.1–9.1 µm, broadly ellipsoid or ovoid, with rounded base and apex, medium to dark red-brown; germ pore central, 1.6–1.9 µm wide; basidia 14–38 × 7–10 µm, 2-spored, surrounded by (3)4–5(6) pseudoparaphyses; cheilocystidia 35–75 × 17–38 µm, (sub)globose, ellipsoid, ovoid, broadly subcylindrical or slightly utriform; pleurocystidia 70–110 × 26–37 µm, elongate ellipsoid, ellipsoid or (sub)cylindrical; elements of veil 40–280 × 4–40(70) µm; clamp-connections present.

HABITAT & DISTR. — Subfasciculate on sawdust and compost in unheated greenhouses, very rare in the Netherlands (Huissen, Kortenhoef, Leidschendam, Maarseveen). Feb.–Dec. Recorded from England and Scotland, also from greenhouses.

50. Coprinus krieglsteineri Bender in Beitr. Kenntn. Pilze Mitteleur. 3: 218. 1987. – Fig. 50.

Coprinopsis krieglsteineri (Bender) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001.

SEL. ICON. — Bender in Beitr. Kenntn. Pilze Mitteleur. 3: between 216 and 217. 1987.

SEL. DESCR. & FIGS. — Bender in Beitr. Kenntn. Pilze Mitteleur. 3: 215. 1987; Uljé & Noordel. in Persoonia 17: 193, fig.14. 1999.

VERN. NAME — Zijdeglansinktzwam.

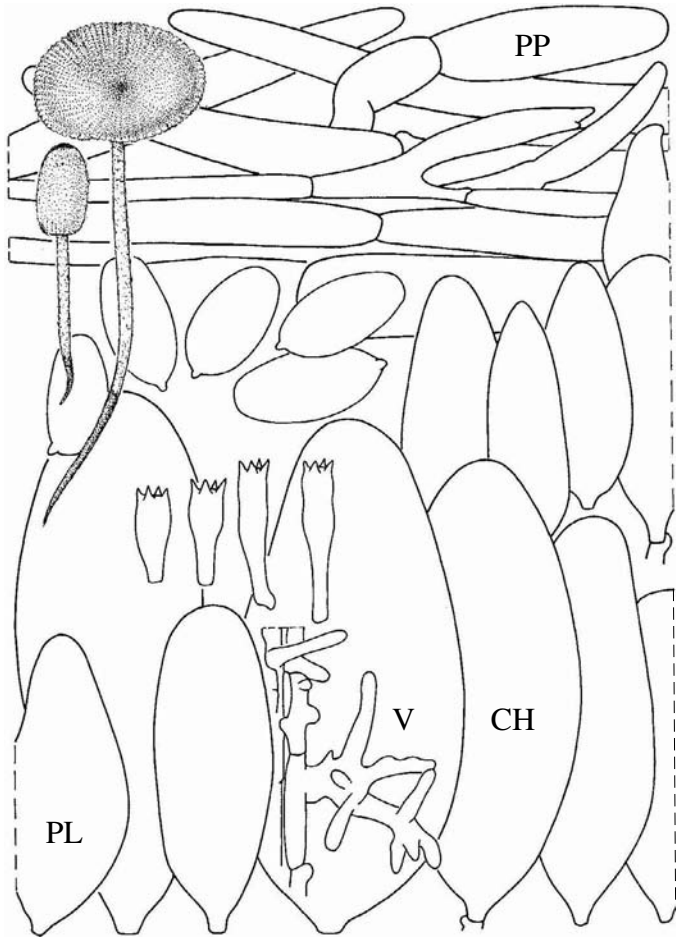


Fig. 50. *Coprinus krieglsteineri*

Pileus 8–20 × 4–7 mm when still closed, 15–30(40) mm when expanded, first ellipsoid or cylindrical ellipsoid, whitish to pale grey with hazel- to dark brown centre (Mu. 7.5 YR 3/2; K. & W. 7F8), and covered with very thin, web-like, silky veil (veil more dense at margin), then becoming campanulate or conical and grey-brown, dark at centre (10 YR 4/2; 6D3), paler towards margin (10 YR 6/2; 5D3). Lamellae, L = 40, l = 0–3, free, first white, then brown, finally black. Stipe up to 80 × 1–2 mm, white, dense minute floccose; base equal or tapering and rooting.

Spores 9.5–14.0 × 6.0–7.0 µm, Q = 1.65–2.05, av. Q = 1.80–1.95, av. L = 11.0–12.8 µm, av. B = 6.1–6.6 µm, oblong, ellipsoid or ovoid with rounded base and apex, dark red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 22–43 × 9–11 µm, 4-spored, surrounded by 4–6(7) pseudoparaphyses. Cheilocystidia 35–115 × 18–45(55) µm, ellipsoid (often conical), subglobose, (broadly) utriform, or subcylindrical. Pleurocystidia 70–160 × 28–55 µm, utriform, subcylindrical or oblong. Pileipellis a cutis. Veil 50–150(200) × 9–18 µm, made up of short chains, up to 4 cylindrical elements; terminal cells often somewhat fusiform; veil elements on stipe often diverticulate. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on paths with woodchips or in humus-rich deciduous forests; very rare in the Netherlands, recorded from Breukelen (Nijenrode, 2 localities). July–Sept. Also known from a few localities in Germany.

Coprinus krieglsteineri can be recognised by the thin, web-like veil on the pileus, which gives the young basidiocarps a silky gloss. The veil soon disappears but stays for a long time at margin.

51. Coprinus pseudoradiatus Watling in Notes R. bot. Gdn Edinb. 35: 154. 1976. – Fig. 51.

Coprinus pseudoradiatus Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 60: 26. ('1944') 1945 (invalid, no Latin description); *Coprinopsis pseudoradiata* (Watling) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001.

SEL. DESCR. & FIGS. — Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 60: 26–28, figs 2 & 3. ('1944') 1945; Uljé & Noordel. in Persoonia 17: 177–178, fig. 6. 1999.

VERN. NAME — Klein mesthazenpootje.

Pileus up to 6 × 4 mm when still closed, up to 10 mm when expanded, first ellipsoid, cylindrical-ellipsoid, grey-brown at centre beneath the whitish to silvery grey veil, paler to margin, expanding to conical, then to convex or applanate, finally plano-concave with revolute margin. Veil whitish to pale (silvery) grey, radially splitting up into hairy to fibrillose, often pointed and adpressed or, especially at centre, recurved flocks, the tips becoming brown on drying. Lamellae, L = 30, l = 1–3(5), free, narrow, rather crowded, first white, soon greyish brown to blackish. Stipe 20–50 × 0.5–1 mm, whitish, somewhat tapering towards apex, up to 1.5 mm wide at clavate base, hollow, minutely hairy flocculose, particularly densely at lower part, becoming glabrous with age. Base often somewhat rooting.

Spores 7.5–9.5 × 5.0–5.5 µm, Q = 1.55–1.80, av. Q = 1.70, av. L = 8.6–8.8 µm, av. B = 5.0–5.2 µm, ellipsoid, with rounded base and apex, very dark red-brown to almost black; germ pore central, 1.3–1.5 µm wide. Basidia 18–32 × 8–10 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 25–60 × 15–28 µm, (sub)globose, ellipsoid to oblong or (sub)utriform. Pileipellis a cutis. Pleurocystidia 30–80 × 20–30 µm, ellipsoid to oblong, utriform or subcylindrical. Veil made up of elongate, sausage-like elements, 30–180 × 8–25(30) µm,

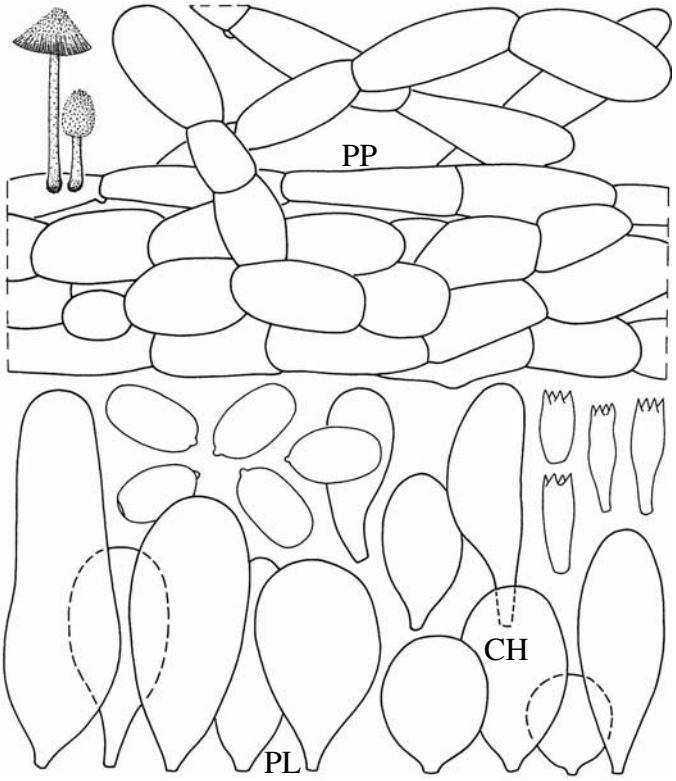


Fig. 51. *Coprinus pseudoradiatus*

often inflated, usually constricted at septa; terminal cells cylindrical to almost globose. Clamp-connections present.

HABITAT & DISTR. — Solitary, in small groups or fasciculate, on pure dung or dung mixed with straw; rather rare in the Netherlands. March–Sept. Widespread in Europe

The very small basidiocarps, the small, often more or less cylindrical spores and the habitat on dung are characters to recognise *C. pseudoradiatus*.

52. Coprinus jonesii Peck in Bull. Torrey bot. Club 22: 206. 1895. – Figs. 52, 53.

Coprinopsis jonesii (Peck) Redhead, Vilgalys & Moncalvo in Taxon 50: 228. 2001. *Coprinus funariarum* Métrod in Bull. trimest. Soc. mycol. Fr. 53: 348. 1937. *Coprinus lagopus* var. *sphaerosporus Kühn*. & Joss. in Bull. trimest. Soc. mycol. Fr. 60: 29. (1944) 1945 (invalid, no Latin description).

SEL. ICON. — R. Phillips, Paddest. Schimm.: 179. 1981.

SEL. DESCR. & FIGS — Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 60: 31–33, fig. 5. 1944 (as C. lagopus var. sphaerosporus); Métrod in Bull. trimest. Soc. mycol. Fr. 53: 346–348. 1937 (as C. funariarum); Uljé & Noordel. in Persoonia 17: 183, fig. 9. 1999.

VERN. NAME — Vals hazenpootje.

Pileus up to 50 × 30 mm when still closed, up to 60 mm when expanded, first ellipsoid, cylindrical-ellipsoid, pale to dark grey-brown at centre beneath the whitish to silvery grey veil, paler to margin, expanding to conical, then to convex or applanate, finally plano-concave with revolute margin. Veil first white, later grey to grey-brown (Mu. 10 YR 4–5/3) and radially splitting up into hairy to fibrillose, often pointed and

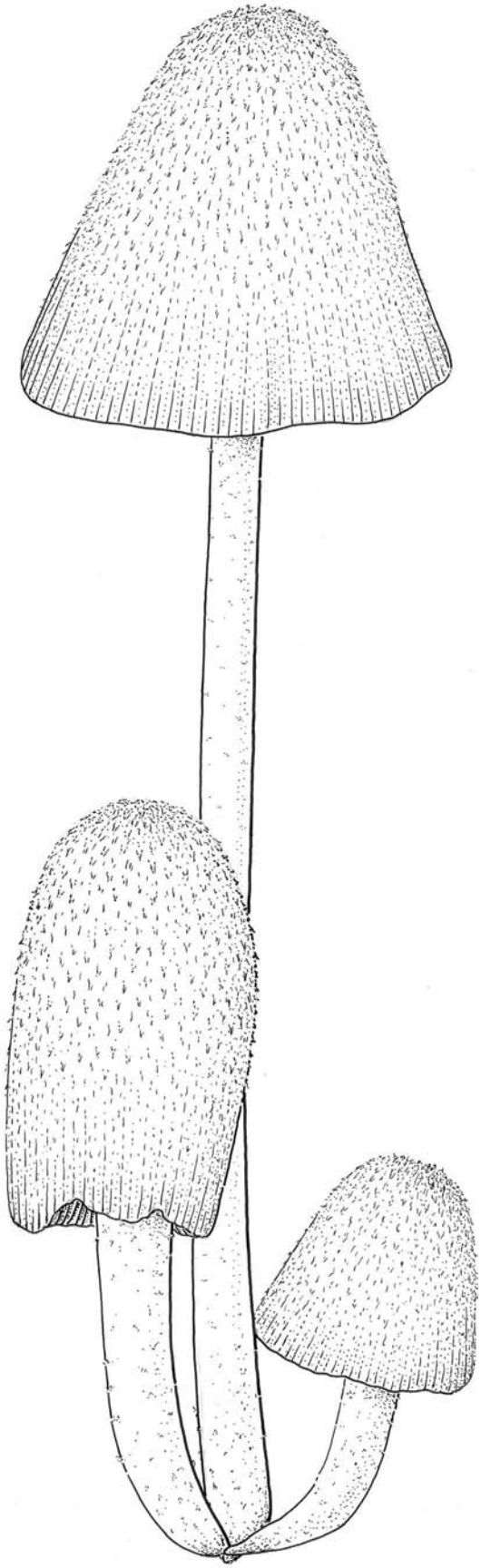


Fig. 52. *Coprinus jonesii*

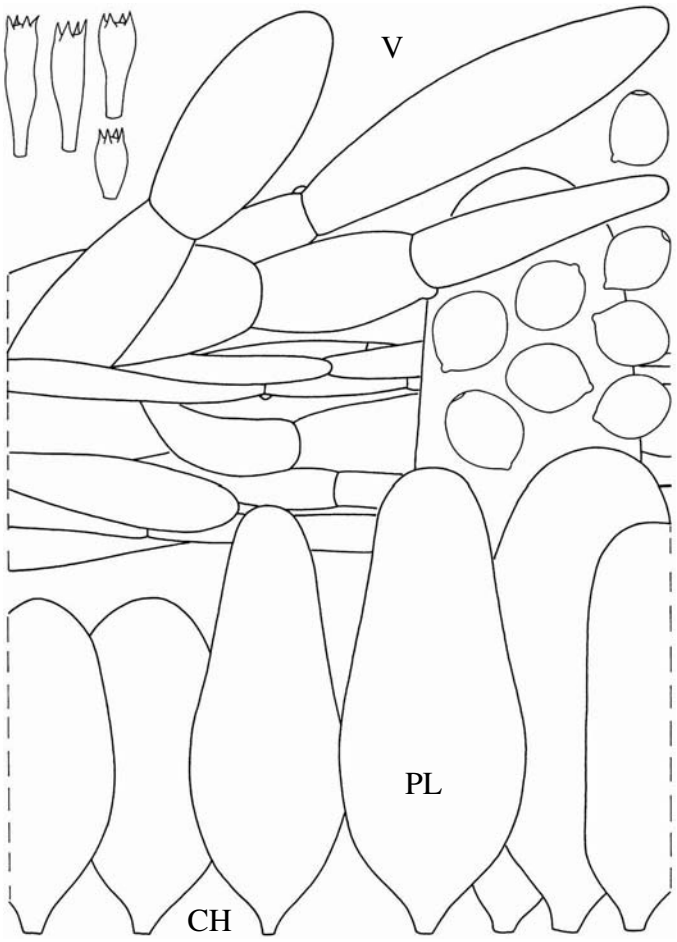


Fig. 53. *Coprinus jonesii*

adpressed or — especially at centre — recurved flocks, the tips becoming brown on drying. Lamellae, L = 55–80, l = 3–7, free, narrow, rather crowded, first white, soon greyish brown to blackish. Stipe 50–130 × 3–10 mm, whitish, somewhat tapering towards apex, up to 13 mm wide at clavate to bulbous base, hollow, hairy flocculose over the whole surface but particularly densely at lower part, becoming glabrous with age.

Spores 6.5–9.5 × 6.0–8.0 µm, Q = 1.05–1.35, av. Q = 1.15–1.30, av. L = 7.2–8.7 µm, av. B = 6.2–7.3 µm, ellipsoid or ovoid, seldom somewhat cylindrical, with rounded base and apex, dark red-brown; germ pore central, 1.4–1.7 µm wide. Basidia 16–40 × 7–9 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 35–85 × 15–50 µm, (sub)globose, ellipsoid to oblong. Pleurocystidia 50–140 × 20–55 µm, subglobose, ellipsoid to oblong, utriform or subcylindrical. Pileipellis a cutis. Veil made up of elongate, sausage-like elements, 50–180 × 15–40 µm, often inflated, usually constricted at septa; terminal cells cylindrical to almost globose. Clamp-connections present, small.

HABITAT & DISTR. — Solitary or fasciculate on burnt places, less frequent on wood-chips or vegetable refuse, heaps of mixed dung, rotten straw, or vegetable refuse, less frequent on pure dung; common in the Netherlands. Jan.-Dec. Widespread all over the world.

The rather large basidiocarps with small spores are characters to identify *Coprinus jonesii*. This species has usually been known under the name *C. lagopides* P. Karst. However, the type collection shows ornamented spores and belongs to *C. phlyctidosporus*. A second collection is conspecific with the taxon described here. As the name *C. lagopides* has consistently been used in a sense that excludes the type, we decided to propose that name for formal rejection.

53. Coprinus geesterani Uljé in Persoonia 14: 565. 1992. – Fig. 54.

Coprinopsis geesterani (Uljé) Redhead, Vilgalys & Moncalvo in Taxon 50: 228. 2001.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 17: 191, fig. 13. 1999.

VERN. NAME — Klein hazenpootje.

Pileus up to 9 × 8 mm when still closed, up to 27 mm when expanded, ellipsoid, cylindrical-ellipsoid, ovoid or (sub)globose, often somewhat conical, white in very young stage, soon becoming grey or grey-brown, the darkest (Mu. 5 YR 2.5/1, 3/2; 10 YR 3/2) at centre of pileus, expanding to campanulate or conical, then to convex or applanate, finally plano-concave with revolute margin, very thin, soon wilting. Veil in primordia smooth, mat, pure white, later grey to grey-brown, covering entire pileus, soon radially splitting into hairy to fibrillose, often pointed and adpressed or, especially at centre, recurved flocks. Lamellae, L= 34–40, l= 0–3, free, narrow, rather crowded, first white, soon grey to blackish. Stipe 15–45 × 1–2 mm, whitish, somewhat tapering towards apex, up to 3 mm wide at clavate to slightly bulbous base, hollow, hairy flocculose over the whole surface but particularly densely at lower part, becoming glabrous with age.

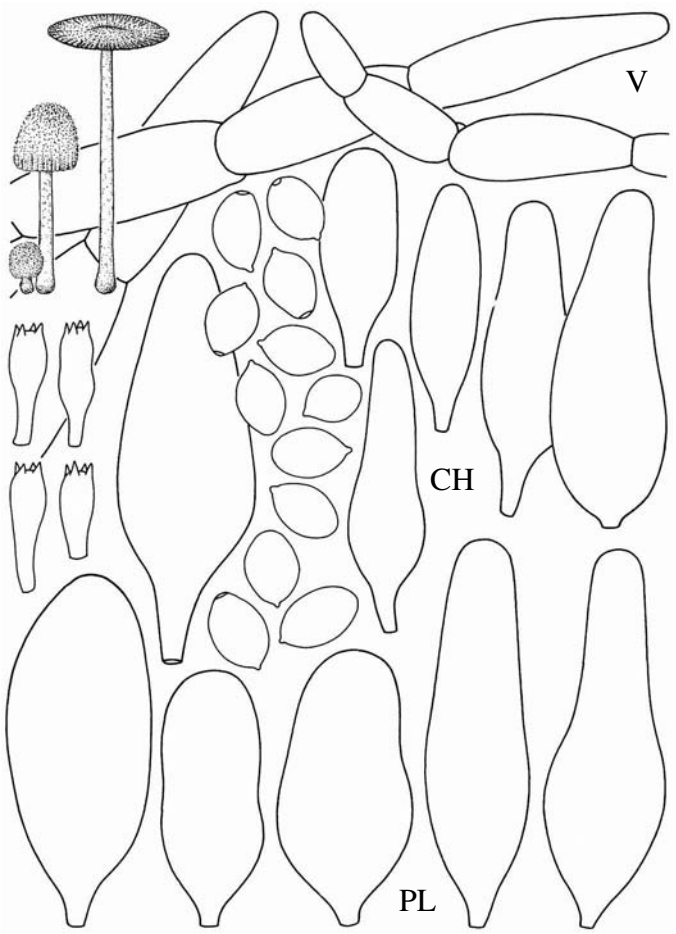


Fig. 54. *Coprinus geesterani*

Spores 5.5–10.5 × 4.5–7.0 µm, Q = 1.15–1.70, av. Q = 1.35–1.45, av. L = 6.6–9.2 µm, av. B = 4.8–6.5 µm, ellipsoid to ovoid tending to mitriform or rhomboid, towards base often slightly conical, dark red-brown; germ pore central, 1.1–1.4 µm wide. Basidia 18–32 × 7–11 µm, 4-spored. Pseudoparaphyses (3)4–5(6) per basidium. Pleurocystidia 70–125 × 22–33 µm, elongate ellipsoid to ovoid, oblong or narrowly fusiform, the latter 7–13 µm wide below apex. Cheilocystidia in very young pileus (sub)globose, then rather elongate and ellipsoid, clavate, narrowly (conico-)utriform or oblong, 25–105 × 12–40 µm, the narrowly utriform ones 7–12 µm in diam. below apex. Pileipellis consisting of short, inflated cells, covered with a thin layer of filamentous hyphae. Veil made up of hyphae consisting of sausage-like cells, 20–150 × 5–40 µm, often somewhat inflated, usually constricted at septa. Clamp-connections present.

HABITAT & DISTR. — Solitary or (sub)fasciculate on soil mixed with pieces of wood, on decaying wood-chips, and on composted vegetable refuse; rather rare. May–Oct. Up to now only known from the Netherlands.

Coprinus geesterani is characterised by small basidiocarps and ellipsoid to ovoid spores tending to mitriform or rhomboid shapes and on the average less than 10 µm long. Except for the size of the basidiocarps species in subsection *Lanatuli* are macroscopically very similar. Therefore, microscopical characters are the most important for identification. In *C. geesterani* the size and the shape of the spores are very useful. Small spores with an average length less than 10 µm are also found in *C. pseudoradiatus* and *C. jonesii*. *Coprinus pseudoradiatus*, however, has predominantly ellipsoid with rather parallel sides spores, with a rounded, never somewhat conical base, much shorter cystidia, somewhat smaller basidiocaprs, and it grows on dung. *Coprinus jonesii* has spores that are similar in shape and size to those of *C. geesterani* (although usually slightly broader), but that species has much larger basidiocarps and grows in general gregariously on burnt ground.

54. Coprinus cinereus (Schaeff. :Fr.) S.F. Gray, Nat. Arr. Br. Pl. 1: 634. 1821. – Fig. 55.

Agaricus cinereus Schaeff., Fung. Bavariae 4: 43. 1774; *Agaricus cinereus* Schaeff. :Fr., Syst. mycol. 1: 310. 1821; *Coprinopsis cinerea* (Schaeff. :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 227. 2001.

MISSAPL. — *Coprinus fimetarius* sensu M. Lange, Paddestoelengids: 136. 1964.

SEL. ICON. — Allen & Young in Mycologist 7: 74. 1993; Courtec. & Duhem, Guide Champ. Fr. Eur.: 779. 1994; Imaz. et al., Fungi Japan: 203. 1988; Jamoni in Funghi Amb. 47: 38. 1988; M. Lange, Paddestoelengids: 137. 1964 (as *C. fimetarius*); Rocabruna in Bolets Catalunya 2: 64. 1983.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 17: 174, fig. 4. 1999.

VERN. NAME — Wortelende inktzwam.

Pileus up to 20 × 15 mm when still closed, up to c. 30 mm when expanded, first ellipsoid, cylindrical-ellipsoid, grey-brown (Mu. 10 YR 6/3) at centre beneath the whitish to silvery grey veil, paler towards margin (10 YR 7/3 half-way pileus), expanding to conical, then to convex or applanate, finally plano-concave with revolute margin. Veil in primordia smooth, mat, pure white, later grey to grey-brown (10 YR 7/3), covering entire pileus, soon radially splitting up into hairy to fibrillose, often pointed and appressed or, especially at centre, recurved flocks, the tips becoming brown on drying. Lamellae, L = 45–60, l = 3–7, free, narrow, rather crowded, first white, soon greyish brown to blackish. Stipe 50–100 × 2–6 mm, whitish, somewhat tapering towards

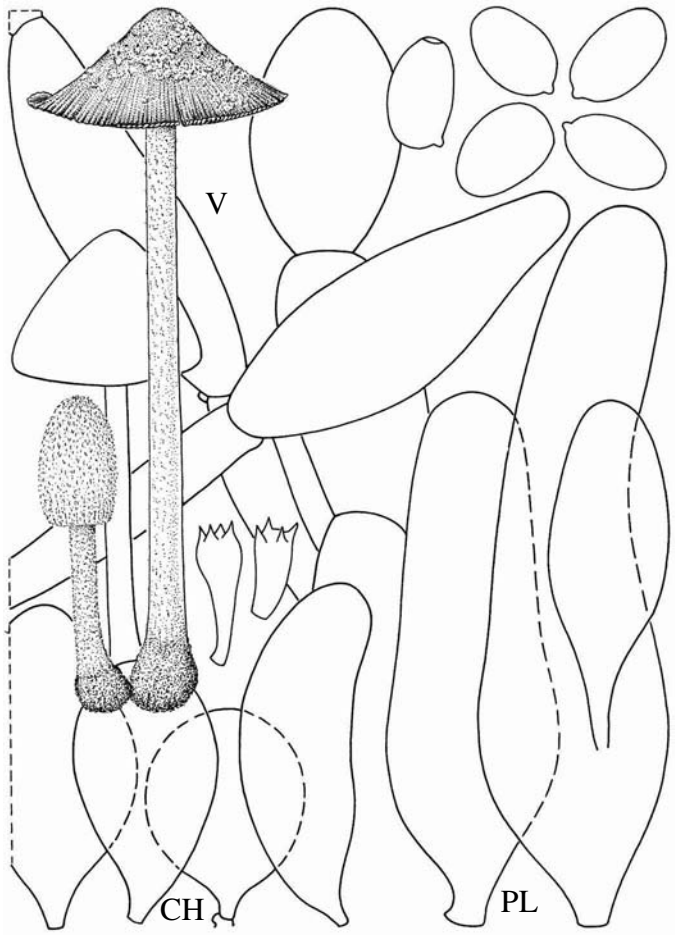


Fig. 55. *Coprinus cinereus*

flocculose, more dense at lower part, becoming glabrous with age; base clavate and often somewhat rooting.

Spores 8.5–12.0 × 6.0–8.0 µm; Q = 1.25–1.65, av. Q = 1.35–1.55; av. L = 9.0–10.6 µm, av. B = 6.1–7.0 µm, ellipsoid or ovoid, seldom somewhat cylindrical, with rounded base and apex, dark red-brown, and central, 1.3–1.5 µm wide germ pore. Basidia 15–36 × 7–11 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 35–85 × 15–50 µm, (sub)globose, ellipsoid to oblong. Pleurocystidia 50–140 × 20–55 µm, subglobose, ellipsoid to oblong, utriform or subcylindrical. Pileipellis a cutis, made up of cylindrical to inflated, more or less parallel, repent hyphae, 20–150 × 3–30 µm. Veil made up of elongate, sausage-like elements, (20)40–250(450) × 8–40(50) µm, often inflated, usually constricted at septa; terminal elements cylindrical to almost globose. Clamp-connections present.

HABITAT & DISTR. — Solitary or fasciculate on heaps of mixed dung, rotten straw, or vegetable refuse; common in the Netherlands. Jan.–Dec. Widespread all over the world.

The size and shape of the spores are the most significant characters to identify *C. cinereus*. The spores are relatively broad with regard to the length. *Coprinus lagopus* has more oblong spores, usually up to 13 µm in length with a quotient > 1.6 and it usually grows terrestrially; *C. macrocephalus* has larger spores, up to 16 × 9.5 µm.

Coprinus cinereus is widely used as a model species in fungal genetic studies.

55. Coprinus macrocephalus (Berk.) Berk., Outl. Brit. Fungol.: 180. 1860. – Fig. 56.

Agaricus macrocephalus Berk. in Hooker's Brit. Fl. 5: 122. 1836, non *A. macrocephalus* Schum. 1803; *Coprinopsis macrocephala* (Berk. Berk.) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001.

SEL. ICON. — Cetto, Funghi Vero 6, Ed. 1: pl. 2173. 1989; Krieglsteiner et al. in Z. Mykol. 45: opposite 73. 1992; R. Phillips, Mushr. other Fungi: 176. 1981.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 17: 187–189, fig. 11. 1999.

VERN. NAME — Stromesthazenpoot.

Pileus up to 30 × 18 mm when still closed, up to 40 mm when expanded, first ellipsoid or cylindrical-ellipsoid, pale grey-brown to dark grey-brown at centre beneath the whitish to silvery grey veil, paler to margin, expanding to conical, then to convex or applanate, finally plano-concave with revolute margin. Veil pale grey, silvery grey or grey-brown, covering entire pileus, splitting up into hairy to fibrillose, often pointed and adpressed or recurved flocks, the tips becoming brown on drying. Lamellae, L = 60, l = 3–7, free, narrow, rather crowded, first white, soon greyish brown to blackish. Stipe 50–150 × 2–6(8) mm, whitish, somewhat tapering towards apex, up to 8(10) mm wide at clavate to bulbous base, hollow, hairy flocculose over the whole surface but particularly densely at lower part, becoming glabrous with age. Base sometimes somewhat rooting.

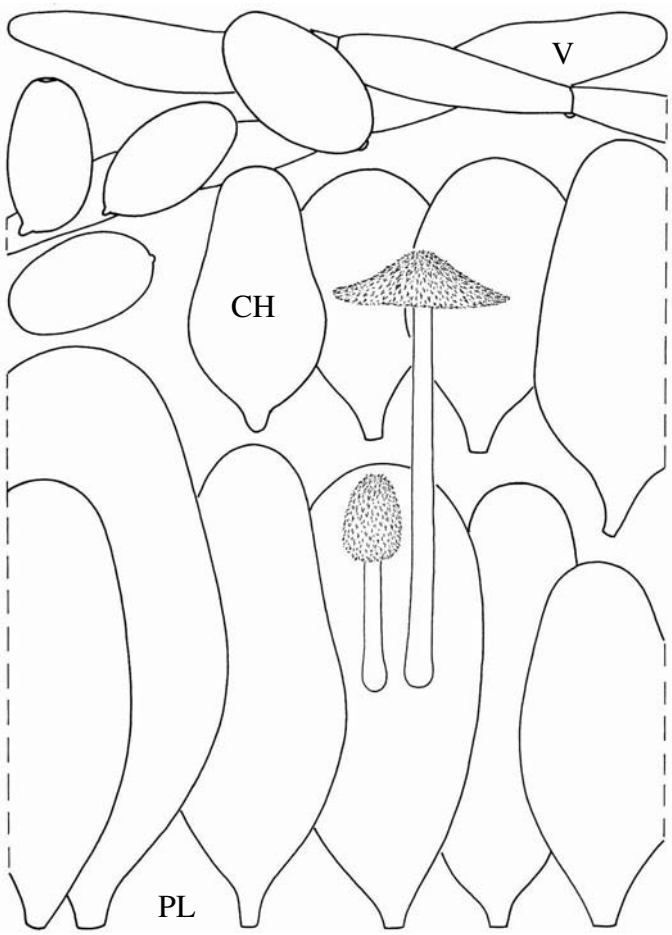


Fig. 56. *Coprinus macrocephalus*

Spores 12.0–17.0 × 8.0–10.0 µm; Q = 1.45–1.90, av. Q = 1.30–1.70; av. L = 13.0–14.9 µm, av. B = 8.2–9.3 µm, ellipsoid or ovoid, seldom somewhat cylindrical, with rounded base and apex, dark red-brown; germ pore central, 2 µm wide. Basidia 16–36 × 9–11 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 50–120 × 20–50 µm, utriform, ellipsoid or oblong. Pileipellis a cutis. Pleurocystidia 70–150 × 20–60 µm, utriform, ellipsoid, oblong or subcylindrical. Veil made up of elongate, sausage-like elements, 40–180 × 10–35 µm, often inflated, usually constricted at septa; terminal cells oblong or fusiform. Clamp-connections present.

HABITAT & DISTR. — Solitary or fasciculate, saprotrophic on dung, or dung mixed with decaying hay or vegetable refuse; not uncommon in the Netherlands. July–Dec. Widespread in Europe.

Coprinus macrocephalus is close to *C. lagopus* but differs in habitat on dung or mixed dung and rotten hay and the broader spores.

56. Coprinus lagopus (Fr. :Fr.) Fr., Epicrisis: 250. 1838.

Agaricus lagopus Fr. :Fr., Syst. mycol. 1: 312. 1821; *Coprinopsis lagopus* (Fr. :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001.

KEY TO THE VARIETIES

1. Stipe rather firm, upright; usually on wood-chips and vegetable-refuse, less frequent in lawns; stipe wall up to 450 µm thick 56a. var. **lagopus**.
1. Stipe very fragile, bending down before pileus expands; exclusively in lawns; stipe wall < 250 µm thick . . . . . .56b. var. **vacillans**.

56a. var. **lagopus** – Fig. 57.

SEL. ICON. — Cetto, Funghi Vero 5, Ed. 1: pl. 1722. 1987; R. Phillips, Paddest. Schimm.: 179. 1981; M. Tabarés, Bolets de Catalunya 18: pl. 858. 1999

SEL. DESCR. & FIGS. — P.D. Orton & Watl., Br. Fung. Fl. 2: 43. 1979; Uljé & Noordel. in Persoonia 17: 181, fig. 8. 1999.

VERN. NAME — Gewoon hazenpootje.

Pileus up to 35 × 20 mm when still closed, up to 50 mm when expanded, first ellipsoid, cylindrical-ellipsoid, pale to very dark grey-brown at centre beneath the whitish to silvery grey veil, paler to margin, expanding to conical, then to convex or applanate, finally plano-concave with revolute margin. Veil first whitish, then silvery grey or pale grey to grey-brown, covering entire pileus, splitting up into hairy to fibrillose, often pointed and adpressed or — especially at centre — recurved flocks, the tips becoming brown on drying. Lamellae, L = 60, l = 3–7, free, narrow, rather crowded, first white, soon greyish brown to blackish. Stipe 50–100 × 2–5 mm, whitish, somewhat tapering towards apex, up to 8 mm wide at clavate to bulbous base, hollow, hairy flocculose over the whole surface but particularly densely at lower part, becoming glabrous with age.

Spores 10.0–14.0 × 6.0–8.5 µm, Q = 1.40–1.95, av. Q = 1.55–1.80, av. L = 11.3–14.2 µm, av. B = 6.8–7.8 µm, ellipsoid or ovoid, with rounded base and apex, dark red-brown; germ pore central, 1.6–2.0 µm wide. Basidia 16–42 × 8–12 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 50–100 × 18–40 µm, ellipsoid to oblong or subutriform. Pleurocystidia 70–150 × 20–60 µm, ellipsoid to oblong, utriform or subcylindrical. Pileipellis a cutis. Veil made up of elongate, sausage-like elements, 40–140(180) × 10–40 µm, often inflated, usually constricted at septa; terminal cells ellipsoid, ovoid or fusiform. Clamp-connections present.

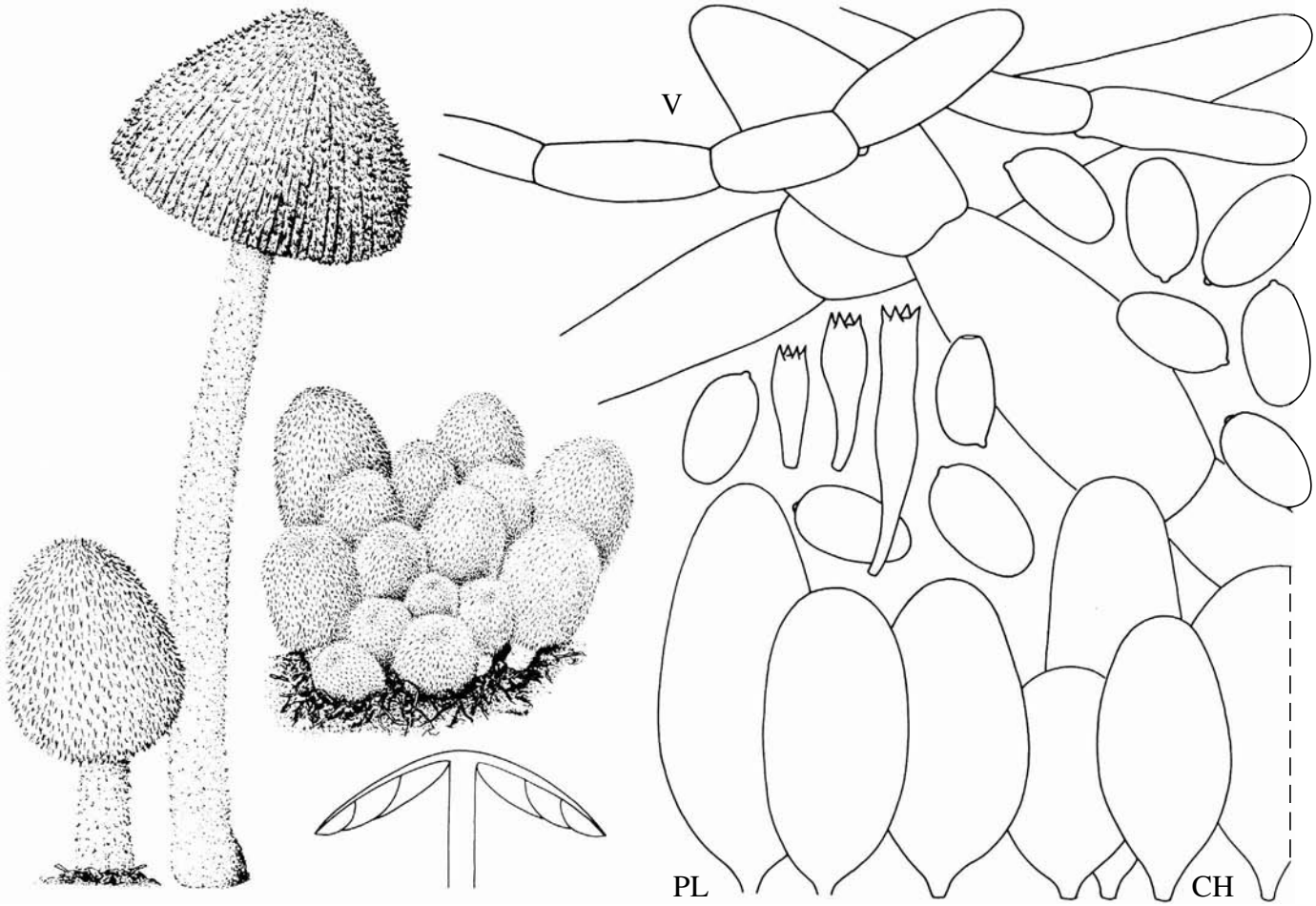


Fig. 57. *Coprinus lagopus* var. *lagopus*

HABITAT & DISTR. — Solitary or fasciculate, on wood-chips, compost heaps, or vegetable refuse; common in the Netherlands. Jan.–Dec. Widespread all over the world.

In greenhouses a very similar taxon occurs, but it differs in the larger spores, as long as in *C. macrocephalus* (14–16 µm long), but distinct narrower than in that species.

Ko et al. (in Mycol. Res. 105: 1519–1526. 2001) showed that there are molecular differences in collections from different geographical regions of the world.

56b. var. **vacillans** Uljé in Uljé et al. in Persoonia 17: 468. 2000. – Fig. 58.

SEL. DESCR. & FIGS. – Uljé in Uljé et al. in Persoonia 17: 468, fig. 2. 2000.

VERN. NAME — Slapjanus.

CHARACTERISTICS — Basidiocarps very fragile; Pileus up to 18 × 8 mm when still closed, up to 32 mm when expanded, first whitish, soon grey with cream or pale ochre centre below a pure white, hairy-floccose veil that splits up in hairy flocks and, as well as the pileus, very soon disappears. Lamellae, L = c. 35–45, l = 0–3, crowded, free, at first white, soon grey to black. Stipe 60–150 × 1–3 mm, pure white, at first densely covered with bristly, hairy-floccose veil, hollow, very fragile and soon laying down; base up to 4 mm wide, clavate. Spores 9.5–14.0 × 6.5–8.5 µm; Q = 1.35–2.05, av. Q = 1.55–1.80; av. L = 10.7–12.5 µm, av. B = 6.7–7.9 µm, ellipsoid or ovoid, less frequently oblong, medium-brown, sometimes very dark red-brown, with rounded base and apex, and c. 2 µm wide, central germ pore. Cortex of the stipe l30–240 µm thick.

HABITAT & DISTR. — Solitary, seldom subfasciculate, in short-mown lawns; rather common in the Netherlands, and recorded from Alphen aan den Rijn and Zoetermeer, and several other localities. June–Sept.

The very fragile basidiocarps, the habitat, the usually somewhat less slender spores (often slightly wider than broad), and the thin wall of the stipe are the main characters to distinguish var. *vacillans* from the typical variety.

It is difficult to collect young basidiocarps in the field by reason of the very rapid developing and wilting of the pileus. Although the pure (silvery) white stipe is very fragile, it does not disappear as quickly as the pileus, and stipes can be found, often in great number, lying on the ground with a black, snotty remnant of the pileus at their extremities. The stipe bends down as soon as it starts to grow, even while the pileus is still closed. Microscopically the wall of the stipe is often thinner than 200 µm, though sometimes reaching 240 µm, whereas in *C. lagopus* var. *lagopus* it usually lies between 200 and 450 µm.

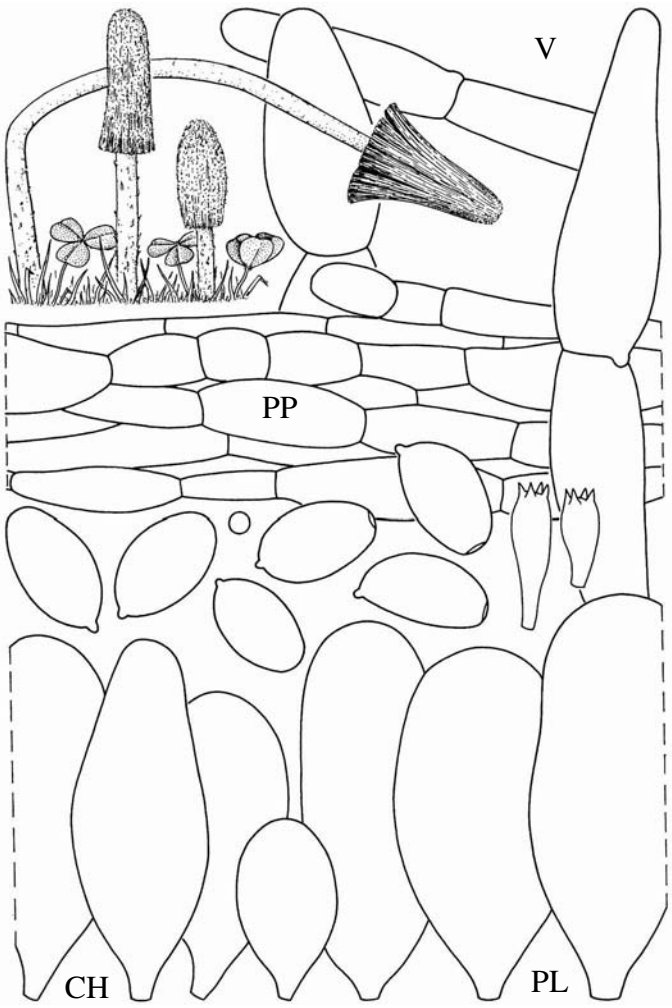


Fig. 58. *Coprinus lagopus* var. *vaccillans*

57. Coprinus radiatus (Bolt. :Fr.) S.F. Gray, Nat. Arr. Br. Pl. 1: 635. 1821. – Fig. 59.

Agaricus radiatus Bolt., Hist. Fung. Halifax 1: 39. 1788; *Agaricus radiatus* Bolt. :Fr., Syst. mycol. 1: 313. 1821; *Coprinopsis radiata* (Bolt. :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001.

SEL. ICON. — Cetto, Funghi Vero 3, Ed. 1: pl. 876. 1979; M. Lange, Paddestoelengids: 139. 1964.

SEL. DESCR. & FIGS. — Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 60: 23. 1944; P.D. Orton & Watl. in Br. Fung. Fl. 2: 43. 1979; Uljé & Noordel. in Persoonia 17: 175. 1999.

VERN. NAME — Pelsinktzwam.

Pileus up to 10 × 6 mm when still closed, up to 15 mm when expanded, first ellipsoid, cylindrical-ellipsoid, grey-brown at centre beneath the whitish to silvery grey veil, paler towards margin, expanding to conical, then to convex or applanate, finally plano-concave with revolute margin. Veil whitish to pale (silvery) grey, radially splitting up into hairy to fibrillose, often pointed and appressed or — especially at centre — recurved flocks, the tips becoming brown on drying. Lamellae, L = 35, l = 1–5, free, narrow, rather crowded, first white, soon greyish brown to blackish. Stipe 20–50 × 0.5–1.5 mm, whitish, somewhat tapering towards apex, up to 2 mm wide at clavate base, hollow, minutely hairy flocculose, more dense at lower part, becoming glabrous with age; base clavate and often somewhat rooting.

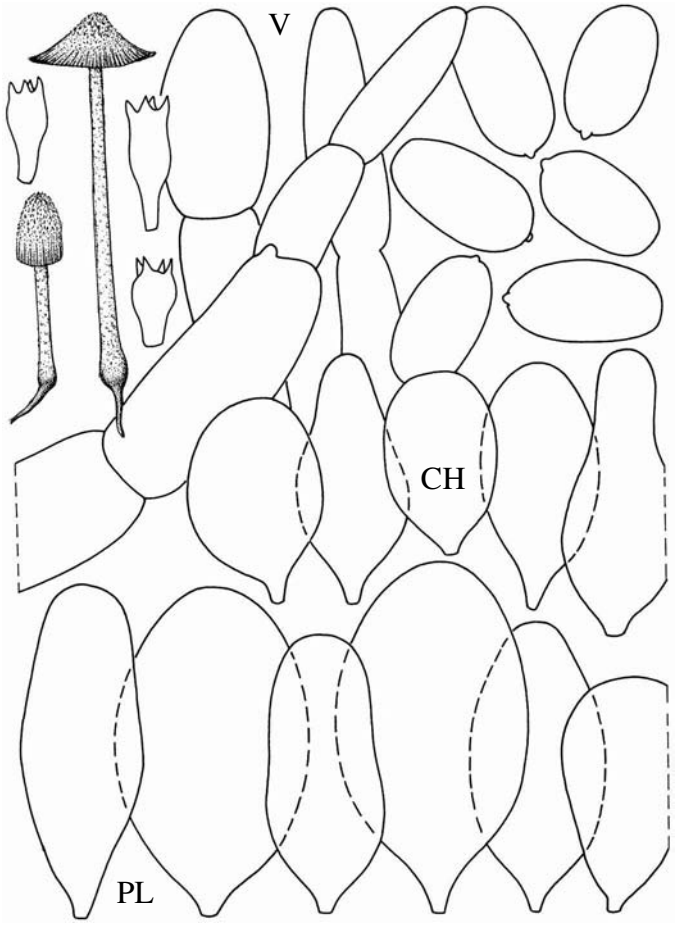


Fig. 59. *Coprinus radiatus*

Spores 13.5–15.0 × 7.5–8.5 µm; Q = 1.65–1.90, av. Q = 1.75–1.80; av. L = 14.2–14.6 µm, av. B = 7.8–8.0 µm, ellipsoid with +/- parallel sides, with rounded base and apex, very dark red-brown to almost black, and central, 1.5–1.8 µm wide germ pore. Basidia 20–36 × 9–11.5 µm, 4-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 35–80 × 15–40 µm, (sub)globose, ellipsoid to oblong or (sub)utriform. Pleurocystidia 50–100 × 20–45 µm, ellipsoid to oblong, utriform or subcylindrical. Pileipellis a cutis, made up of cylindrical or fusiform, more or less parallel, repent hyphae, up to 150 µ long and 3–30 230 µm wide. Veil made up of elongate, sausage-like elements, 30–250 × 8–25(30) µm, often inflated, usually constricted at septa; terminal elements cylindrical to almost globose. Clamp-connections present.

HABITAT & DISTR. — Solitary in groups or subfasciculate on heaps of mixed dung or on pure dung; not uncommon, widespread in the Netherlands. Rather rare but widespread in Europe. Jan.–Dec.

Coprinus radiatus can be recognised by the rather narrow spores with a length of 13–15 µm, ellipsoid with +/- parallel sides in frontal view, and the habitat on dung.

58. Coprinus bicornis Uljé & Horvers in Persoonia 17: 170. 1999. – Fig. 60.

Coprinopsis bicornis (Uljé & Horvers) Redhead, Vilgalys & Moncalvo in Taxon 50: 227. 2001.

SEL. ICON. — Uljé & Horvers in Persoonia 17: pl. 11, 12. 1999.

SEL. DESCR. & FIGS. — Uljé & Horvers in Persoonia 17: 170–172, fig. 2. 1999.

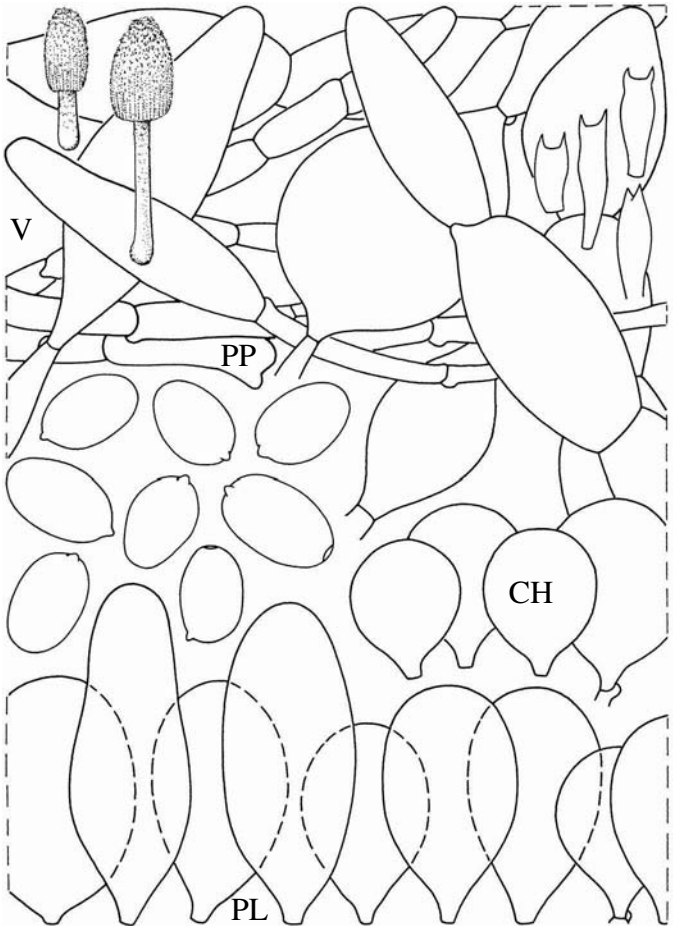


Fig. 60. *Coprinus bicornis*

VERN. NAME — Tweesporig mesthazenpootje.

Pileus up to 8 × 5 mm when still closed, up to 15 mm when expanded, ellipsoid, cylindrical-ellipsoid, often somewhat conical, white in very young stage, soon becoming somewhat grey or grey-brown at centre of pileus, expanding to campanulate or conical, then to convex or applanate, finally plano-concave with revolute margin, very thin. Veil in primordia smooth, mat, pure white, later greyish to grey-brown, covering entire pileus, soon radially splitting into hairy to fibrillose, often pointed and appressed or — especially at centre — recurved flocks. Lamellae, L = 16, l = 0–3, free, narrow, rather crowded, first white, soon grey-brown to blackish. Stipe 30–50 × 1–1.5 mm, whitish, somewhat tapering towards apex, up to 2 mm wide at clavate to slightly bulbous base, hollow, hairy flocculose but particularly densely at lowest part, becoming glabrous with age.

Spores 9.0–12.5 × 6.0–8.5 µm; Q = 1.40–1.85, av. Q = 1.50–1.75; av. L = 10.8–11.7 µm, av. B = 6.4–7.4 µm, oblong or ovoid, more or less cylindrical with rounded base and apex, dark red-brown, and central, 1–1.3 µm wide germ pore (difficult to observe). Basidia 14–36 × 7–10 µm, 2-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–80 × 20–35 µm, (sub)globose or ellipsoid, a few subutriform. Pleurocystidia 40–80 × 20–40 µm, oblong, ellipsoid, ovoid or subutriform. Pileipellis consisting of short, inflated elements, 20–100 × 4–20 µm. Veil made up of cylindrical or fusiform elements, usually inflated, incrusted and constricted at septa, 25–100 × 5–40 µm, the elements in part strongly swollen, fusiform, ellipsoid or even subglobose and up to 60(70) µm thick. Clamp-connections present.

HABITAT & DISTR. — Solitary or (sub)fasciculate on dung of cow and horse; very rare in the Netherlands, known from two localities only (Tilburg, Wassenaar). Oct.–Nov. Not yet recorded from elsewhere in Europe.

Coprinus bicornis can be recognised by the 2-spored basidia, the in part ellipsoid or subglobose elements in the veil, and the habitat on dung.

59. Coprinus ammophilae Courtecuisse in Doc. mycol. 18 (72): 76. 1988. – Fig. 61.

Coprinopsis ammophilae (Courtecuisse) Redhead, Vilgalys & Moncalvo in Taxon 50: 226. 2001.

SEL. DESCR. & FIGS. —Uljé & Noordel. in Persoonia 17: 168, fig. 1. 1999.

VERN. NAME — Helminktzwam.

Pileus 5–15 × 3–13 mm when still closed, expanded up to 25 mm in diam., first ellipsoid or (broadly) ovoid, entirely covered with sordid white to pale greyish, hairy floccose veil, then campanulate to (plano) convex, grey-brown or greyish beige (first Mu. 10 YR 4/3, then between 6/3 and 6/4 with darker centre: 5/4; clefts pale pure grey), strongly sulcate-striate; expanding pileus near margin with copious flocks of whitish, fibrillose veil, towards centre with numerous, strikingly

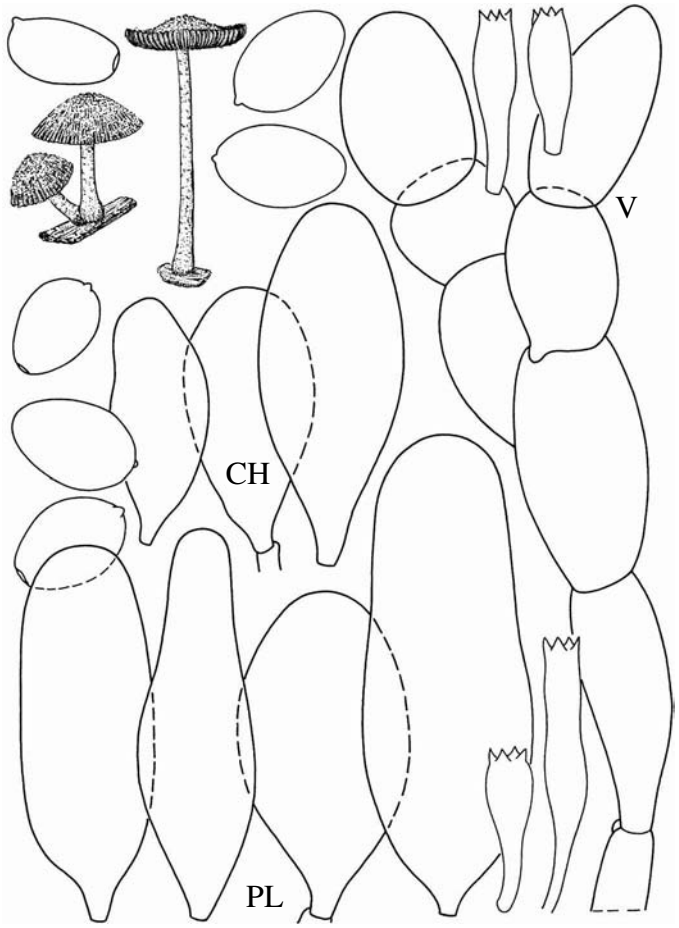


Fig. 61. *Coprinus ammophilae*

reflexed, squamulose scales of veil, whitish, with pale ochre tips. Lamellae, L = 24–50, l = 0–1, free, up to 4.5 mm wide, crowded, first whitish, then dark reddish brown with conspicuous white edge, finally black. Stipe up to 35 × 1.5–4 mm, usually short and solid, white, hollow, hairy floccose, slightly broadening towards not or slightly bulbous base.

Spores 8.5–12.5 × 6.0–9.5(10.5) × 6.0–8.0 µm; Q = 1.20–1.75, av. Q = 1.30–1.55; av. L = 10.0–11.3 µm, av. B = 7.2–8.1 µm, av. W = 7.1 µm, (broadly) ellipsoid or ovoid with rounded base and apex, dark red-brown, and central, 1.3 µm wide germ pore. Basidia 24–65 × 7–12 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 20–100 × 15–32(40) µm, oblong, (sub)globose, ellipsoid, ovoid, broadly subcylindrical or slightly utriform. Pleurocystidia 55–115 × 20–42 µm, oblong, ellipsoid, subglobose or (sub)cylindrical. Pileipellis made up of inflated, sausage-shaped elements, 20–100 × 4–30 µm. Veil made up of long chains of inflated, cylindrical, oblong to ellipsoid elements, 25–100 × 5–40 µm. Clamp-connections present.

HABITAT & DISTR. — Subfasciculate on dead leaves of *Ammophila arenaria* in yellow dunes; very rare in the Netherlands, known from two localities (Rottumeroog, Goedereede). Oct.–Nov. Also known from the French coast.

The small basidiocarps with remarkably short stipe, the rather broad spores with regard to their length, and the habitat on *Ammophila arenaria* are characters to identify *C. ammophilae*.

60. Coprinus spelaiophilus Bas & Uljé in Persoonia 17: 179. 1999. – Fig. 62.

Coprinopsis spelaiophila (Bas & Uljé) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001.

MISSAPL. — *Coprinus extinctorius* sensu Romagn. in Rev. Mycol. 6: 112. 1941; sensu Kühn. & Romagn., Fl. anal. Champ. sup.: 387. 1953; sensu Mos., Röhrlinge Blätterpilze, 5. Aufl.: 256. 1983; sensu P.D. Orton & Watl. in Br. Fung. Fl. 2: 39. 1979

SEL. ICON. — Cetto, Funghi Vero 6, Ed. 1: pl. 2175. 1989 (as *C. extinctorius*); Moreno et al., Guia Incafo Hongos Penins. Iberica I + II: 304. 1986 (as *C. extinctorius*).

VERN. NAME — Ivoorinktzwam.

Pileus up to 25 × 20 mm and ellipsoid to cylindrical-ellipsoid when still closed, up to 35 mm wide when expanded, white to isabelline or pale ochraceous, becoming grey-brown with isabelline to ochre centre, radially sulcate up to centre; finally plano-concave with revolute margin, with veil in primordia smooth, mat, pure white to greyish, covering pileus entirely, but soon breaking up into scattered small, flocculose, fibrillose squamules with tips sometimes recurving and brownish. Lamellae, L = 45–60, l = 3–7, free, narrow, rather crowded, first white, soon greyish brown to blackish. Stipe 50–100 × 2–5 mm, whitish, somewhat tapering towards apex, up to 8 mm wide at clavate to bulbous base, hollow, hairy flocculose, and more densely so towards lower part, becoming glabrous with age. Context rather firm and somewhat tough.

Spores 8.0–11.5 × 6.5–8.0 × 5.0–7.0 µm; Q = 1.20–1.50, av. Q = 1.35–1.40; av. L = 9.2–10.4 µm, av. B = 6.5–7.6 µ, av. W = 5.7–6.9 µm, very broadly fusiform or rhomboid-ellipsoid, sometimes somewhat amygdaliform, with (sub)conical or rounded base and slightly truncate apex, and central, 1.5–1.8 µm wide germ pore, dark red-brown. Basidia 18–38 × 8–10 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 50–140 × 25–50 µm, utriform, oblong or subcylindrical. Pileipellis a cutis, made up of more or less parallel, repent hyphae, consisting of cylindrical to fusiform elements, 40–100 × 3–25 µm. Pleurocystidia 70–150 × 25–60 µm, subglobose, ellipsoid to oblong, utriform or subcylindrical. Veil made up of elongate, sausage-like elements, 25–150 × 10–40 µm, often inflated, constricted at septa; terminal elements ellipsoid, oblong or fusiform. Clamp-connections present.

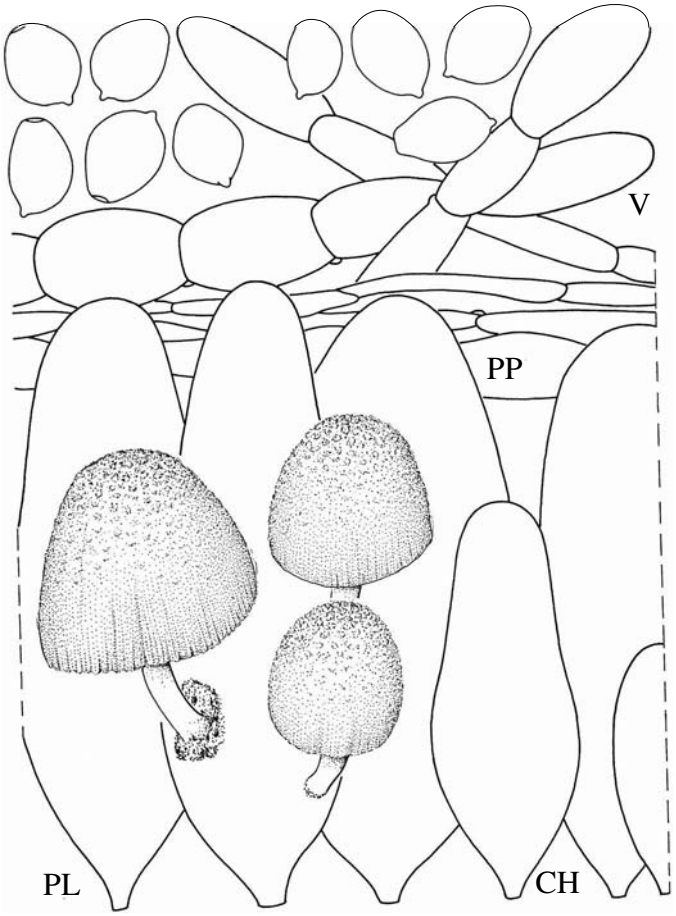


Fig. 62. *Coprinus spelaiophilus*

HABITAT & DISTR. — Solitary or subfasciculate on wood, often in wounds of living, deciduous trees; very rare, in the Netherlands only known from a few localities in the western and central parts of the country (Wageningen, Amsterdam, Wassenaar, Vogelenzang). June–Oct. In Europe furthermore recorded from England, France, Germany, Spain, Italy, and Turkey.

Macroscopically *C. spelaiophilus* is a *C. domesticus*-like fungus, but belonging to subsection *Lanatuli* on account of the structure of the veil, which consists of chains of inflated, thin-walled hyphal elements. It can be recognised by the *C. domesticus*-like appearance, the initially white to isabelline colours of the pileus, the fairly firm context, the Lanatuli-like structure of the veil, the very broad, fusiform, 8–11 µm long spores and the habitat, viz. often growing in cavities of the trunk of living, deciduous trees.

61. Coprinus candidolanatus Doveri & Uljé in Uljé et al. in Persoonia 17: 465. 2000. – Fig. 63.

SEL. DESCR. & FIGS. — Doveri & Uljé in Uljé et al. in Persoonia 17: 465–466, fig. 1. 2000.

VERN. NAME — Wit hazenpootje.

Pileus 3–6 × 2–4 mm when still closed, 6–12 mm when expanded, ovoid to ellipsoid, expanding to applanate, whitish in early stages, later

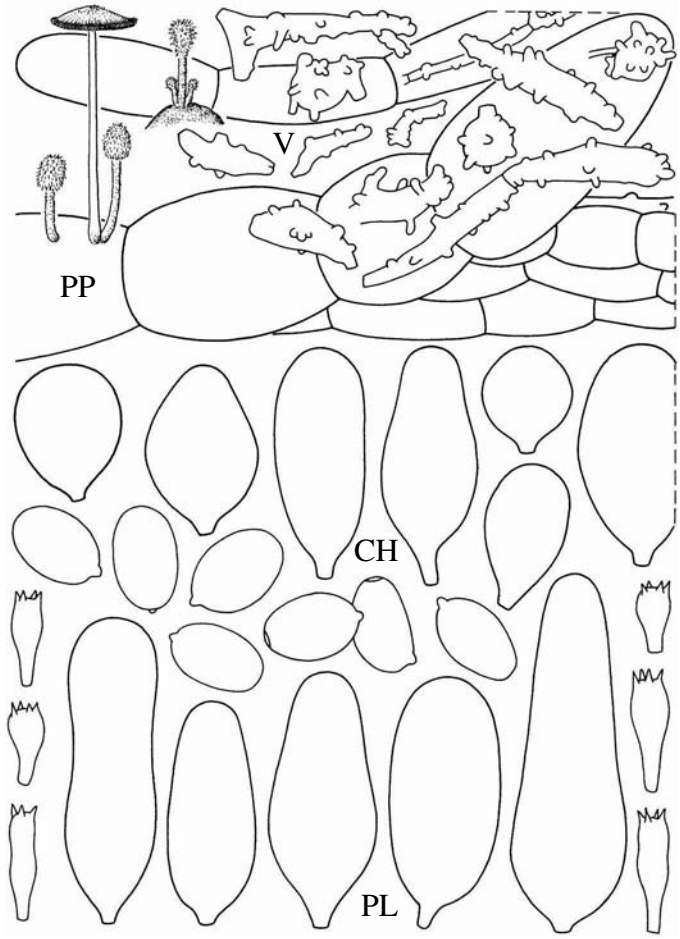


Fig. 63. *Coprinus candidolanatus*

on greyish with pale ochre to brown disc, slightly grooved up to the centre, fully covered with a fibrous-woolly, snow-white veil, which appears crowded at the disc but at the periphery splits up in separate fibrils, which are slightly upturned at their ends. Lamellae, L = 14–22, l = 0–3, ascending, free, narrow, rather crowded, white then blackening, with a pale edge. Stipe 20–60 × 0.8–1.2 mm, cylindrical-filiform, often wavy, slightly narrowed near the base but without a true pseudorhiza, snow-white, at first covered with many veil fibrils, later on smooth. Context inconspicuous, devoid of particular smell and taste.

Spores 7.5–10.5 × 5.0–7.0 µm; Q = 1.25–1.75; av. Q = 1.45–1.55; av. L = 8.7–9.6 µm, av. B = 5.8–6.5 µm, ellipsoid or ovoid, exceptionally subcylindrical in frontal view, sometimes slightly flattened at one side in side view, rounded at the base and apex, smooth, dark reddish brown in water, with central, 1.3–1.5 µm wide germ pore. Basidia 18–34 × 7–10 µm, 4-spored, trimorphous: 1) claviform, 2) spheropedunculate, and 3) subcylindrical with a distinct median narrowing (the longest ones). Each basidium surrounded by (3)4–5(6) pseudoparaphyses. Cheilocystidia 22–70 × 17–30 µm, abundant, (sub)globose, ovoid, ellipsoid, oblong or (sub)utriform, with a short basal peduncle. Pleurocystidia 40–90 × 18–30 µm, ellipsoid, ovoid, oblong, (sub)utriform or subcylindrical, with a short basal peduncle. Pileipellis a cutis, made up of cylindrical, ellipsoid or subglobose, parallel, 10–60 long and 10–25 µm wide elements. Veil hyphal in form of hardly separable chains of cylindrical, ellipsoid or even subglobose elements, mainly thin-walled and hyaline, sometimes slightly thick-walled (walls up to 0.5 µm thick), in part rather strong yellowish encrusted, 25–150(250) × 15–45(60) µm, not diverticulate, very rarely branched, with subglobose, ellipsoid, subcylindrical or fusoid terminal elements; mixed with much narrower, 2–10(15) µm wide elements, not arranged in chains, easily separable from each other, thin-walled, densely diverticulate, with up to 10 µm long, finger-like diverticula. Veil on the stipe mainly diverticulate with up to 17 µm long diverticulae, sometimes branched, but often also with remnants of typical Lanatuli-veil. Clamp-connections absent.

HABITAT & DISTR. — Solitary or subfasciculate, on pure dung of deer and sheep. Apr.–Aug. Very rare, only known from one locality in the Netherlands (Bemelen) and one in Italy.

The two kinds of veil elements, the small basidiocarps, the habitat on dung, the rather broad spores with an average quotient of 1.45–1.55, and the absence of clamp-connections are the main characters to recognise *C. candidolanatus*. *Coprinus pseudoradiatus* and *C. cinereus* are other two coprophilous species with up to 11 µm long spores, but the former has narrower spores with an average quotient > 1.6, while the latter possesses larger basidiocarps. Moreover, both species are provided with clamp-connections and only one kind of veil, that is to say with chains of sausage-shaped, non-diverticulate elements.

Subsect. **Alachuani** Sing.

Veil breaking up in small, felty or hairy flocks, made up of weakly to strongly diverticulate, and then often thick-walled elements.

62. Coprinus xenobius P.D. Orton in Notes R. bot. Gdn Edinb. 35: 148. 1976. – Fig. 64.

Coprinopsis xenobia (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 232. 2001.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 273, fig. 1. 1997.

VERN. NAME — Withaarinktzwam.

Pileus 2–7(14) × 2–4(8) mm when still closed, subglobose, ellipsoid or ovoid, white, often with clay-coloured or grey-cream centre; expanded pileus up to 8(20) mm, greyish; veil radial hairy-floccose, whitish. Lamellae crowded, free, first whitish, then clay-coloured or greyish, finally violaceous black. Stipe up to 40 × 0.3–2(2.5) mm, whitish, watery white, very fine floccose, more dense at base.

Spores 9.5–14.5 × 5.0–8.0 µm, Q = 1.60–2.15, av. Q = 1.80–1.95, av. L = 10.9–13.5 µ, av. B = 5.9–7.5 µm, oblong or ellipsoid, mainly rounded at base and apex, dark red-brown; germ pore central, 1.5–1.8 µm wide. Basidia 18–32 × 8–10 µm, 4-spored, surrounded by (3)4–6 pseudoparaphyses. Cheilocystidia 60–100 × 22–40 µm, mainly utriform, a smaller number globose to ellipsoid or cylindrical. Pleurocystidia 90–125 × 20–40 µm, cylindrical, utriform or ellipsoid. Elements of veil 30–100 × 2–10(12) µm, thin-walled, diverticulate. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on old cow dung; very rare in the Netherlands (Dorst). Apr.–May. Known from a few records in Europe (Scotland, Italy, and Germany).

Coprinus xenobius differs from *C. luteocephalus* in having slightly larger spores and smaller basidiocarps, less globose-ellipsoid but more utriform cheilocystidia and lack of yellow colours. The contrast in substrate preference (horse dung in *C. luteocephalus* versus cow dung in *C. xenobius*) does not seem to represent a reliable difference between the two taxa, especially when so little material is available.

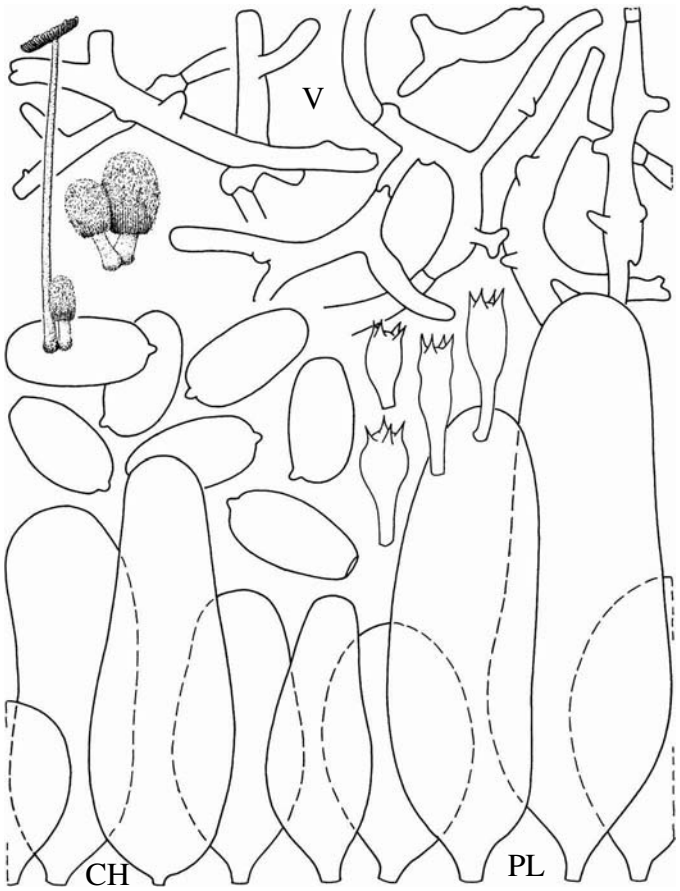


Fig. 64. *Coprinus xenobius*

63. Coprinus luteocephalus Watling in Notes R. bot. Gdn Edinb. 31: 359. 1972.

Coprinopsis luteocephala (Watling) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 275, fig. 2. 1997; Watling in Notes R. bot. Gdn Edinb. 31: 359–360. 1972.

CHARACTERISTICS — Pileus 8–18 × 6–16 mm when still closed, ellipsoid, ovoid or oblong, first sulfur to citrine-yellow, darker and more yellow towards the centre, becoming more yellow at maturity then isabelline towards the margin; expanded pileus 8–22 mm, distinctly umbonate, fibrillose scurfy throughout or more velvety at the disk, striate then sulcate at margin; lamellae crowded, free, first whitish, then grey, finally violaceous black, whitish floccose at margin when young; stipe up to 60 × 1–1.5 mm, 2–3 mm at base, hyaline or slightly brownish, equal except for slightly bulbous base, which is coated with sulfur or olivaceous hyphae.

Spores 9.5–12.0 × 5.5–7.0 µm, oblong, mainly rounded at apex, dark brown, with central, c. 1.6 µm wide germ pore; Q = 1.60–2.00, av. Q = 1.65–1.85; av. L = 10.3–10.9, av. B = 5.9–6.5 µm; basidia 14–28 × 8–10 µm, 4-spored, surrounded by (3)4–6 pseudoparaphyses; pleurocystidia 75–175 × 25–50 µm, utriform, cylindrical or ellipsoid; cheilocystidia 35–100 × 25–50 µm, globose to ellipsoid or broadly utriform; elements of veil thin-walled, sometimes slightly thick-walled (< 0.5 µm) and yellowish, diverticulate, up to c. 100 × 2–10(12) µm; clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on horse dung, very rare; and not yet known from the Netherlands. Only known from Scotland and Germany.

The macroscopical description is based on Watling (in Notes R. bot. Gdn Edinb. 31: 359. 1972). *Coprinus luteocephalus* is microscopically close to *C. xenobius*. In subsect. *Alachuani* the only other species with oblong spores is *C. goudensis* and that species grows on wood, the spores are distinctly smaller, and the cystidia are ellipsoid or subcylindrical, never utriform.

64. Coprinus stanglianus Enderle et al. in Z. Mykol. 54: 57. 1988. – Fig. 65.

Coprinopsis stangliana (Enderle et al.) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001.

SEL. ICON. — Arnolds in Arnolds et al., Overz. Paddest. Nederland: pl. 4A. 1995; Enderle et al in Z. Mykol. 54: opposite p. 64. 1988; Henrici & Læssøe in Mycologist 7: 87. 1993.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 280, fig. 4. 1997.

VERN. NAME — Kleine spechtinktzwam.

Pileus 15–40 × 10–25 mm when still closed, ellipsoid or ovoid, first whitish, soon pale greyish or beige, cream-beige (Mu. 2.5 YR 7/2 to

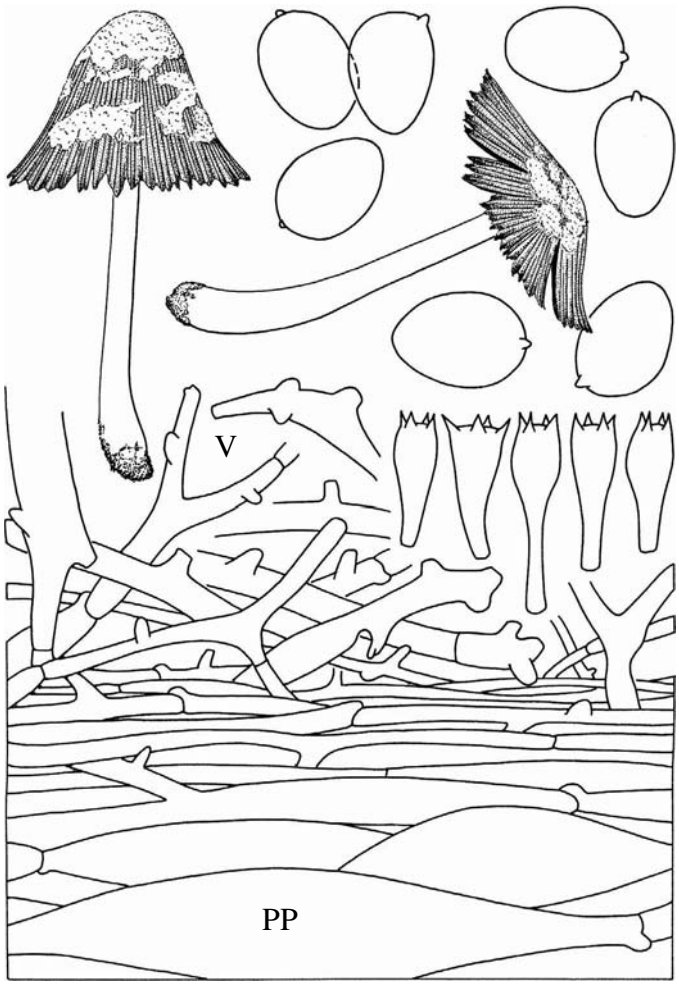


Fig. 65. *Coprinus stanglianus*

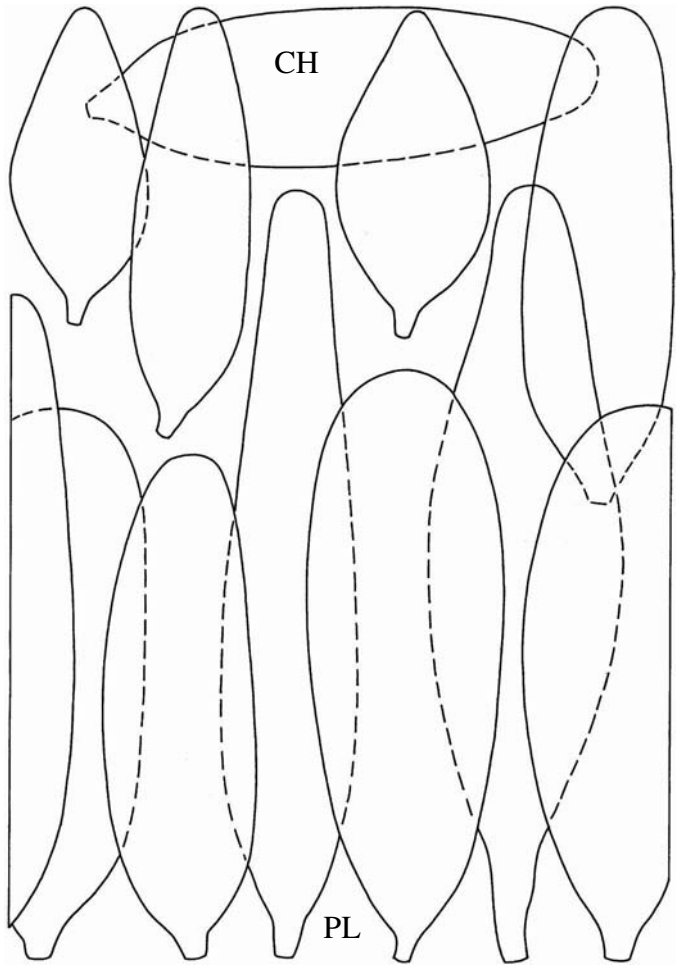


Fig. 65 (continued)

10 YR 5/3; K. & W. 4B3 to 5D3), later with beige, greyish ochre or ochre-brown tinges. Veil at first whitish then splitting up in greyish beige to ochre-brown patches, the last particularly on disc. Lamellae very crowded, free, first whitish, then brownish, later grey-brown to dark grey, finally black. Stipe up to 120 × 3–10 mm, slightly attenuate upwards, white or grey-white, minute woolly fibrous, in particular at base.

Spores 8.5–12.5 × 6.0–9.0 µm, Q = 1.25–1.65, av. Q = 1.40–1.50, av. L = 10.1–11.4 µm, av. B = 6.9–8.0 µm, ovoid or ellipsoid, rounded at base and rounded or somewhat acute at apex, very dark red-brown; germ pore central, 1.5–1.8 µm wide. Basidia 18–47 × 8–13 µm, 4-spored, surrounded by (4)5–7(8) pseudoparaphyses. Cheilocystidia 50–135 × 18–45 µm, utriform, ellipsoid, oblong or broadly conical. Pleurocystidia 75–165 × 21–50 µm, ellipsoid, oblong, utriform, narrowly utriform or cylindrical. Elements of veil thin-walled, diverticulate, up to 100 × 4–8(11) µm thick. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, in dry limestone grasslands; in the Netherlands mainly found in southern Limburg on chalky loam. Sept.–Oct. Very rare in Belgium and Italy, rare in Germany, usually found on calcareous soil.

Coprinus stanglianus is rather similar to *C. picaceus*, but that species has distinctly larger spores and somewhat larger basidiocarps. Macroscopically also *C. kimurae* is close but that species has smaller spores of different shape.

65. Coprinus picaceus (Bull. :Fr.) S.F. Gray, Nat. Arr. Br. Pl. 1: 634, 1821. – Fig. 66.

Agaricus picaceus Bull., Herb. Fr.: pl. 206. 1785; *Agaricus picaceus* Bull. :Fr., Syst. mycol. 1: 308. 1821; *Coprinopsis picacea* (Bull. :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001.

SEL. ICON. — Anon. in Mycologist 6: 15. 1992; Breitenb. & Kränzl., *Pilze Schweiz* 4: pl. 297. 1995; Jamoni in Funghi Amb. 47: between 16 and 17, pl. 118. 1988; R. Phillips, Mushr. other Fungi: 178. 1981.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 280–283, fig. 5. 1997; P.D. Orton & Watl. in Br. Fung. Fl. 2: 36. 1979.

VERN. NAME — Spechtinktzwam.

Pileus 20–70 × 15–40 mm when still closed, ellipsoid or ovoid, first covered with whitish, soon pale greyish or beige, cream-beige, later beige, greyish ochre or ochre-brown veil, breaking up in patches. Lamellae very crowded, free, first whitish, then brownish, later grey-brown to dark grey, finally black. Stipe up to 300 × 6–15 mm, slightly attenuate upwards, white or grey-white, minute woolly fibrous, in particular at base.

Spores 14.0–19.0 × 9.5–13.0 µm, Q = 1.25–1.60, av. Q = 1.35–1.50, av. L = 14.7–16.9 µm, av. B = 10.7–11.6 µm, ellipsoid or ovoid, with rounded base and apex, very dark red-brown, almost black; germ pore central, 2.0–2.3 µm wide. Basidia 16–46 × 12–15 µm, 4-spored, surrounded by 5–8 pseudoparaphyses. Cheilocystidia 80–150 × 24–50 µm,

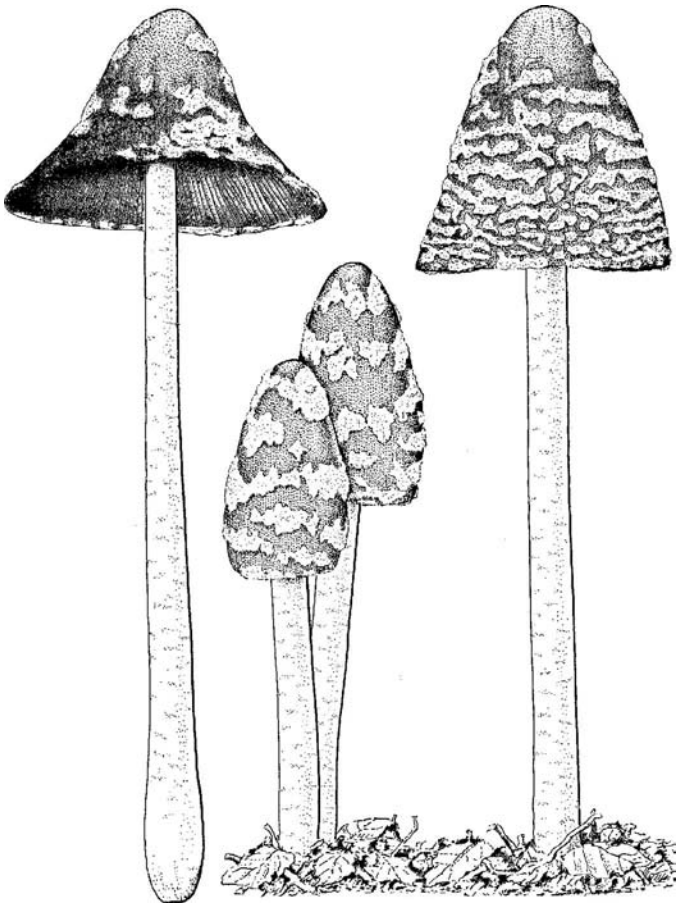


Fig. 66. *Coprinus picaceus*

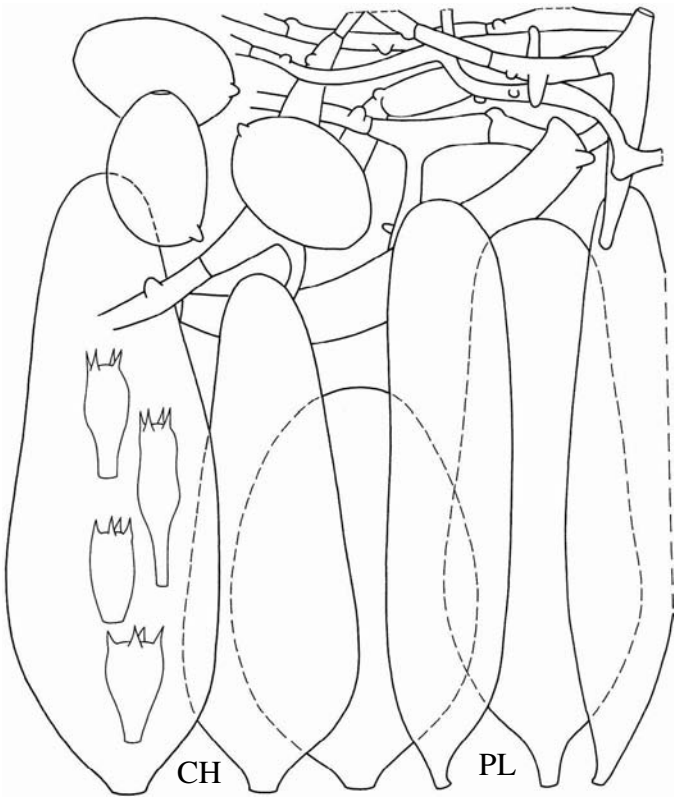


Fig. 66. (continued)

utriform, broadly utriform, ellipsoid or conical. Pleurocystidia 100–165 × 28–50(60) µm, utriform, cylindrical, conical or ellipsoid. Elements of veil thin-walled, diverticulate, up to 100(175) × (3)5–14(18) µm. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on calcareous soil or chalky loam; mainly in *Fagus* forests, in the Netherlands only known from a few localities in the valley of the river IJssel. June–Dec. Rare but widespread in Europe.

66. Coprinus sclerotiorum Horvers & de Cock in Uljé & Noordel. in Persoonia 16: 283. 1997. – Figs. 67, 68.

Coprinopsis sclerotiorum (Horvers & de Cock) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001.

SEL. ICON. — Uljé in Micologia 2000: 539. 2001.

SEL. DESCR. & FIGS. — Horvers & de Cock in Uljé & Noordel. in Persoonia 16: 283, 287, pl. 1, fig.6. 1997.

VERN. NAME — Knolletjesspechtinktzwam.

Pileus up to 18 mm high and 13 mm wide when still closed, first globose (primordia), soon ellipsoid, ovoid or conical, then campanulate, flattened when fully expanded and up to 25 mm wide. Veil a thick, felty layer, white, covering the whole pileus when young, splitting up in patches during expanding; pileus first white under veil, then pale to dark grey-brown (Mu. 10 YR 5/4, 4/4, 3/3, 3/1; K. & W. 5D4, 5E6, 5E5, 5F4), finally fuscous violaceous grey to black. Surface of pileus (below veil) often covered with a very thin gelatinous layer. Lamellae very crowded, up to 3.5 mm broad, white when very young, soon grey to dark grey with white edge, later black. Stipe up to 120 × 5–6 mm, white, somewhat fibrous, with yellow-brown drops when fresh, slightly widened downwards; after margin of pileus gets loose from bulbous base, a small, volva-like margin remains, with a finely striate imprint from the lamellae. Sclerotia subglobose, somewhat irregular, 10 mm in diam. or finger-shaped and then up to 35 × 10 mm, very dark brown.

Spores 13.5–17.5 × 10.5–12.5 × 9.0–10.5 µm, Q = 1.25–1.45, av. Q = 1.35, av. L = 14.7–15.7 µm, av. B = 11.1–11.3 µm, rounded angular ovoid in frontal view, ellipsoid to cylindrical ellipsoid in side view, flattened, convex to almost flat at base and rather truncate at apex, very dark red-brown, almost black; germ pore central, hardly visible, 2.5 µm wide. Basidia 22–40 × 12–17 µm, 4-spored, surrounded by 5–8(9) pseudoparaphyses. Cheilocystidia 60–100 × 30–40 µm, ellipsoid or ovoid, broadly ellipsoid, ellipsoid, oblong or utriform. Pleurocystidia 80–125(160) × 25–45 µm, cylindrical, subutriform, oblong or ellipsoid. Elements of veil diverticulate, thin-walled, 2–7 µm wide. Between surface of pileus and veil a slimy layer is present, 70–100 µm thick and mixed with velar elements. Pileipellis made up of filamentous, in part inflated elements. Clamp-connections not found, only pseudoclamps.

HABITAT & DISTR. — Solitary, on sclerotia in dung of cow; in the Netherlands very rare, only known from one locality near Tilburg. May. Not yet recorded from other countries.

Related species with large spores are *C. picaceus* and *C. stanglianus*, but these species never grow on dung and have ellipsoid spores. The gelatinous layer between surface of pileus and veil is not always present, only in wet conditions. If present, it can also be found on dried specimens.

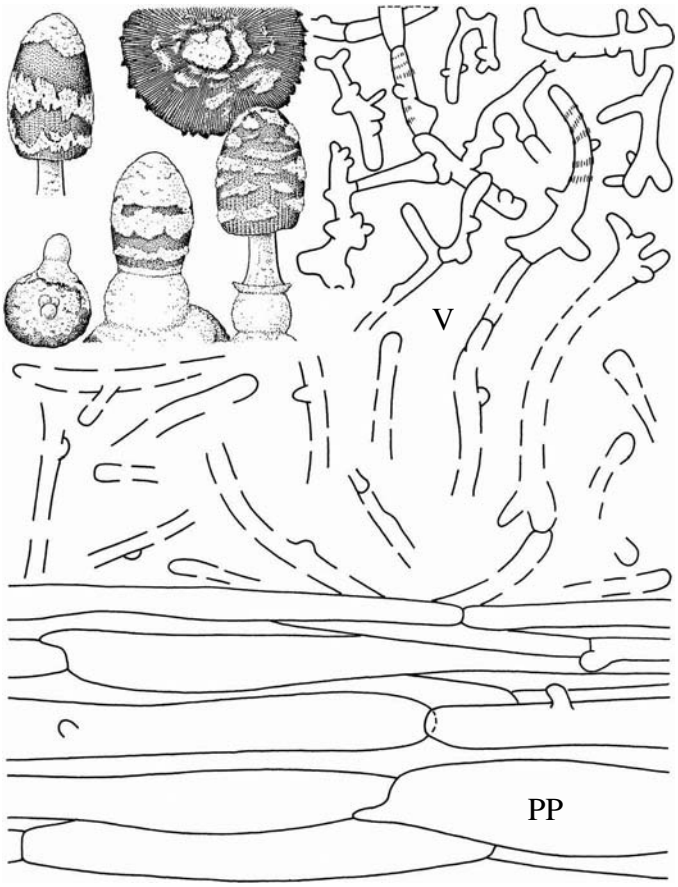


Fig. 67. *Coprinus sclerotiorum*

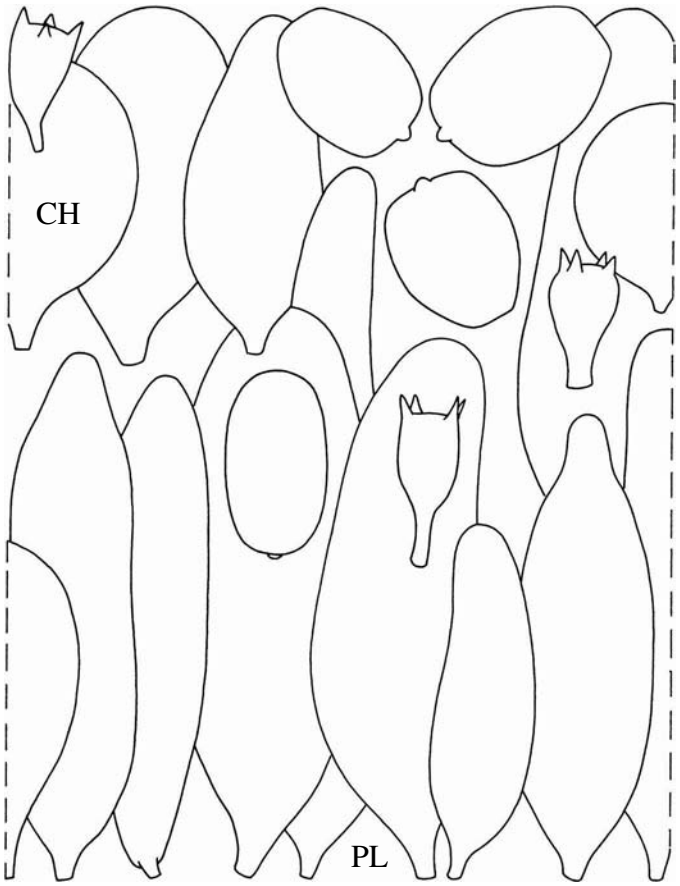


Fig. 68. *Coprinus sclerotiorum*

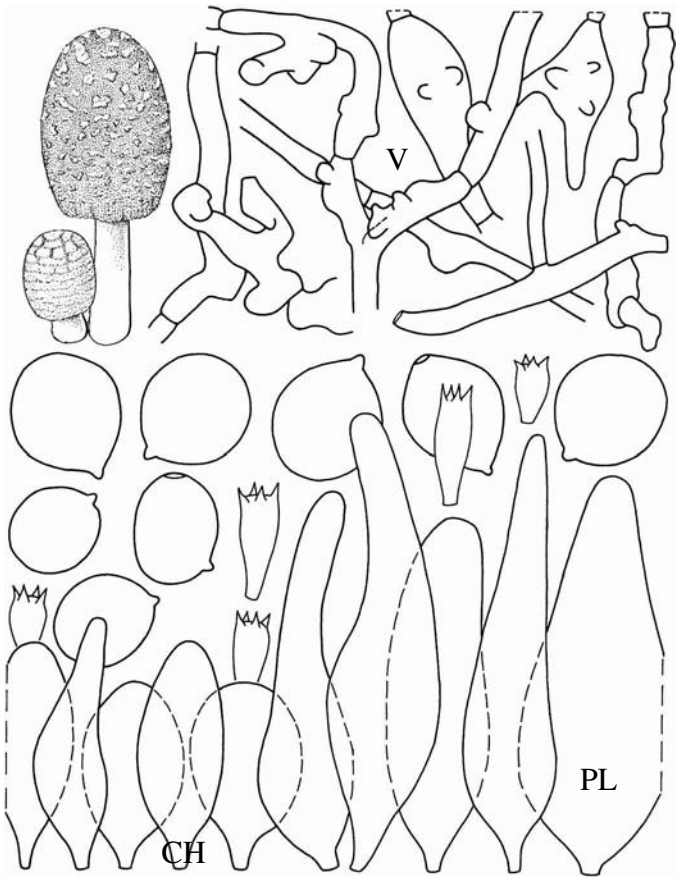


Fig. 69. *Coprinus kimurae*

67. Coprinus kimurae Hongo & Aoki in Trans. mycol. Soc. Japan 7: 16. 1966. – Fig. 69.

Coprinopsis kimurae (Hongo & Aoki) Redhead, Vilgalys & Moncalvo in Taxon 50: 228. 2001.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 284. 1995; Imaz. et al., Fungi Japan: 204. 1988.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 287, fig. 7. 1997.

VERN. NAME — Rondsporige halminktzwam.

Pileus 15–30 × 6–18 mm when still closed, 45 mm when expanded, oblong, often somewhat conical, first covered with a layer of white, woolly-felty veil, breaking up in patches, later often cream or ochre-brown coloured. Lamellae, L = 60–80, l = 1–5, free, first white to beige, then grey-brown to dark grey, finally black. Stipe up to 120 × 2–6 mm, white, greyish white, minutely fibrillose-floccose, later glabrous; base slightly bulbous and white felty.

Spores 9.0–12.5 × 8.0–11.5 µm, Q = 1.00–1.25, av. Q = 1.05–1.15, av. L = 10.9–11.3 µm, av. B = 9.5–10.7 µm, subglobose or broadly ellipsoid, sometimes with slightly apical papilla, slightly narrower in side view (0.5 µm), rounded or slightly conical at base and apex, dark red-brown; germ pore central to slightly eccentric, often difficult to observe, 1.6 µm wide. Basidia 16–32 × 9–13 µm, 4-spored, surrounded by 5–7(8) pseudoparaphyses. Cheilocystidia 50–120 × 20–32 µm, (narrowly) utriform, (sub)cylindrical, (narrowly) conical or sublageniform. Pleurocystidia 60–200 × 20–26(40) µm, (narrowly) utriform, (sub)cylindrical, lageniform or conical. Elements of veil thin-walled, diverticulate, 3–10(18) µm wide. Clamp-connections absent.

HABITAT & DISTR. — Subfasciculate, in small groups on straw (greenhouses), rice-straw (Japan), and on rotting material made up of natural materials like coconut mattings, lime ceilings mixed with straw, cotton textiles, etc.; rare in the Netherlands. Jan.–Dec. In Western Europe in most cases indoors and in greenhouses. Recorded from Canada and Japan.

Coprinus kimurae can be recognised by the subglobose to broadly ellipsoid spores, the absence of clamp-connections, the rather large basidiocarps, the veil breaking up in patches (similar to *C. picaceus*), and the habitat. Considering the occurrence indoors in (heated) greenhouses, and outdoors in places like compost heaps and on rotten coconut-fiber fabric, it is likely that *Coprinus kimurae* is a thermophilic fungus. In an earlier publication (Uljé in Arnolds et al., *Overz. Padd. Nederland*: 119. 1995) *C. kubickae* was considered synonymous with *C. kimurae,* but further study has indicated that this opinion was wrong. *Coprinus kubickae* is a very small species with veil breaking up in very small flocks and not in patches, with on average somewhat smaller spores, narrower elements of veil, presence of clamp-connections, and by growing on grasses.

68. Coprinus kubickae Pilát & Svrček in Česká Mykol. 21: 142. 1967. – Fig. 70.

Coprinopsis kubickae (Pilát & Svrček) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001. *Coprinus amphibius* Anastasiou in Can. J. Bot. 45: 2213. 1967.

SEL. DESCR. & FIGS. — Pilát & Svrček in Česká Mykol. 21: 140–144. 1967; Uljé & Noordel. in Persoonia 16: 289, fig. 8. 1997.

VERN. NAME — Grijzige halminktzwam.

Pileus 3–6(10) × 2.5–5(8) mm when still closed, up to 10(18) mm when expanded, first subglobose, ellipsoid or ovoid and ochre-brown (K. & W. 6E5) or mocha brown, soon becoming pale grey to grey, covered with minute flocculose veil. Lamellae, L = 34, l = 1–3, free, first white to beige, then grey-brown to dark grey, finally black. Stipe up to 30 × 0.5–1.5 mm, white, minutely fibrillose-floccose, later glabrous; base bulbous, with tomentose, basal disc.

Spores 7.0–11.5 × 6.0–10.5 µm, Q = 1.00–1.35, av. Q = 1.05–1.25, av. L = 8.1–10.7 µm, av. B = 7.5–9.2 µm, subglobose or broadly ellipsoid, rounded or slightly conical at base and apex, medium to dark red-brown; germ pore central to slightly excentric, often difficult to observe, 1.3–1.6 µm wide. Basidia 14–36 × 8–11.5 µm, 4-spored, surrounded by 5–8 pseudoparaphyses. Cheilocystidia 35–80(120) × 11–20(28) µm, (narrowly) utriform, (sub)cylindrical or conical. Pleurocystidia 55–110(200) × 12–20(28) µm, utriform or (sub)cylindrical. Elements of veil thin-walled, diverticulate, 2–6 µm wide. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate on dead *Phragmites*, *Juncus,* and *Carex*, in greenhouses on rich soil and rotten straw; rather rare, but probably overlooked. June–Oct. Known from Europe, but probably also in other regions.

In greenhouses the basidiocarps become larger (see sizes between parentheses), as do the pleuro- and cheilocystidia.

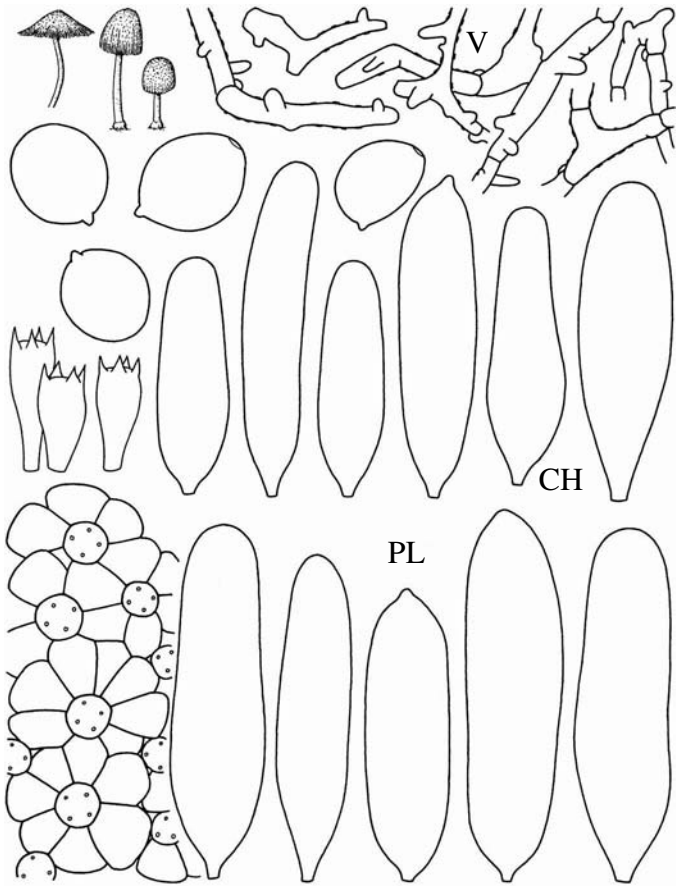


Fig. 70. *Coprinus kubickae*

69. Coprinus strossmayeri S. Schulz. in Verh. zool. bot. Ges. Wien 28: 430. 1879. – Fig. 71.

Coprinopsis strossmayeri (S. Schulz.) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001. — *Coprinus rhizophorus* Kawam., Icons Jap. Fungi 5: 559. 1954 (invalid, no Latin diagnosis); *Coprinus rhizophorus* Kawam. ex Hongo & K. Yokoyama in Trans. mycol. Soc. Japan 17: 140. 1976.

SEL. ICON. — Enderle & Bender in Z. Mykol. 56: opposite 40. 1990; Vizzini in Boll. Gruppo micol. G. Bres. 44 (1): 4, 7. 2001; Fraiture & Vanholen in Bull. trimest. Soc. mycol. France 116: 7, 15. 2000.

SEL. DESCR. & FIGS. — Immerzeel in Coolia 40: 39. 1997; Uljé & Noordel. in Persoonia 16: 291, fig. 9. 1997; Fraiture & Vanholen in Bull. trimest. Soc. mycol. France 116: 1–18. 2000.

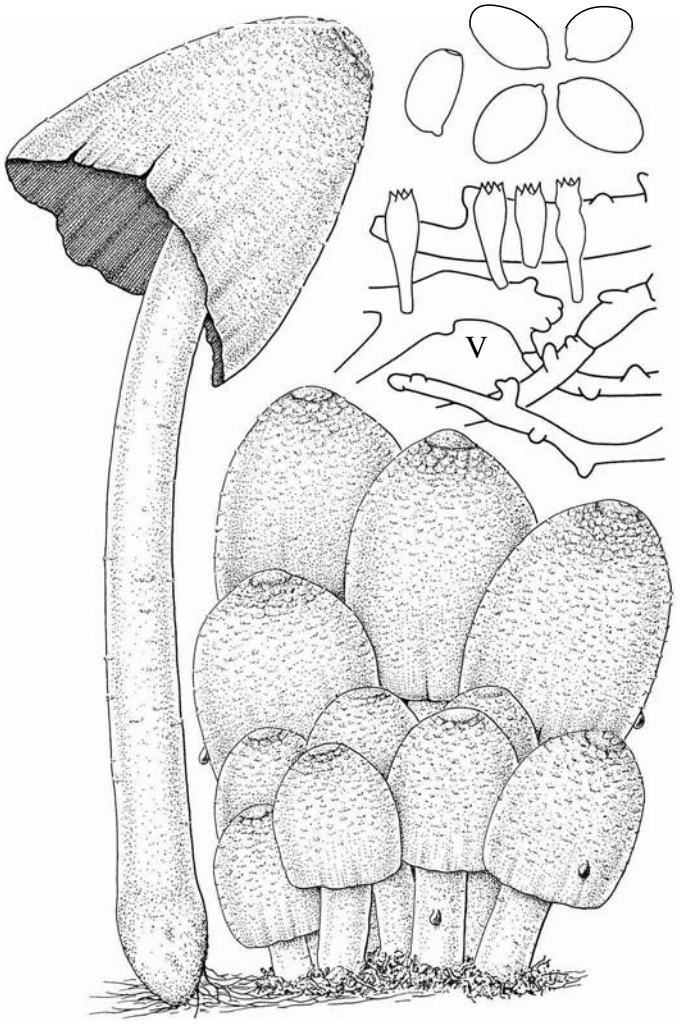
VERN. NAME — Kapjesinktzwam.

Pileus up to 40 × 25 mm when still closed, up to 45(60) mm wide when mature, but never fully expanded; young pileus at first ellipsoid, ovoid, broadly cylindrical, then paraboloid, obtusely conical or campanulate with rounded umbo, finally subumbonate, completely covered with white veil when young, later splitting up in small, white or cream (Mu. 10 YR 8/2; K. & W. 4A2) felty patches, dirty yellow at centre (10 YR 7/4, 7/6; 5B3, 5B4); pileus below veil greyish to ochraceous, in particular at centre ochre-brown, paler towards margin (from centre to margin: 10 YR 6/3, 5/2, 6/2, 7/2, 8/2; 5C3, 5D3, 5C2, 5B2, 5A2); primordia often cream coloured (10 YR 7/6; 5B4). Lamellae, L = more than 60, l = 3–5(7), very crowded, free, first white, then grey-brown to dark brown, finally black. Stipe up to 120 × 4–10 mm, cylindrical, hollow, whitish, slightly yellowish (10 YR 7/4, 8/4; 5B3, 5D/E5) in the middle, somewhat fibrous with scattered velar remnants; base equal or slightly enlarged with mycelium remnants, finally and fleetingly hairy; stipe develops from orange-brown to dark brown rhizomorphs, 20–30 cm in length and up to 3 mm thick, densely available in upper 10 cm of bottom between and adherent to wooden remnants. Yellow-brown drops often are present on fresh specimens. Smell fungoid but rhizomorphs with strong smell of truffle or mold.

Spores 7.0–9.0 × 4.5–6.0 × 4.5–5.0 µm, Q = 1.35–1.70, av. Q = 1.50–1.55, av. L = 7.7–8.2 µm, av. B = 5.1–5.6 µm, ovoid or ellipsoid with rounded base and apex, dark red-brown; germ pore central, 1.0–1.3 µm wide. Basidia 13–32 × 6–9 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia 40–170 × 15–40 µm, to a large extent utriform and then often with rather long neck (sublageniform), ellipsoid, oblong or fusiform. Pleurocystidia 70–180 × 24–50 µm, ellipsoid, oblong, sublageniform or utriform. Elements of veil thin-walled, branched, weakly diverticulate, 50–100 × (2)4–9(14) µm wide, in part slightly thick-walled (less than 0.5 µm) and pale yellowish incrusted. Clamp-connections present.

HABITAT & DISTR. — Fasciculate on wood or woody remnants of broad-leaved trees, often dozens of basidiocarps together; very rare in the Netherlands, and known from two localities (est. Nijenrode near Breukelen, and Wassenaar). May–July. Recorded from Europe and Japan.

Coprinus strossmayeri is recognisable in the field by the rather large basidiocarps growing in clumps like *C. atramentarius* but in contrast to that almost smooth species, the young specimens of *C. strossmayeri* are covered with thick, white veil breaking up in small, felty scales when the pileus expands. These scales are larger than the flocculose scales of species in subsect. *Domestici* and more persistent. The base of the stipe in *C. strossmayeri* is connected to dense, dark orange-brown rhizomorphs with strong smell of mold. Microscopically *C. strossmayeri* is distinguished from species in subsect. *Domestici* in having diverticulate



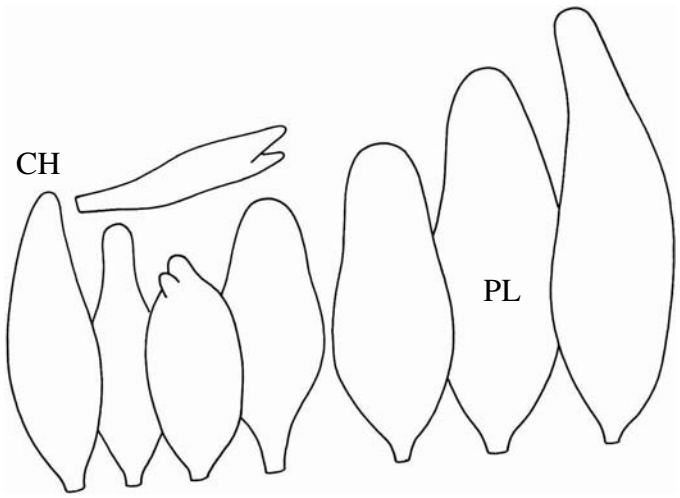


Fig. 71. *Coprinus strossmayeri*

velar hyphae and distinct ovoid spores. In subsect. *Domestici* the elements of veil are in chains, globose in great part, never diverticulate and the spores are ellipsoid.

70. Coprinus goudensis Uljé in Uljé & Bas in Persoonia 15: 363. 1993. – Fig. 72.

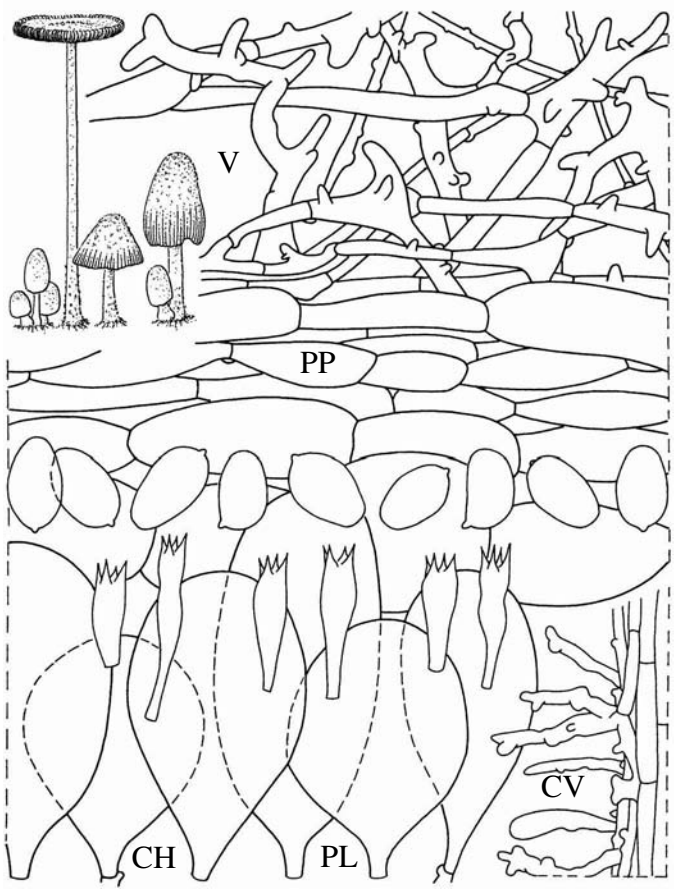


Fig. 72. *Coprinus goudensis*

Coprinopsis goudensis (Uljé) Redhead, Vilgalys & Moncalvo in Taxon 50: 228. 2001.

SEL. DESCR. & FIGS. Uljé in Uljé & Bas in Persoonia 15: 363–365, fig. 3. 1993; Uljé & Noordel. in Persoonia 16: 293, fig. 10. 1997.

VERN. NAME — Middelst hazenpootje.

Pileus 5–12 × 4–9 mm when still closed, up to 20 mm when expanded, first ellipsoid, ovoid or conical, white, soon greyish. Veil white, breaking up in small, radial, hairy-fibrillose scales. Lamellae, L = 23–26, l = 0–3, rather crowded, free, first white, then grey-brown to blackish. Stipe up to 40 × 1–1.5 mm, white, greyish white, minutely white floccose, in particular at clavate base.

Spores 7.0–10.0(10.5) × 4.5–6.0(7.0) µm, Q = 1.45–1.90, av. Q = 1.55–1.70, av. L = 8.4–9.1 µm, av. B = 5.0–5.6 µm, oblong, sometimes ellipsoid or ovoid with rounded base and apex, rather pale (dirty) red-brown; germ pore central, 1.3 µm wide. Basidia 18–40 × 7–9 µm, 4-spored, surrounded by (3)4–5(6) pseudoparaphyses. Cheilocystidia 30–80 × 20–50 µm, (sub)globose to ellipsoid, oblong or obovoid, sometimes subutriform or subcylindrical. Pleurocystidia 60–100 × 35–50 µm, broadly cylindrical or oblong to ellipsoid. Elements of veil thin-walled, diverticulate, 3–10(15) µm wide; excrescences up to 15 µm in length. Clamp-connections present.

HABITAT & DISTR. — Subfasciculate, in small groups, on dead wood (*Acer* and *Populus*); very rare in the Netherlands and only known from a few localities (Reeuwijk, Hontenisse). Sept.–Nov. Also known from Germany.

Coprinus goudensis can easily be recognised by the ellipsoid spores that in average are less than 10 µm long, having an average quotient of 1.6 or more, and the lignicolous habitat.

71. Coprinus urticicola (B. & Br.) Buller in Trans. Br. mycol. Soc. 5: 485. 1917.

Agaricus urticicola B. & Br. in Ann. Mag. Nat. Hist., ser. 3 (7): 376. 1861; *Coprinopsis urticicola* (B. & Br.) Redhead, Vilgalys & Moncalvo in Taxon 50: 232. 2001 — *Coprinus brassicae* Peck in Rep. N.Y. St. Mus. nat. Hist. 43: 64. 1890 — *Coprinus melo* in *J. Favre,* Ass. fong. Hauts-Marais: 215. 1948 — *Coprinus suburticicola* Pilát & Svrček, Česká Mykol. 21: 140. 1967.

KEY TO THE VARIETIES

1. Pileus with white to pale cream veil . . . . . .71a. var. **urticicola**.
1. Pileus with grey to blackish veil, at least at centre of pileus 71b. var. **salicicola**.

71a. var. **urticicola**. – Fig. 73.

SEL. ICON. — Arnolds in Arnolds et al., Overz. Paddest. Nederland: pl. 5C. 1995; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 306. 1995; Cetto, Gr. Pilzf. 5: pl. 1724. 1987.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 294, 296, fig. 11. 1997.

VERN. NAME — Witte halminktzwam.

Pileus 3–6(8) × 2–4 mm when still closed, up to 13 mm when expanded, at first (sub)globose, ellipsoid, ovoid or conical, pure white. Veil white, breaking up in small, woolly-hairy scales. Lamellae, L = 35, l = 0–3, crowded, free, first white, then grey to blackish. Stipe up to 30 × 0.5–1 mm, white, greyish white, somewhat floccose above the slightly clavate base.

Spores 5.5–9.0 × 4.5–6.5 µm, Q = 1.10–1.65, av. Q = 1.25–1.45, av. L = 6.0–8.1 µm, av. B = 4.8–6.0 µm, subglobose to ellipsoid and then often somewhat conical to base and rounded at apex, rather pale red-brown; germ pore central, 1.0–1.5 µm wide. Basidia 10–23 × 6–8.5 µm, 4-spored, surrounded by (3)4–6 pseudoparaphyses. Cheilocystidia 30–65 × 10–14 µm, similar to pleurocystidia. Pleurocystidia 40–70 × 10–15 µm, (sub)cylindrical, (narrowly) utriform, oblong, ellipsoid or narrowly conical. Elements of veil thin-walled, diverticulate, 2–8 µm wide; walls slightly to strongly incrusted. Clamp-connections absent.

HABITAT & DISTR. — Solitary or subfasciculate, on grasses and herbs, sometimes on wood; common in the Netherlands. March–Nov. Common in Europe, also recorded from North America.

Coprinus urticicola is a common species in hay-fields with abundant dead grasses and also rather common in *Phragmites* lands. The species can be recognised by the small, pure white basidiocarps with woolly scales of veil. Microscopically the often conical, ellipsoid or ovoid, pale coloured spores and thin-walled elements of veil are good characters to identify *C. urticicola*. The microscopical characters of the types of *C. melo* and *C. suburticicola* are similar to those of *C. urticicola*, and these species are therefore considered synonyms. Since the description of *C. brassicae* also agrees very well with *C. urticicola*, this species is also listed among the synonyms.

71b. var. **salicicola** Uljé & Noordel. in Persoonia 16: 296. 1997. – Fig. 74.

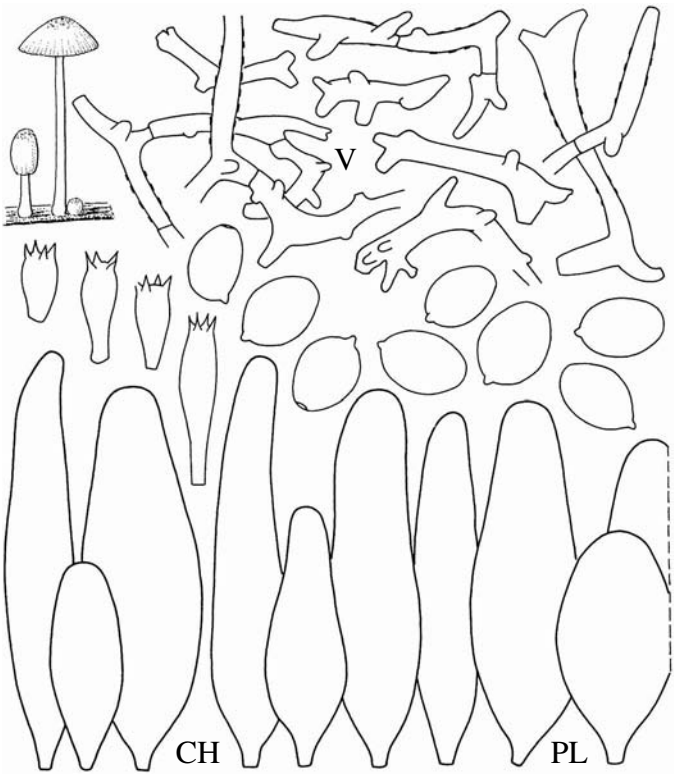


Fig. 73. *Coprinus urticicola* var. *urticicola*

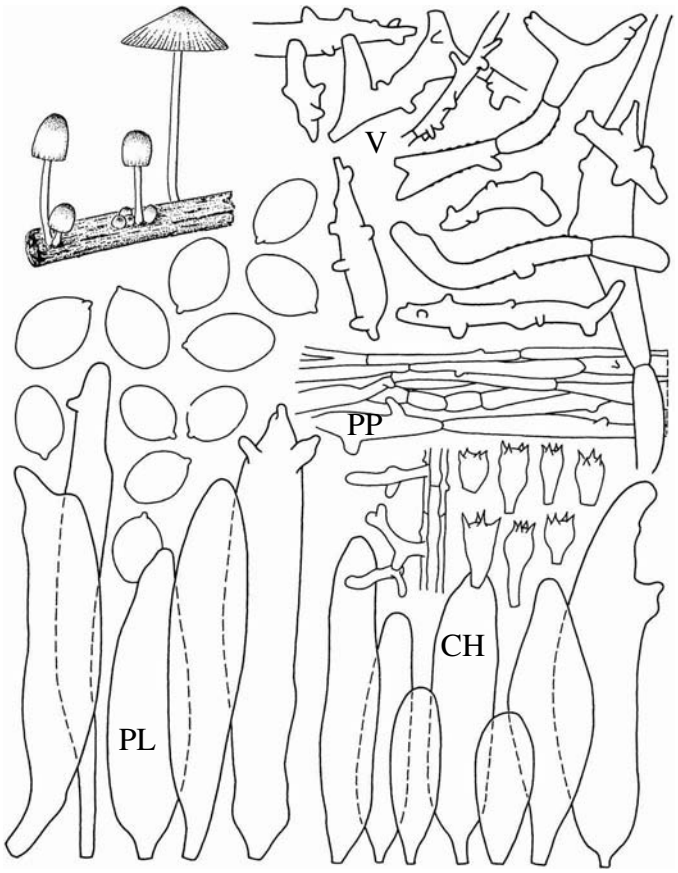


Fig. 74. *Coprinus urticicola* var. *salicicola*

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 296–297, fig. 12. 1997.

VERN. NAME — Wilgenhalminktzwam.

Differs from the typical variety mainly by the dark colour of the veil that also becomes slightly thick-walled, the grey-brown colour of the spores, and the habitat on branches of *Salix*.

HABITAT & DISTR. — Solitary or subfasciculate on dead branches of *Salix*; very rare, so far only collected from one locality (Alphen aan den Rijn). July–Aug.

72. Coprinus gonophyllus Quél. in Ann. Sciences Nat. Bordeaux Sud-Ouest 14, Suppl. 5: pl. 1. 1884. – Fig. 75.

Coprinopsis gonophylla (Quél.) Redhead, Vilgalys & Moncalvo in Taxon 50: 228. 2001.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 278. 1995; Cacialli et al., Schede Micol. 1: 133. 1995; Jamoni in Funghi Amb. 47: between 16 and 17, pl. 117. 1988; Migl. & Coccia in Boll. Ass. micol. ecol. Romana 16: 14. 1989; Monti, Funghi cenosi Aree bruciate: 83. 1992.

SEL. DESCR. & FIGS. — Joss. In Bull. trimest. Soc. mycol. Fr. 71: 120. 1955; P.D. Orton & Watl. in Br. Fung. Fl. 2: 46–47. 1979

VERN. NAME — Brandplekvlokinktzwam.

Pileus up to 4–15(20) × 3–12 mm when still closed, up to 30 mm when expanded, first globose or sometimes ellipsoid, ovoid or conical, then hemispherical or obtusely conical, finally convex, white. Veil first white and covering whole pileus, then breaking up around centre in felty patches, later becoming brownish in part. Lamellae, L = 32–38, l = 0–3(5), free, first white, then grey-brown, finally blackish. Stipe up to 60 × 1–3(4) mm, whitish; base somewhat clavate, up to 5 mm.

Spores 6.0–8.5 × 5.5–8.0 × 5.0–6.5 µm, Q = 1.00–1.35, av. Q = 1.05–1.25, av. L = 7.0–8.0 µm, av. B = 6.1–7.6 µm, short ovoid or subglobose, with rounded base and truncate apex, somewhat flattened, generally very dark red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 12–34 × 7–9 µm, 4-spored, surrounded by 4–7 pseudoparaphyses. Cheilocystidia 40–85 × 25–45 µm, subcylindrical, oblong, (broadly) ellipsoid, fusiform or subutriform. Pleurocystidia 50–120 × 20–40 µm, subcylindrical, oblong and then often conical towards apex or fusiform. Elements of veil thin-walled, diverticulate, 2–5(7) µm wide, slightly incrusted. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate; often on burnt places but also on bare, often clayey soil; widespread but not common in the Netherlands. May-Nov. Widespread in Europe, but uncommon.

Coprinus gonophyllus can be recognised by the rather firm, usually hemispherical basidiocarps that often grow on burnt places and the thin-walled, narrowly velar hyphae and the short, subglobose spores with truncate germ pore. The size of the spores is somewhat similar to that of *C. spilosporus,* but that species has long, thick-walled hairs between the velar elements. One collection, possibly belonging to another taxon, differs in smaller, (sub)globose spores with an apical papilla (ellipsoid with apical papilla ["limoniform"]). *Coprinus epichloeus* is a much smaller and fragile species with spores that are not distinctly truncate at apex.

73. Coprinus epichloeus Uljé & Noordel. in Persoonia 16: 300. 1997. – Fig. 76.

Coprinopsis epichloea (Uljé & Noordel.) Redhead, Vilgalys & Moncalvo in Taxon 50: 227. 2001.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 300–301, fig. 15. 1997.

VERN. NAME — Gazonhalminktzwam.

Pileus 3–6 × 2–5 mm when still closed, subglobose or ovoid, veil at primordia sepia, soon paler grey to almost white when expanded; then pileus up to 15 mm wide. Veil breaking up in small, hairy flocks.

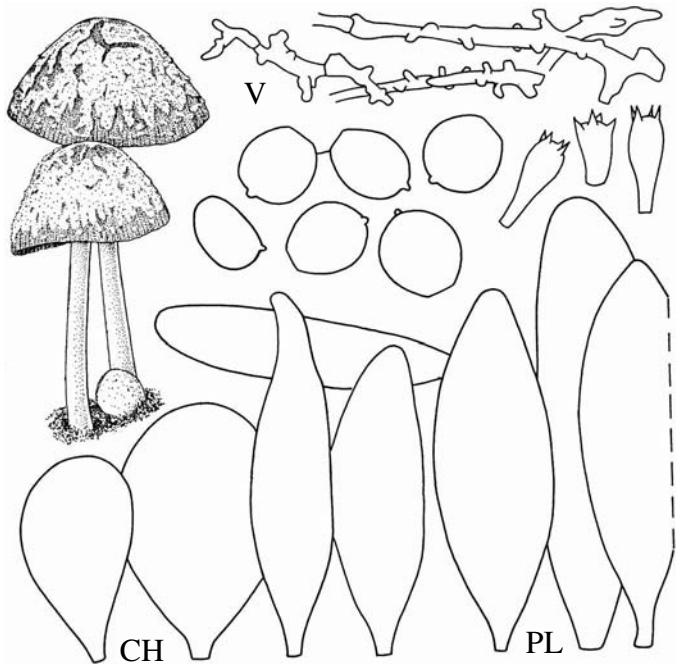


Fig. 75. *Coprinus gonophyllus*

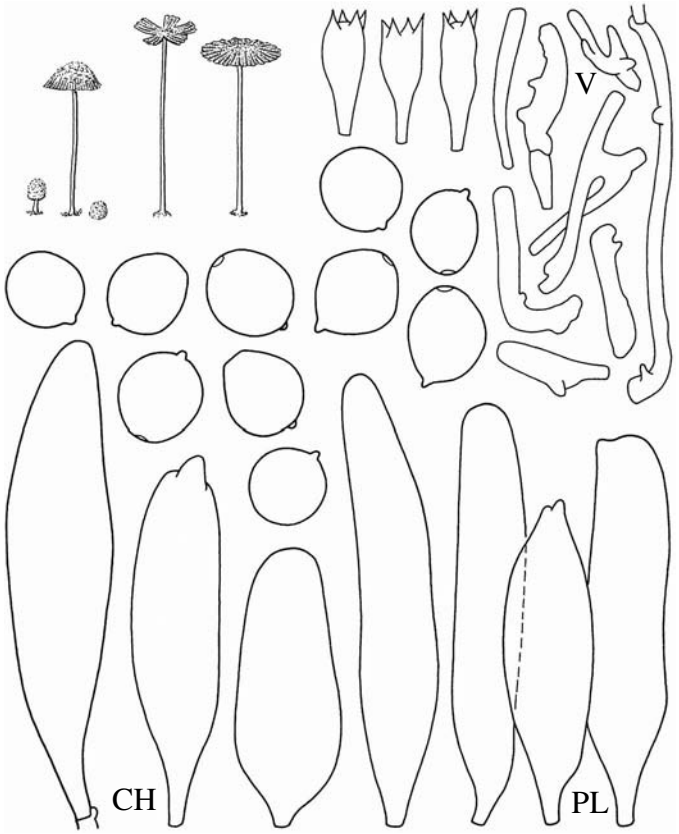


Fig. 76. *Coprinus epichloeus*

Lamellae, L = 20, l = 1–3, free, first whitish, soon grey-brown to dark grey, finally blackish. Stipe up to 30 × 0.5–1 mm, white, greyish white, almost glabrous; base somewhat woolly hairy.

Spores 7.0–10.0 × 6.5–9.0 × 6.5–8.0 µm, Q = 1.00–1.20, av. Q = 1.10, av. L = 8.1 µm, av. B = 7.5 µm, subglobose, often more or less conical to the apex, sometimes somewhat quadrangular, medium red-brown (about Mu. 2.5 YR 3/6; K. & W. 8E8); germ pore central, 1.3–1.5 µm wide. Basidia 16–32 × 9–11 µm, 4-spored, surrounded by 5–7(8) pseudoparaphyses. Cheilocystidia 45–100 × 15–30 µm, oblong, ellipsoid, (sub)cylindrical or (narrowly) utriform. Pleurocystidia 60–105 × 12–24 µm, oblong, (sub)cylindrical or utriform. Elements of veil thin-walled, sparsely diverticulate, 2–10 µm wide; walls hyaline or slightly greyish yellow, less than 0.3 µm thick. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate in small groups; in lawns, often on bare places on the ground; probably not rare, but in the Netherlands up to now known only from several localities in Alphen aan den Rijn. June–Sept. Not yet known from other countries.

Microscopically this species is close to *C. gonophyllus* but differs in distinctly smaller, much more fragile basidiocarps and the more globose, slightly larger spores with rarely truncate apex. The habitat also is different, as it does not grow in burnt places, but in lawns among grass (though often also on bare places in the lawns). The spores of *C. epichloeus* resemble somewhat those of *C. phaeosporus*, but that species, like all other species in subsect. *Alachuani* with subglobose spores, has thick-walled velar elements. *Coprinus fluvialis*, recently described from Italy (Lanconelli & Uljé in Persoonia 16: 297. 1997), differs in shape and quotient of the spores and sizes and shape of the cystidia.

74. Coprinus filamentifer Kühner in in Kühn. & Romagn. in Bull. Soc. Nat. Oyonnax 10–11: 64. 1957 (*Compl. Fl. anal*. 7). – Fig. 77.

Coprinopsis filamentifer (Kühner) Redhead, Vilgalys & Moncalvo in Taxon 50: 228. 2001.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 302, fig. 17. 1997.

VERN. NAME — Hoeksporige inktzwam.

Pileus 7–10 × 4–5.5 mm when still closed, up to 18 mm when expanded, subglobose, ellipsoid, ovoid, first white with somewhat greyish centre, soon more grey. Veil white to grey, radially splitting up in small, hairy floccose scales. Lamellae, L = 26–28, l = 0–3, rather crowded, free, first white, then greyish, finally blackish. Stipe up to 100 × 1–1.5 mm, whitish, at base somewhat clavate.

Spores 6.5–8.5 × 5.0–6.5 µm, Q = 1.30–1.60, av. Q = 1.45, av. L = 7.9–8.3 µm, av. B = 5.5–5.6 µm, cylindrical-ovoid, rounded rectangular in most cases, rather truncate, very dark red-brown, with central, 1.6–1.8 µm wide germ pore. Size of basidia not noted, 4-spored. Cheilocystidia 50–100 × 15–25 µm, subcylindrical or oblong, often conical. Pleurocystidia 80–135 × 20–30 µm, subcylindrical or oblong, often conical. Elements of veil thin-walled, diverticulate, 2–7(10) µm wide, slightly incrusted. Clamp-connections probably present.

HABITAT & DISTR. — In small groups on dung of herbivores; very rare in the Netherlands, only known from one locality (Holthe). Nov. Also recorded from England, Ireland, and Scotland.

The presence of clamp-connections could not be verified with certainty because of the bad condition of the material. *Coprinus filamentifer* can readily be recognised by the subcylindrical spores and coprophilous habitat.

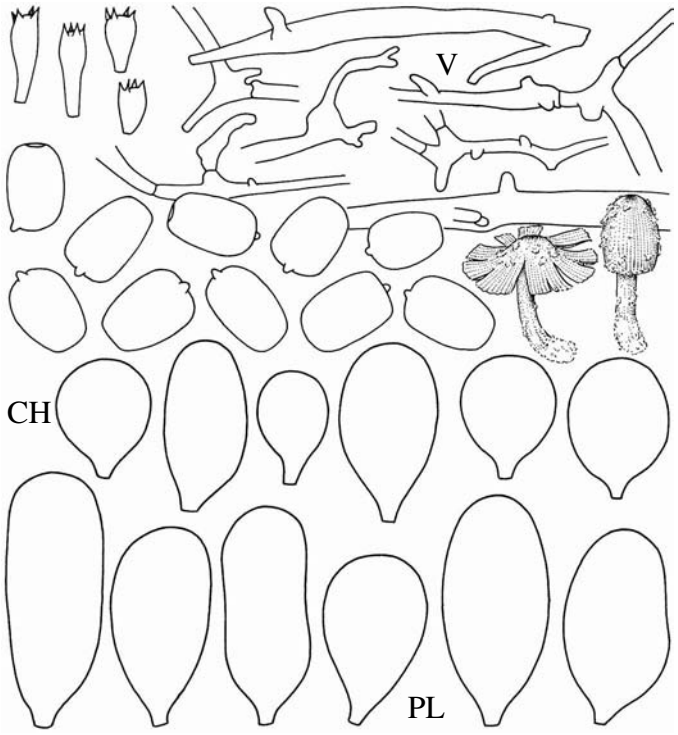


Fig. 77. *Coprinus filamentifer*

75. Coprinus episcopalis P.D. Orton in Trans. Brit. mycol. Soc. 40: 270. 1957.

Coprinopsis episcopalis (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 228. 2001.

SEL. DESCR. & FIGS. — Geesink in *Westf. Pilzbr.* 9: 72–73, fig. 3. 1972.

CHARACTERISTICS — Pileus 20–30 × 10–18 mm when still closed, first oblong or obtusely conical, then conical to convex, up to 55 mm when fully expanded, first white, soon more greyish; veil white, often somewhat yellow-brown in centre, breaking up in patches; lamellae crowded, free, first white, then greyish, finally blackish; stipe up to 95 × 5–9 mm, white, base (8–15 mm) more or less marginate bulbous, white silky striate.

Spores (6.5)8.0–10.5(11.5) × 6.0–9.0(11.0) × 5.0–6.5 µm, Q = 1.00–1.45, av. Q = 1.10–1.30, av. L = 8.1–9.8 µm, av. B = 6.5–8.5(8.7) µm, rounded quadrangular with apical, rather truncate papilla, dark red-brown; germ pore central, 1.5–1.8 µm wide; basidia 17–35 × 10–11 µm, 4-spored, surrounded by 4–7(8) pseudoparaphyses; cheilocystidia 30–120 × 10–40 µm, (sub)globose, ellipsoid, oblong, (sub)cylindrical or utriform; pleurocystidia 50–140 × 15–40 µm, (sub)cylindrical, oblong, ellipsoid or utriform; elements of veil thin-walled, slightly diverticulate, 2–10(15) µm wide, slightly incrusted; sometimes some elements slightly thick-walled (less than 0.5 µm) and then somewhat yellowish; excrescences up to c. 5 µm in length; clamp-connections present.

HABITAT & DISTR. — Solitary or a few together among leaves of deciduous trees (*Fagus*) on calcareous soil; not yet known from the Netherlands. Aug.–Nov. Very rare in England and Germany.

Coprinus episcopalis is a rather large species in subsect. *Alachuani* and easy to recognise by the characteristic shape of the spores. The American

species *C. maysoidisporus* (Redhead & Traquair in Mycotaxon 13: 381. 1981) is rather close but the spores in that species never have an apical papilla and are somewhat smaller. Furthermore, the basidiocarps of *C. maysoidisporus* are much smaller (4.5–7 mm when still closed).

76. Coprinus phaeosporus P. Karst. in Meddn Soc. Fauna Fl. fenn. 6: 9. 1881. – Fig. 78.

Coprinopsis phaeospora (P. Karst.) P. Karst. in *Acta Soc. Fauna Fl. fenn*. 2(1): 28. 1881. — *Coprinus saichiae* D. Reid in Trans. Br. mycol. Soc. 41: 430. 1958.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 311, fig. 24. 1997.

VERN. NAME — Kleinsporige halminktzwam.

Pileus 5–15(20) × 3–12 mm when still closed, subglobose, ellipsoid, oval or conical, up to 30 mm when expanded, white with ochre-brown, velvety scales, especially around disk. Lamellae, L = 32–38, l = 0–3, crowded, free, first white, then dark grey to blackish. Stipe up to 120 × 0.5–2 mm, white, greyish white, almost glabrous.

Spores 5.5–8.0 × 4.5–7.0 × 4.5–6.0 µm, Q = 1.05–1.30, av. Q = 1.10–1.20, av. L = 6.1–7.1 µm, av. B = 5.3–6.3 µm, subglobose or ovoid, sometimes slightly the shape of a maize-kernel, often truncate, not strongly but distinctly flattened, dark red-brown; germ pore slightly to rather strongly eccentric, sometimes central, 1.0–1.3 µm wide. Basidia 14–28 × 7–9 µm, 4-spored, surrounded by 4–7 pseudoparaphyses. Cheilocystidia 30–100(120) × 10–30 µm, oblong, utriform or subcylindrical. Pleurocystidia 50–100(150) × 10–30 µm, oblong, (sub)cylindrical or subutriform. Elements of veil thick-walled, strongly multiple-branched and diverticulate, 2–10 µm wide; walls less than 1.5 µm thick, pale yellow-brown. Clamp-connections present.

HABITAT & DISTR. — Solitary, in small groups on herbs and grasses; rather common in the Netherlands. Jan.–Nov. Widespread in Europe.

The subglobose, rather strongly flattened spores, which have in most cases a slightly to rather strongly eccentric germ pore, distinguish *C. phaeosporus* from *C. pseudofriesii* and *C. xantholepis*, both of which have more broadly ellipsoid and somewhat larger, not distinctly flattened spores. Only in *C. xantholepis* is the germ pore sometimes slightly eccentric. *Coprinus argenteus* P.D. Orton (in Notes R. bot. Gdn Edinb. 32: 139. 1972) differs by the slightly smaller spores (4.5–6.5 × 4.5–6.0 × 4.5–6.0 µm). It is only known from the type locality in England. *Coprinus herinkii* Pilát & Svrček (in Česká Mykol. 21: 137. 1967) also has smaller, more rounded spores, and thick-walled velar elements.

77. Coprinus pseudofriesii Pilát & Svrček, Česká Mykol. 21: 140. 1967. – Fig. 79.

Coprinopsis pseudofriesii (Pilát & Svrček) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 312, fig. 25. 1997.

VERN. NAME — Grote halminktzwam.

Pileus 5–10 × 3–8 mm when still closed, up to 20 mm when expanded, first conical-ellipsoid or conical, rounded at apex and whitish with pale brown, ochre centre. Veil breaking up in ochre-brown patches, becoming paler with age. Lamellae, L = 32–40(50), l = 0–3, crowded, free, first white, then grey to blackish. Stipe up to 60 × 1–2 mm, white, greyish white, somewhat floccose at base.

Spores 6.0–10.0 × 5.0–8.0 µm, Q = (1.05)1.15–1.55, av. Q = 1.25–1.40, av. L = 7.0–8.9 µm, av. B = 5.4–6.8 µm, broadly ellipsoid, ellipsoid, ovoid or slightly rhomboid, rounded to somewhat conical at base and apex, medium dirty red-brown; germ pore central, 1.5 µm wide. Basidia 18–32 × 9–11 µm, 4-spored, surrounded by 4–7 pseudoparaphyses. Cheilocystidia 30–80 × 7–22 µm, similar to pleurocystidia. Pleurocystidia 60–120 × 10–27 µm, (sub)cylindrical or narrowly utriform. Elements of veil thick-walled, multiple-branched and diverticulate, 3–8 µm wide; walls up to 1.5 µm thick, distinctly yellow, very clear in microscope; excrescences up to 20 µm in length. Clamp-connections present.

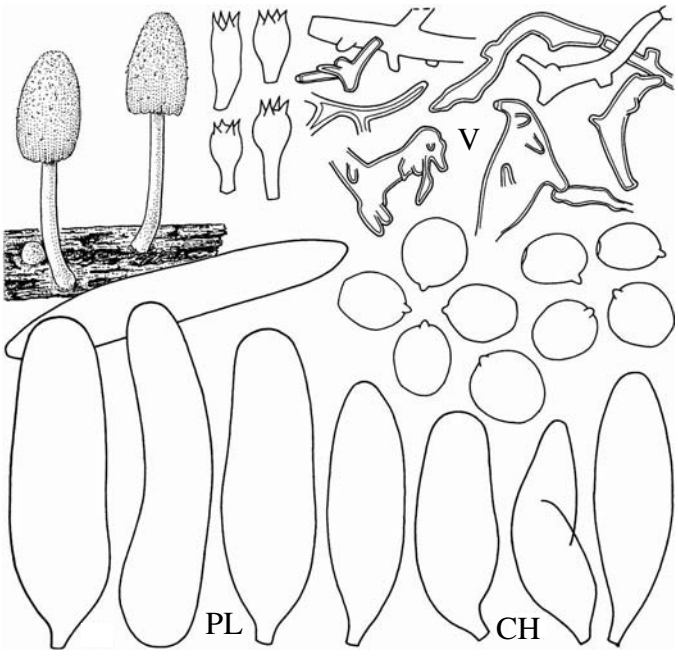


Fig. 78. *Coprinus phaeosporus*

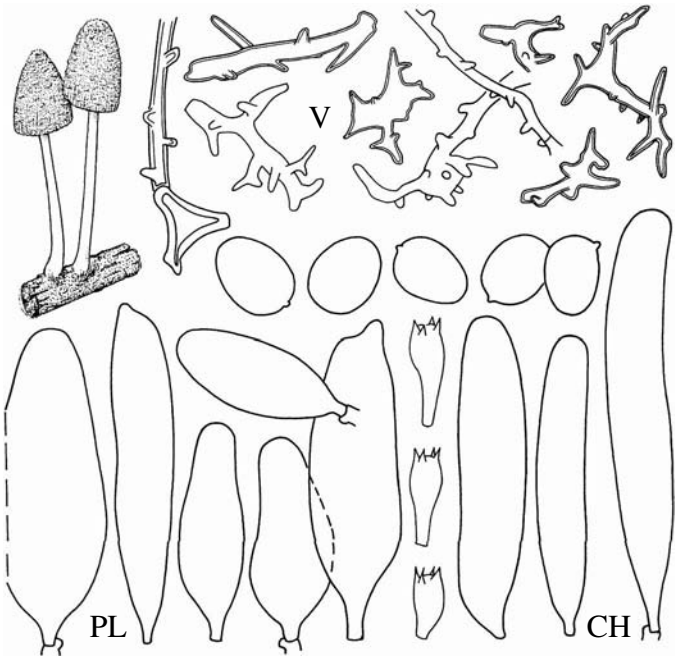


Fig. 79. *Coprinus pseudofriesii*

HABITAT & DISTR. — Solitary or subfasciculate; on wood, especially dead branches, also found on herbs and grasses; rather common in the Netherlands. June–Nov. Widespread in Europe.

Coprinus pseudofriesii is characterised by the slightly thick-walled veil (up to 1.5 µm wide); the ellipsoid, ovoid, or rhomboid spores up to 9 or 10 µm in length; and the rather large basidiocarps. *Coprinus pseudofriesii* differs from *C. friesii* by the larger basidiocarps, the generally lignicolous habitat, and less thick walls of velar elements, and from *C. phaeosporus* by the not distinctly flattened, more ellipsoid spores with central germ pore. *Coprinus xantholepis* has much larger cystidia.

78. Coprinus tigrinellus Boud. in Bull. Soc. bot. Fr. 32: 283. 1885. – Fig. 80.

Coprinopsis tigrinella (Boud.) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001. *Coprinus subtigrinellus* Dennis in Kew Bull. 15: 122–123. 1961; *Coprinopsis subtigrinella* (Dennis) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001.

SEL. ICON. — Arnolds in Arnolds et al., Overz. Paddest. Nederland: pl. 5D. 1995; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 304. 1995.

SEL. DESCR. & FIGS. — Bas in Coolia 15: 43–48. 1972; Krieglsteiner et al. in Z. Mykol. 48: 75. 1982; P.D. Orton & Watl. in Br. Fung. Fl. 2: 55–56, fig. 101. 1979.

VERN. NAME — Gespikkelde halminktzwam.

Pileus 5–10 × 3–6 mm when still closed, up to 14 mm when expanded, ovoid, conical or ellipsoid, whitish with dark brown, sepia centre. Veil breaking up in dark brown, woolly scales and becoming paler with drying. Lamellae, L = 32–40(50), l = 0–3, rather crowded, free, first white, then grey to blackish. Stipe up to 60 × 1–2 mm, white, greyish white, somewhat floccose at base.

Spores 5.5–10.5 × 4.0–8.5 µm, Q = 1.05–1.45, av. Q = 1.20–1.30, av. L = 6.1–10.1 µm, av. B = 4.6–8.0 µm, ovoid or ellipsoid, mainly rounded at base and apex, medium red-brown; germ pore central to slightly eccentric, 1.3–1.5 µm wide. Basidia 12–28 × 8–10 µm, 4-spored, surrounded by (4)5–7(8) pseudoparaphyses. Cheilocystidia 40–80(100) × 18–28(32) µm, (sub)cylindrical, oblong, ellipsoid, conical or utriform. Pleurocystidia 50–100(120) × 16–25(28) µm, subcylindrical, oblong and then often with tapering apex. Elements of veil thick-walled, multiple-branched and diverticulate, 3–7(10) µm wide; excrescences rounded; walls up to 1.5 µm thick. Clamp-connections present.

HABITAT & DISTR. — In small groups, solitary or subfasciculate, on *Phragmites* and other grasses, widespread in the Netherlands and in Europe but not common. June–Nov. Also recorded from Venezuela.

Although *C. tigrinellus* usually is macroscopically fairly well characterised by the dark brown (sepia) veil on the pileus, this may be less distinctly developed. The distinctive character, however, of this species is to be found in the rounded excrescences of the elements of the veil.

79. Coprinus xantholepis P.D. Orton in Notes R. bot. Gdn Edinb. 32: 150. 1972. – Fig. 81.

Coprinopsis xantholepis (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 232. 2001.

SEL. DESCR. & FIGS. — P.D. Orton in Notes R. bot. Gdn Edinb. 32: 150. 1972; P.D. Orton & Watl. in Br. Fung. Fl. 2: 49–50, figs. 81, 82. 1979.

VERN. NAME — Grootcellige halminktzwam.

Pileus 8–10 × 4–5 mm when still closed, up to 20 mm when expanded, first cylindrical, ellipsoid, ovoid or somewhat conical, whitish with

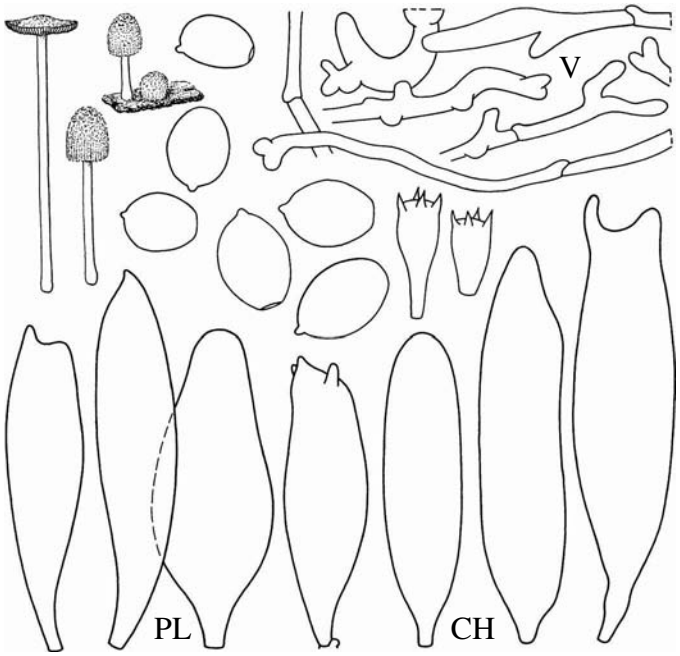


Fig. 80. *Coprinus tigrinellus*

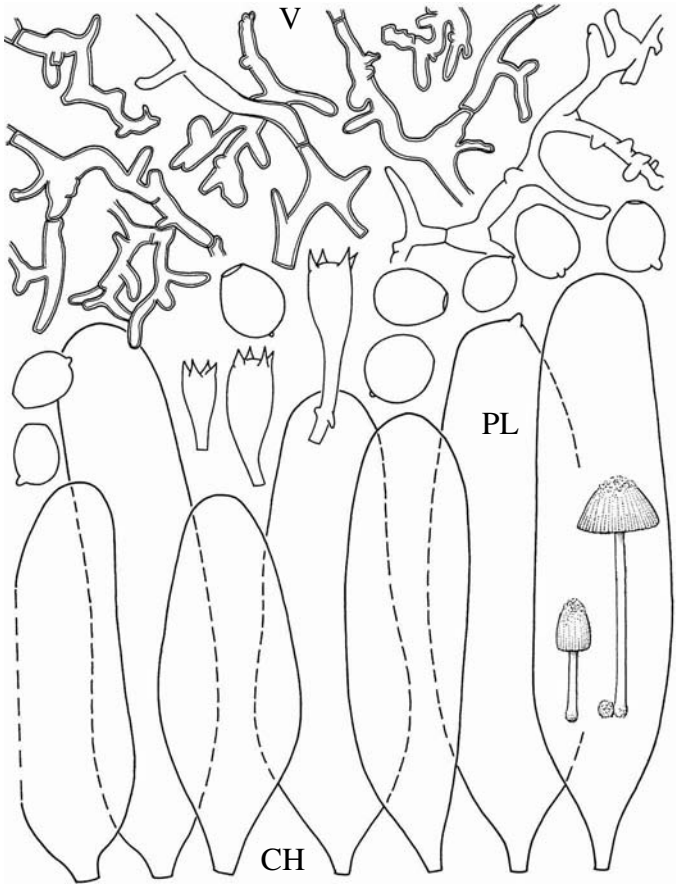


Fig. 81. *Coprinus xantholepis*

ochre centre. Veil breaking up in felty, ochre scales and becoming paler. Lamellae, L = 34–46, l = 0–3, rather crowded, free, first white, then grey to blackish. Stipe up to 60 × 1–1.5 mm, white, greyish white, somewhat floccose at clavate base.

Spores 5.0–7.0 × 4.5–6.0 µm, Q = 1.00–1.30, av. Q = 1.10–1.20, av. L = 5.9–6.3 µm, av. B = 5.4 µm, short ovoid or ovoid, truncate, medium red-brown; germ pore central, rarely slightly eccentric, 1.3–1.5 µm wide. Basidia 18–44 × 8–11 µm, 4-spored, surrounded by (3)4–6(7) pseudoparaphyses. Cheilocystidia 40–120 × 18–32(40) µm, similar to pleurocystidia. Pleurocystidia 80–180 × 25–40(60) µm, (sub)cylindrical, oblong or utriform. Elements of veil thick-walled, strongly multiple-branched and diverticulate, in general with rounded protuberances, 3–7(10) µm wide; walls up to 1 µm thick, pale brown. Clamp-connections present.

HABITAT & DISTR. — In small groups, solitary or subfasciculate, on grasses and herbs; in the Netherlands very rare (Kortenhoef). Oct. Also known from Scotland.

Coprinus xantholepis differs from *C. phaeosporus*, *C. pseudofriesii,* and *C. tigrinellus* particularly by the larger and broader cystidia.

80. Coprinus friesii Quél. in Mém. Soc. Émul. Montbéliard, Sér. II, 5: 129. 1872 (Champ. Jura Vosges). – Fig. 82.

Coprinopsis friesii (Quél.) P. Karst. in Acta Soc. Fauna Fl. fenn. 2(1): 27. 1881. *Coprinus rhombisporus* P.D. Orton in Notes R. bot. Gdn Edinb. 32: 145. 1972.

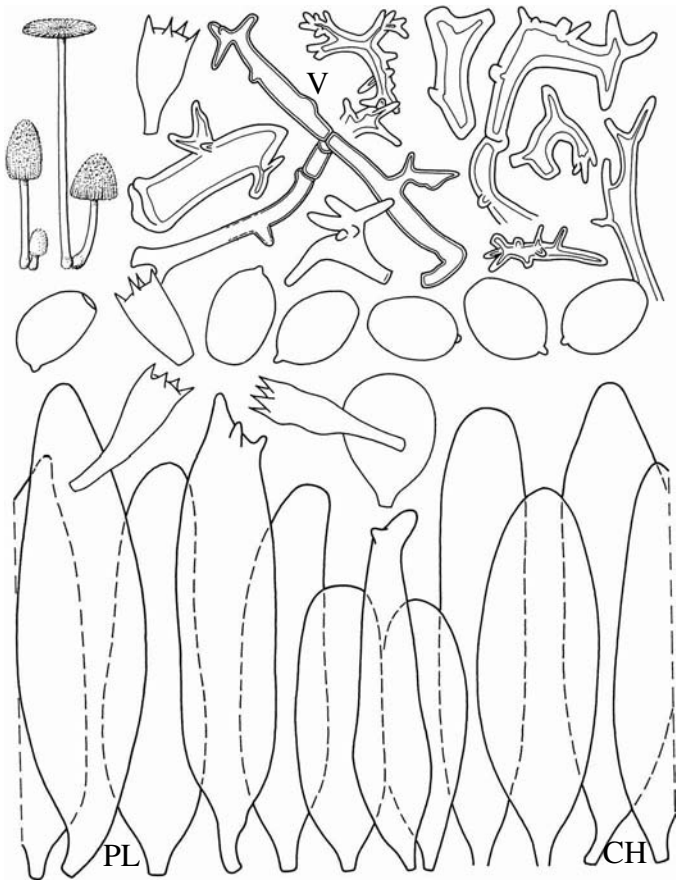


Fig. 82. *Coprinus friesii*

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 16: 318, fig. 28. 1997.

VERN. NAME — Bleke halminktzwam.

Pileus 3–8 × 2–6 mm when still closed, up to 15 mm when expanded, conical, ovoid or ellipsoid, whitish with ochre centre. Veil breaking up in cream-coloured to ochre patches. Lamellae, L = 40, l = 0–3, rather crowded, free, first white, then grey to blackish. Stipe up to 35 × 1–1.5 mm, white, greyish white, somewhat floccose at the slightly clavate base.

Spores 6.0–9.5(11.0) × 5.5–7.0(8.5) µm, Q = 1.10–1.40(1.50), av. Q = 1.20–1.30, av. L = 7.6–8.3(9.7) µm, av. B = 6.0–6.8(7.9) µm, ovoid to slightly rhomboid, mainly rounded at base and apex or in part somewhat conical, medium red-brown; germ pore central, 1.3–1.6 µm wide. Basidia 14–32 × 8–9 µm, 4-spored, surrounded by 5–7 pseudoparaphyses. Cheilocystidia 30–100 × 14–32 µm, (sub)cylindrical, oblong, narrowly conical or ellipsoid. Pleurocystidia 80–125 × 16–22 µm, (sub)cylindrical, oblong or narrowly conical. Elements of veil thick-walled, strongly multiple-branched and diverticulate, 2–8 µm thick; walls more than 1.5 µm thick, up to (2)2.5–3(4) µm in places and not or only slightly coloured. Clamp-connections present.

HABITAT & DISTR. — In small groups, subfasciculate, generally on grasses; common in the Netherlands. Feb.–Nov. Common in Europe; recorded from Canada, South America, and North Africa.

Coprinus friesii can be recognised by the ovoid or rhomboid spores with average length of 8 µm in combination with the strongly thick-walled, not or slightly coloured veil. *Coprinus friesii* differs from *C. pseudofriesii* by smaller basidiocarps, not or only slightly coloured walls of veil, which are more than 2 µm thick in places and the habitat: *C. friesii* grows on grasses, whereas *C. pseudofriesii* is mainly lignicolous.

81. Coprinus vermiculifer Dennis in Kew Bull. 19: 112. 1964.

Coprinus vermiculifer Joss. in Bull. trimest. Soc. mycol. Fr. 60: 5 ('1944') 1945 (invalid, no Latin diagnosis); *Coprinopsis vermiculifer* (Dennis) Redhead, Vilgalys & Moncalvo in Taxon 50: 232. 2001.

SEL. DESCR. & FIGS. — Joss. in Bull. trimest. Soc. mycol. Fr. 60: 6–7, fig. 1. 1944.

VERN. NAME — Schapenmestinktzwam.

CHARACTERISTICS — Pileus 6 × 4 mm when still closed, expanded 8–16 mm, rounded conical, first entirely covered with white, felty veil, at centre often sepia-coloured and persistent there, breaking up in small, hairy-floccose scales; lamellae crowded, free, first white, later blackish brown; stipe up to 30 × 0.5–1 mm, whitish, minutely fibrillose-floccose, later glabrous; base slightly bulbous.

Spores 8.5–13.5 × 6.0–9.0 µm, Q = 1.30–1.75, av. Q = 1.50–1.60, av. L = 10.3–12.4 µm, av. B = 6.8–7.9 µm, ellipsoid or ovoid, rounded at base and apex, dark red-brown; germ pore central, 1.5 µm wide; basidia 14–28 × 9–10 µm, 4-spored, surrounded by 4–6 pseudoparaphyses; cheilocystidia 35–55 × 20–32 µm, ellipsoid or (sub)globose; pleurocystidia 60–90 × 25–28 µm, ellipsoid, (sub)cylindrical; elements of veil thick-walled, 3–9 µm wide, diverticulate and strongly, multiple-branched with long, thick-walled terminal elements, ascending from the pileipellis; walls up to 1.5(2.5) µm thick; clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, in small groups on dung of sheep; not known from the Netherlands. Oct. Very rare and

known from England, France, and Namibia, where it is found on elephant droppings.

Microscopically *C. vermiculifer* can easily be recognised by the brown, thick-walled terminal elements of the veil in combination with the large spores and the habitat on dung.

82. Coprinus spilosporus Romagn. in Rev. Mycol. 16: 127. 1951.

Coprinopsis spilospora (Romagn.) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001.

SEL. ICON. — Cacialli et al., Schede Micol. 1: 139. 1995; Jamoni in *Funghi Amb.* 47: between 16 and 17, pl. 110. 1988.

SEL. DESCR. & FIGS. — Romagn. in Rev. Mycol. 16: 112–113, fig. 2. 1951; Usuelli & Damiani in Bull. trimest. Soc. mycol. Fr. 77 (4): 163. 1999.

CHARACTERISTICS — Pileus 10–20 × 8–15 mm when still closed, 25–40 when expanded, subglobose, broadly ellipsoid or ovoid, then hemispherical or obtusely conical to convex, very deliquescent, white, then grey with pale brown to ochre centre; veil felty, silky fibrillose, then splitting up in small, woolly-felty, white flocks, at the tips and in centre becoming brownish, ochre-brown; lamellae, L = 50–60, very crowded, white then grey-brown, finally black; stipe 40–80 × 2.5–3.5 mm, equal or slightly tapering to the apex, snow-white at submarginate bulbous base, upwards and at maturity more watery white or slightly brownish, minutely fibrous-floccose when fresh.

Spores 7.5–9.5 × (5.5)7.0–9.5 µm, Q = 1.00–1.20(1.40), av. Q = 1.05–1.10(1.25), av. L = 7.6–8.7 µm, av. B = (6.7)7.2–8.2 µm, subglobose, globose, the shape of a maize-kernel or rounded quadrangular (some spores are elongate cylindrical-ovoid, the breadth, av. B, Q and av. Q are put in parentheses), truncate, with distinctly paler spot on the supra hilar plage, or with entirely pale plage, red-brown (Mu. 2.5 YR 3/6–5 YR 4/6; K. & W. 8E8–8E6); germ pore large, slightly eccentric to almost central, 2.8–3.0 µm wide (in some spores, two very small apiculus-like knobs occur on the sides.); basidia 22–36 × 8.5–10 µm, 4-spored, surrounded by (4)5–6 pseudoparaphyses; cheilocystidia similar to pleurocystidia but somewhat smaller in part; pleurocystidia 80–200 × 25–60 µm, utriform, conical or fusiform and then rather acute at apex in most cases or utriform; elements of veil 2–8 µm wide, strongly diverticulate; excrescences up to 20 µm in length with very thick walls, up to 3 µm thick and pale yellowish; long, up to 350 µm and 2–4 µm wide, thick-walled, hair-like terminal elements grow out of thick-walled, veil-like hyphae. Clamp-connections present.

HABITAT & DISTR. — Solitary or a few together, on bare, gravelly-calcareous soil or in deciduous forests in mossy places, also found on burnt places; not yet known from the Netherlands. In Europe very rare, known from France, Italy, and possibly Germany.

The macroscopic description has been taken from the selected descriptions. The paler spot on the plage or the entirely pale plage of the spores is a good character to distinguish *C. spilosporus* from *C. gonophyllus*. In addition the very thick-walled veil with elongate, hair-like terminal elements (up to 350 µm in length) and the (in great part) conical or fusiform cystidia are salient characters for this species.

83. Coprinus phlyctidosporus Romagn. in Rev. Mycol. 10: 88. 1945. – Fig. 83.

Coprinopsis phlyctidospora (Romagn.) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001.

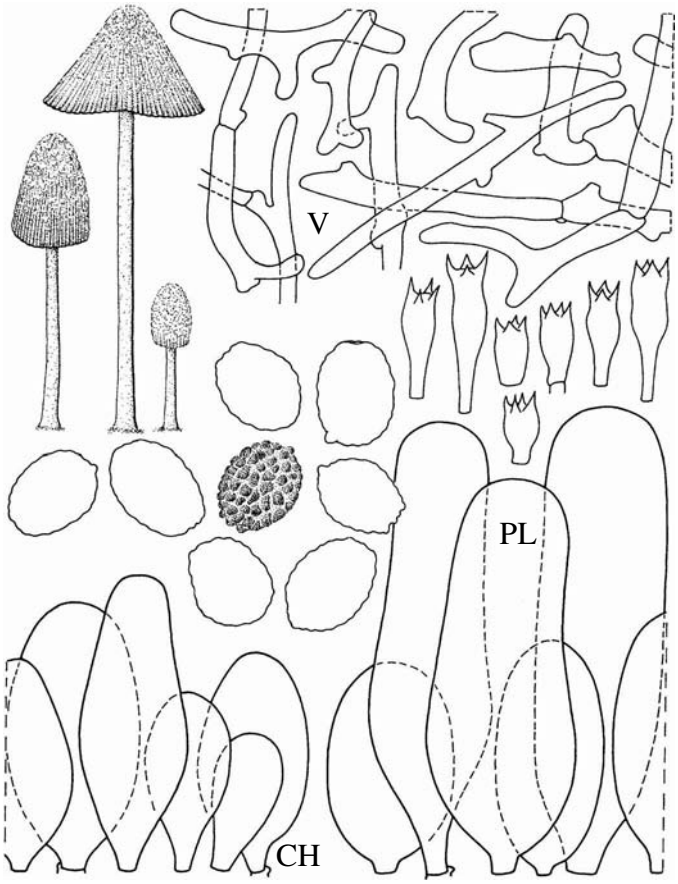


Fig. 83. *Coprinus phlyctidosporus*

SEL. ICON. — Cetto, Gr. Pilzf. 5: pl. 1721. 1987; Imler & Springael in Sterbeeckia 12: 2. 1979; Rocabruna in Bolets Catalunya 18: pl. 858. 1999.

SEL. DESCR. & FIGS. — Geesink in Coolia 16: 73. 1973; Imler & Springael in Sterbeeckia 12: 4. 1979: ; Romagn. in Rev. Mycol. 10: 73. 1945; Uljé & Noordel. in Persoonia 16: 326–328, fig. 33. 1997.

VERN. NAME — Tandsporig hazenpootje

Pileus 5–20 × 3–15 mm when still closed, 8–30(40) mm when expanded, ellipsoid, ovoid, at first white, soon becoming grey, centre dark (Mu. 5 YR 2.5/2, 7.5 YR 5/2, 10 YR 4/3 below veil). Veil white to grey, breaking up in small, radial hairy-fibrillose scales, not in patches. Lamellae, L = 18–42, l = 0–3, free, first white, then greyish, finally blackish. Stipe up to 80 × 1–3 mm, whitish, base slightly clavate.

Spores 7.5–11.0 × 5.5–8.0 µm, Q = 1.20–1.50, av. Q = 1.30–1.40, av. L = 8.4–10.6 µm, av. B = 6.0–7.6 µm, ovoid, with rounded base and apex, but rather truncate, with warty ornamentation, very dark red-brown; germ pore central, 1.5–2.0 µm wide. Basidia 20–35 × 7–9 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–70 × 15–30 µm, ellipsoid, ovoid, (sub)globose or utriform. Pleurocystidia 50–110 × 20–35 µm, ellipsoid, oblong, utriform or cylindrical. Elements of veil thin-walled, diverticulate, 2–8 µm wide. Clamp-connections present.

HABITAT & DISTR. — Subfasciculate, in small groups, on wood, generally on dead branches on the ground, also on burnt places; not

common but widespread in the Netherlands. March–Nov. Widespread in Europe, also recorded from Japan.

Coprinus phlyctidosporus resembles a small specimen of *C. lagopus*. It is microscopically clearly distinguished by the warty, ovoid spores. The 4-spored basidia differentiate it from *C. rugosobisporus*. The type of *C. lagopides* P. Karst. belongs to this species, but the name has always been used for *C. jonesii*. Therefore the name *C. lagopides* is proposed for formal rejection.

84. Coprinus rugosobisporus Geesink & Imler in Sterbeeckia 12: 9. 1979. – Fig. 84.

Coprinopsis rugosobispora (Geesink & Imler) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001.

MISSAPL. — *Coprinus phylyctidosporus* sensu Geesink in Coolia 16: 73. 1973; Huijsman in Coolia 22: 20. 1979.

SEL. DESCR. & FIGS. — Geesink in Coolia 16: 73. 1973 (as. *C. phlyctidosporus*); Geesink & Imler in Sterbeeckia 12: 9. 1979; Huijsman in Coolia 22: 20. 1979 (as *C. phlyctidosporus*).

VERN. NAME — Tweesporig hazenpootje.

Pileus 15 × 10 mm when still closed, up to 30 mm when expanded, ellipsoid or ovoid when young, first white, soon greyish. Veil white to grey, breaking up in radial hairy/fibrillose flocks, not in patches. Lamellae, L = 18–42, l = 0–3, rather crowded, free, first white, then grey, finally blackish. Stipe up to 80 × 1–3 mm, whitish, base slightly clavate.

Spores 9.0–12.0 × 7.0–9.0 µm, Q = 1.15–1.40, av. Q = 1.30 av. L = 10.3–10.6 µm, av. B = 7.9–8.1 µm, ovoid with rounded base and rather truncate apex, with warty ornamentation, very dark red-brown; germ pore central, 1.5–2 µm wide. Basidia 16–34 × 6–8 µm, 2-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–70 × 20–35 µm, (sub)globose, ellipsoid, narrowly ovoid, utriform or broadly cylindrical. Pleurocystidia 50–80 × 30–40 µm, ellipsoid, utriform or broadly cylindrical. Elements of veil thin-walled, diverticulate, 2–8 µm wide. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate on wood, also found on charcoal; in the Netherlands very rare (Wieringermeer). July–Oct. Also known from Belgium.

Like *C. phlyctidosporus*, this species is characterised by warty, ovoid spores, but these are borne on 2-spored basidia. Therefore, it could be a 2-spored form of that species, but then the spores would be distinctly larger than in the 4-spored *C. phlyctidosporus*. For the time being *C.rugosobisporus* is therefore considered a separate species.

85. Coprinus echinosporus Buller in Trans. Brit. mycol. Soc. 6: 363. 1920. – Fig. 85.

Coprinus echinosporus Buller in Trans. Br. mycol. Soc. 3: 350. 1912 (invalid); *Coprinopsis echinospora* (Buller) Redhead, Vilgalys & Moncalvo in Taxon 50: 227. 2001. — *Coprinus giganteoporus* Huijsman in Fungus 25: 19. 1955.

SEL. ICON. — Arnolds in Arnolds et al., Overz. Paddest. Nederland: pl. 4B. 1995; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 274. 1995; Læssøe in Svampe 20: 64. 1989.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 312–313, fig. 129. ('1982') 1983; Buller in Trans. Br. mycol. Soc. 6: 363. 1920; P.D. Orton & Watl. in Br. Fung. Fl. 2: 35. 1979.

VERN. NAME — Wratsporig hazenpootje.

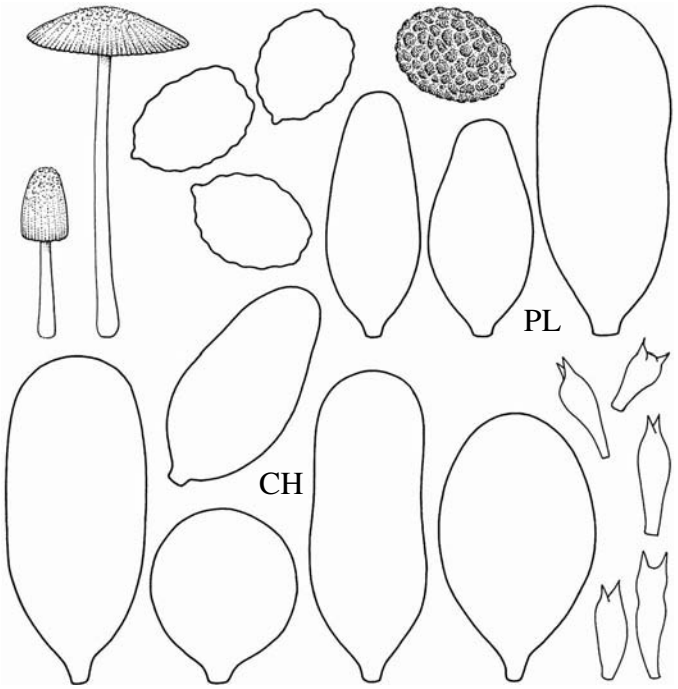


Fig. 84. *Coprinus rugosobisporus*

Pileus 10–20 × 5–10 mm when still closed, ellipsoid or ovoid, 10–30 mm when expanded, first white, soon becoming greyish; centre very dark under veil. Veil white to grey, radially splitting up in minute, hairy-fibrillose scales. Lamellae, L = 18–42, l = 0–3, rather crowded, free, first white, then greyish, finally blackish. Stipe up to 100 × 1–3 mm, whitish; base slightly clavate, up to 4 mm wide.

Spores 8.5–12.0(13.0) × 6.0–8.0 µm, Q = 1.25–1.80, av. Q = 1.35–1.60, av. L = 9.2–11.1 µm, av. B = 6.8–7.4 µm, amygdaliform with warty ornamentation, truncate, very dark red-brown in most cases; germ pore central, 1.5–1.8 µm wide. Basidia 16–38 × 8–9.5 µm, 4-spored, surrounded by 3–6(7) pseudoparaphyses. Cheilocystidia 25–100 × 20–55 µm, subglobose, ellipsoid, utriform or (sub)cylindrical. Pleurocystidia 60–120(150) × 20–50(80) µm, ellipsoid, oblong, utriform or (sub)cylindrical. Elements of veil thin-walled, diverticulate, 2–8 µm thick. Clamp-connections present.

HABITAT & DISTR. — In small groups on wood; widespread but not common in the Netherlands. May–Dec. Widespread in Europe.

Coprinus echinosporus is easily recognised by the warty, amygdaliform spores and the 4-spored basidia. The spores of *C. phlyctidosporus* and *C. rugosobisporus* are ovoid.

86. Coprinus piepenbroekii Uljé & Bas in Persoonia 15: 365. 1993. – Fig. 86.

Coprinopsis piepenbroekii (Uljé & Bas) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001.

SEL. ICON. — Uljé in Micologia 2000: 538. 2001.

SEL. DESCR. & FIGS. — Uljé & Bas in Persoonia 15: 365–367, fig. 4. 1993.

VERN. NAME — Groenige vlokinktzwam.

Pileus 10 × 7 mm when still closed, up to 20 mm when expanded, first ellipsoid or ovoid, then obtusely conical to convex, pale brown, darker

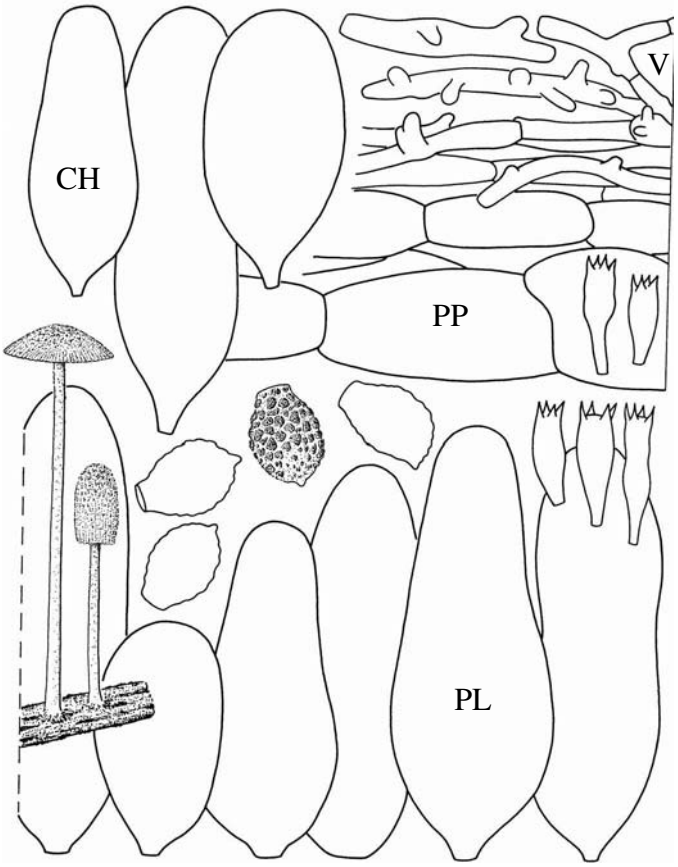


Fig. 85. *Coprinus echinosporus*

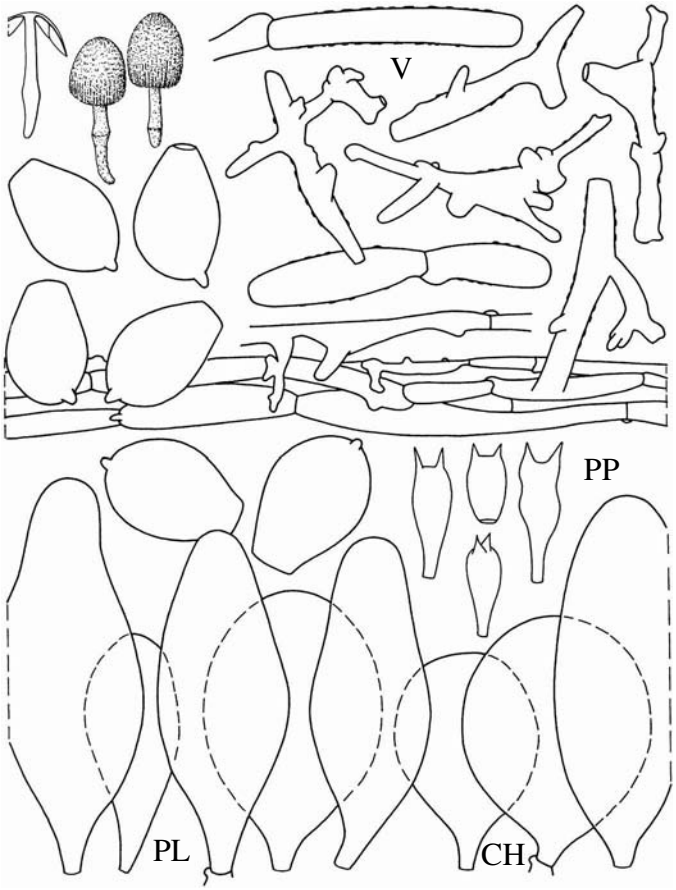


Fig. 86. *Coprinus piepenbroekii*

in centre. Veil ochre with distinct green tinge, around centre breaking up in small, floccose scales. Lamellae rather crowded, free, first white, then grey-brown, finally black. Stipe up to 40 × 1–2 mm, whitish; base slightly clavate.

Spores 12.0–15.5 × 7.5–10.5 µm, Q = 1.30–1.60, av. Q = 1.45–1.50, av. L = 12.7–13.8 µm, av. B = 8.4–9.4 µm, amygdaliform, smooth, truncate, dark red-brown; germ pore central, 2.5 µm wide. Basidia 15–32 × 9–12 µm, 2-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 40–85 × 25–45 µm, (sub)globose, ellipsoid, sometimes oblong. Pleurocystidia 55–90 × 22–40 µm, subglobose, ellipsoid or utriform. Elements of veil thin-walled, diverticulate, 3–9(12) µm thick, rather strongly incrusted. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, in small groups on burnt places, in the Netherlands very rare, only known from one locality (Wilp). July. Not yet known from other countries.

Microscopically *C. piepenbroekii* is easily recognised by the smooth, large, amygdaloid spores and the 2-spored basidia. The greenish tinge of the fresh basidiocarps is characteristic for this species.

Sect. **Veliformes** (Fr.) Penn.

Pileus very small to medium-sized; expanded pileus 0.1–50 mm. Pileus with veil made up of, at least in part, (sub)globose cells mixed or not with elongate, hyphal elements. Pileipellis made up of radial chains of (sub)globose or fusiform cells, often covered by a very thin layer of narrow hyphae. Stipe smooth and/or covered with very small velar flocks or, in some species, covered with lageniform or (sub)globose caulocystidia.

Subsect. **Micacei** (Fr.) Uljé & Noordel.

Pileus medium-sized, somewhat fleshy, pale ochre, rust or cinnamon; stipe 3–10 mm thick; veil made up of very small, scattered, granular flocks, not covering entire pileus when young, made up of (sub)globose, hyaline, thin-walled cells, not in chains; pileus subglobose to ovoid, only tardily expanding to campanulate.

87. Coprinus micaceus (Bull. :Fr.) Fr., Epicrisis: 247. 1838. – Fig. 87.

Agaricus micaceus Bull., Herb. Fr.: pl. 246. 1786; *Agaricus micaceus* Bull. :Fr., Syst. mycol. 1: 309. 1821; *Coprinellus micaceus* (Bull. :Fr.) Vilgalys, Hopple & Johnson in Taxon 50: 234. 2001.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 294. 1995; Imaz. et al., Fungi Japan: 205. 1988; M. Lange, Paddestoelengids: 141. 1964; R. Phillips, Paddest. Schimm.: 180. 1981.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 244.

VERN. NAME — Gewone glimmerinktzwam.

Pileus up to 35 × 30 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 50 mm wide, deep ochre or rust (Mu. 5 YR 3/4–4/6, 7.5 YR 4/6), paler towards

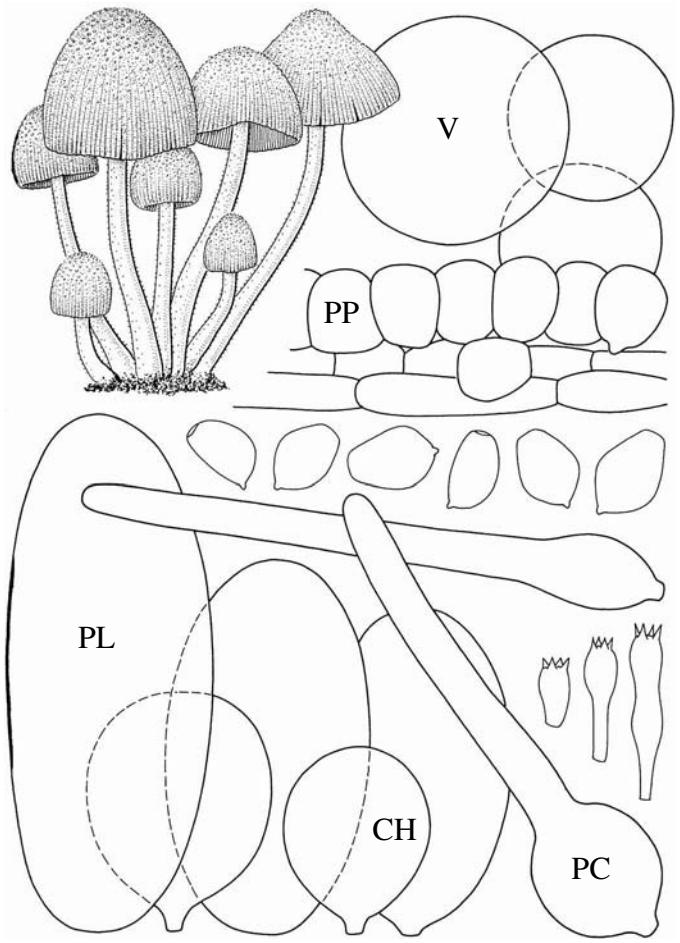


Fig. 87. *Coprinus micaceus*

margin, covered with minute, granular, whitish flocks, soon disappearing. Lamellae, L = 55–60, l = 3–5, free, first white, then grey-brown to black, 3–8 mm broad. Stipe 30–100 × 2–6 mm, white, pruinose over all, base clavate or bulbous, often with a volva-like margin.

Spores 6.5–10.0 × 4.5–7.0 × 4.5–5.5 µm, QB = 1.20–1.75, QW = 1.50–1.85, av. QB = 1.25–1.50, av. QW = 1.65–1.75, av. L = 7.4–9.3 µm, av. B = 5.3–6.3 µm, av. W = 4.3–5.5 µm, ellipsoid or ovoid with conical base (mitriform) and truncate apex, medium red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 16–43 × 7–9 µm, 4-spored, surrounded by 3–5(6) pseudoparaphyses. Cheilocystidia 30–140 × 30–80 µm, (sub)globose, ellipsoid, oblong or ovoid. Pleurocystidia 60–150 × 30–70 µm, ellipsoid, ovoid or oblong. Caulocystidia up to 100 µm long, lageniform. Veil made up of (sub)globose cells, 15–60(75) µm in diam., thin-walled, connected by narrowly, somewhat diverticulate hyphae. Pileipellis an epithelioid hymeniderm. Clamp-connections not found, only pseudoclamps.

HABITAT & DISTR. — Fasciculate or gregarious around trunks or on dead trees; very common in the Netherlands. Jan.–Dec. Widespread, and common in Europe, America, and Japan.

Coprinus micaceus differs from the other species in the complex by the spores with distinct conical base and truncate apex, and the caulocystidia on the stipe. *Coprinus rufopruinatus* Romagn. (in Bull. trimest. Soc. mycol. Fr. 92: 205. 1976) differs from *C. micaceus* mainly by the pinkish coloured veil, and needs rediscovery.

Ko et al. (in Mycol. Res. 105: 1519–1526. 2001) showed that there are molecular differences in collections from different geographical regions of the world.

88. Coprinus saccharinus Romagn. in Bull. trimest. Soc. mycol. Fr. 92: 203. 1976. – Fig. 88.

SEL. DESCR. & FIGS. Romagn. in Bull. trimest. Soc. mycol. Fr. 92: 201–202, fig. 6. 1976.

VERN. NAME — Parelglimmerinktzwam.

Pileus up to 35 × 30 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 50 mm wide, deeply coloured, ochre or rust covered with minute, granular, white flocks, disappearing not as quickly as in *C. truncorum*. Lamellae, L = 55–60, l = 3–5, free, first white, then grey-brown to black, 3–8 mm broad. Stipe 25–130 × 3–6 mm, white; base clavate with a volva-like margin.

Spores 6.0–9.5 × 5.0–6.5 × 4.5–5.5 µm, Q = 1.15–1.60, av. Q = 1.30–1.40, av. L = 7.1–8.2 µm, av. B = 5.4–5.9 µm, ellipsoid or ovoid, in part with somewhat conical base (slightly mitriform) and rounded or truncate apex, medium red-brown; germ pore central, 1.0–1.3 µm wide. Basidia 20–32 × 8–9 µm, 4-spored, surrounded by 3–5(–6) pseudoparaphyses. Pleurocystidia 70–140 × 40–70 µm, ellipsoid, ovoid or subcylindrical. Cheilocystidia 30–120 × 25–60 µm, (sub)globose, ellipsoid or ovoid. Caulocystidia absent or very sparse; veil made up of (sub)globose cells, 15–40 µm in diam., thin-walled, connected by narrowly, somewhat diverticulate hyphae. Pileipellis an epithelioid hymeniderm. Clamp-connections not found, only pseudoclamps present.

HABITAT & DISTR. — Fasciculate, sometimes gregarious around trunks or on dead trees; very rare (Leiden). Sept.–Oct. Widespread but rare in Europe, recorded from France, Germany, and Spain.

Coprinus saccharinus is rather similar to *C. truncorum*, but has also some characters of *C. micaceus*. In fact *C. saccharinus* seems to be intermediate between these species. The spores vary from ovoid (in *C. truncorum*) to submitriform (in part in *C. micaceous*). The white to greyish veil, described for *C. saccharinus*, can also be present in *C. micaceus*.

89. Coprinus truncorum (Scop.) Fr., Epicrisis: 248. 1838. – Figs. 89. 90.

Agaricus truncorum Scop., Fl. carn. 2: 426. 1772; *Coprinellus truncorum* (Scop.) Redhead, Vilgalys & Moncalvo in Taxon 50: 235. 2001.

SEL. ICON. — Bender & Enderle in Z. Mykol. 54: opposite 64. 1988.

SEL. DESCR. & FIGS. — Bender & Enderle in Z. Mykol. 54: 64. 1988; P.D. Orton & Watl. in Br. Fung. Fl. 2: 55, fig. 101. 1979.

VERN. NAME — Gladstelige glimmerinktzwam.

Pileus up to 35 × 30 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 50 mm wide, at first ochre (Mu. 7.5 YR 4/6–5/8; K. & W. 6D6), soon pale ochre (10 YR 5/6, 6/6, 7/6; 5D7, 4A3–4) with ochre centre, covered with minute, granular, whitish flocks but at least somewhat coloured at centre, soon disappearing. Lamellae, L = 55–60, l = 3–5, free, first white then grey-brown to black, 3–8 mm broad. Stipe 40–140 × 2–7 mm, white, smooth or very fine fibrillous, base clavate with a volva-like margin.

Spores 6.5–9.5 × 4.5–6.5(7.0) × 4.0–5.5 µm, QB = 1.25–1.60, av. QB = 1.40–1.55, QW = 1.55–1.75, av. QW = 1.55–1.70, av. L = 7.8–8.3 µm, av. B = 5.0–5.8 µm, av. W = 4.6–5.1 µm, ellipsoid or ovoid, with

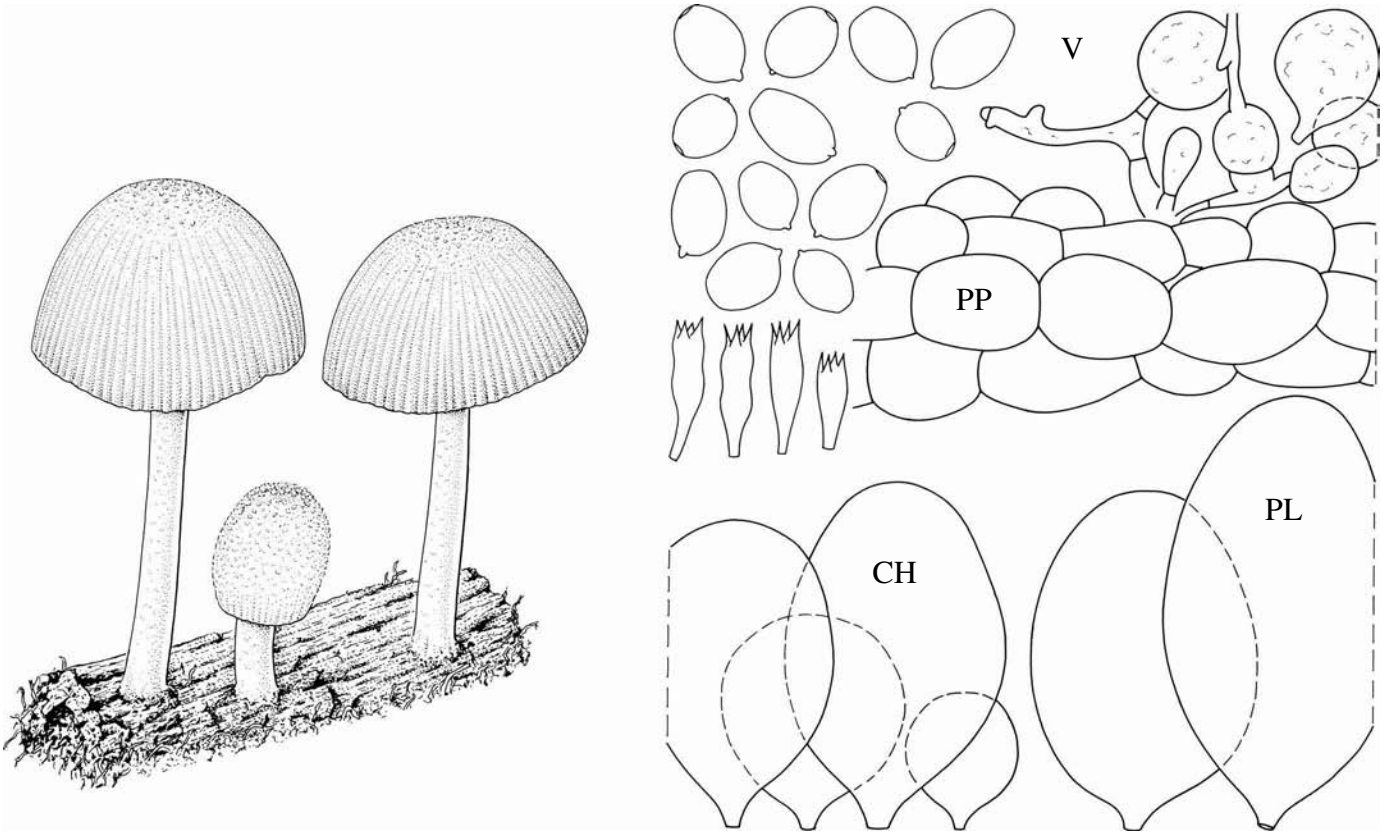


Fig. 88. *Coprinus saccharinus*

rounded base and apex, in part slightly truncate, medium red-brown; germ pore central, 1.0–1.3 µm wide. Basidia 14–38 × 8–9 µm, 4-spored, surrounded by 3–5(6) pseudoparaphyses. Cheilocystidia 40–130 × 25–70 µm, (sub)globose, ellipsoid or ovoid. Pleurocystidia 50–150 × 30–80 µm, ellipsoid, ovoid or subcylindrical. Caulocystidia absent or very sparse. Veil made up of subglobose cells, 15–40 µm in diam., thin-walled, connected by narrowly, somewhat diverticulate hyphae. Pileipellis an epithelioid hymeniderm. Clamp-connections not found, only pseudoclamps.

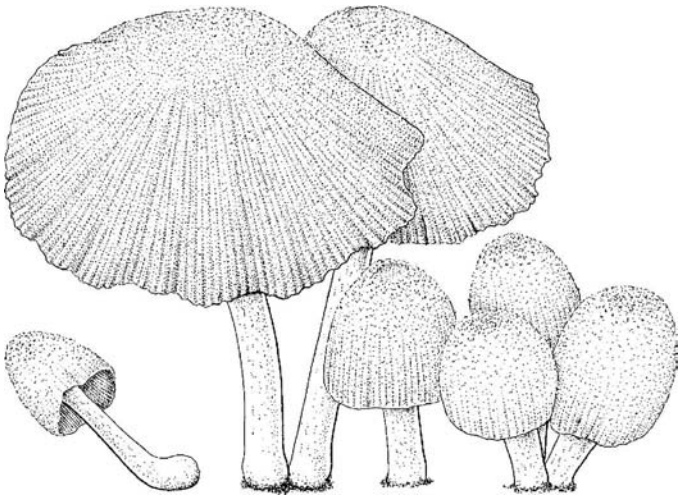


Fig. 89. *Coprinus truncorum*

HABITAT & DISTR. — Fasciculate or gregarious around trunks or on dead trees; rather rare but widespread in the Netherlands. Jan.–Dec. Known from Europe.

Coprinus truncorum is very close to *C. saccharinus*. Both species lack caulocystidia, but *C. truncorum* has pale ochre basidiocarps with very minute, soon disappearing, somewhat coloured, granular veil flocks, and the spores are only ovoid or ellipsoid, never in part somewhat mitriform, as in *C. saccharinus*. In *C. saccharinus* the veil is pure white.

90. Coprinus pallidissimus Romagn. in Bull. trimest. Soc. mycol. Fr. 92: 204. 1976. – Fig. 91.

SEL. DESCR. & FIGS. — Romagn. in Bull. trimest. Soc. mycol. Fr. 92: 203–204, fig. 6. 1976.

VERN. NAME — Bleke glimmerinktzwam.

Pileus up to 30 × 25 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 50 mm wide, pale ochre, covered with minute, granular, whitish flocks, soon dissapearing. Lamellae, L = 55–60, l = 3–5, free, first white, then grey-brown to black, 3–8 mm broad. Stipe 50–80 × 3.5–5 mm, white, base clavate with a volva-like margin.

Spores 6.5–9.5 × 4.5–5.5 × 5.0–5.5 µm, Q = 1.40–1.60, av. Q = 1.55, av. L = 7.8 µm, av. B = 5.0 µm, ellipsoid or ovoid, with rounded base and apex, in part slightly truncate, medium red-brown; germ pore central, 1.0–1.3 µm wide. Basidia 20–38 × 8–9 µm, 4-spored, surrounded by 3–5(6) pseudoparaphyses. Cheilocystidia 40–120 × 25–50 µm, (sub)globose, ellipsoid or ovoid. Pleurocystidia 50–110 × 30–50 µm,

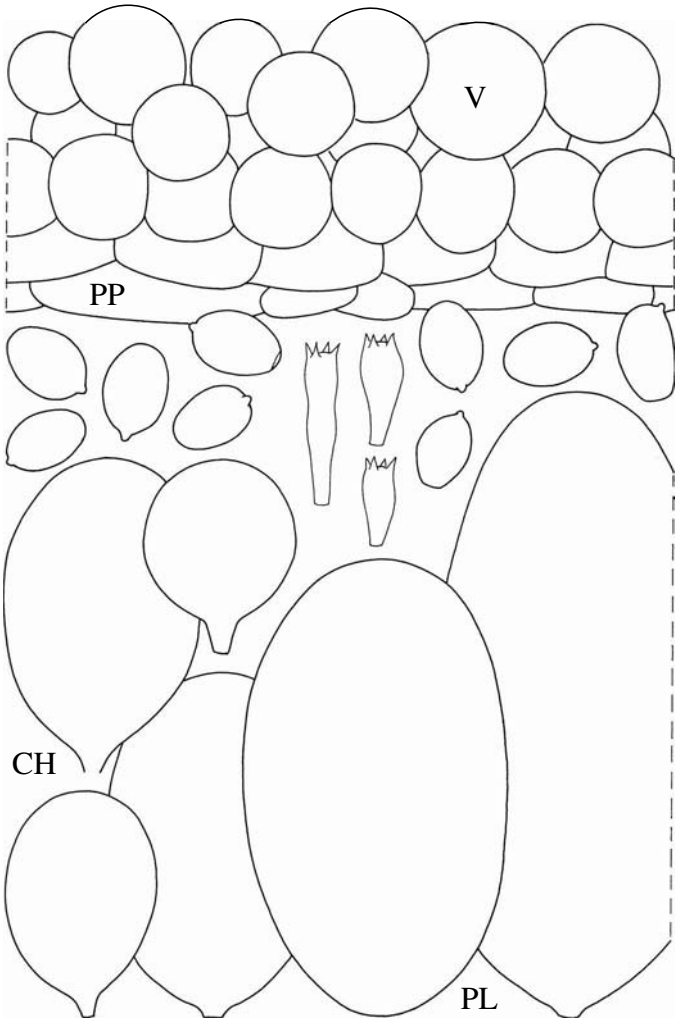


Fig. 90. *Coprinus truncorum*

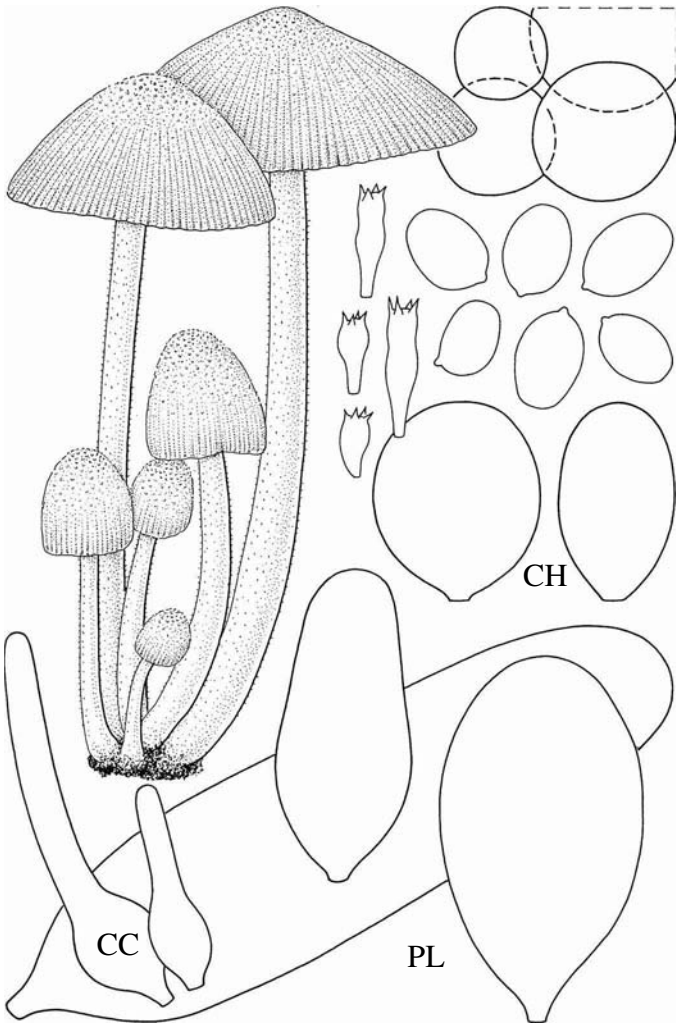


Fig. 91. *Coprinus pallidissimus*

oblong, ovoid or subcylindrical, rather numerous. Caulocystidia 25–80 × 10–20 (lower part) × 5–10 (neck) µm, lageniform, sometimes capitate. Veil made up of (sub)globose cells, 15–40 µm in diam., thin-walled, connected by narrowly, somewhat diverticulate hyphae. Pileipellis an epithelioid hymeniderm. Clamp-connections not found, only pseudoclamps.

HABITAT & DISTR. — Fasciculate around trunks or on dead trees, in the Netherlands very rare, known only from Linschoten. Aug. Also known from France.

Coprinus pallidissimus is distinguished not only by its pale colour, but above all by the abundance of pleurocystidia and caulocystidia. *Coprinus micaceus* and *C. rufopruinatus* are darker and have only rare and scattered pleurocystidia. The pale coloured *C. truncorum* lacks caulocystidia.

Subsect. **Domestici** Sing.

Pileus medium-sized, somewhat fleshy, pale ochre to ochre; stipe 3–10 mm wide; veil covering entire pileus when young, breaking up in small, woolly or felty flocks, made up of chains of cylindrical, ellipsoid, broadly fusiform or (sub)globose, hyaline, thin-walled and in part thick-walled and yellow-brown cells; terminal cells distinct, cylindrical, ellipsoid, ovoid or fusiform; pileus subglobose to ovoid, only tardily expanding to campanulate.

91. Coprinus flocculosus (DC. :Fr.) Fr., Epicrisis: 245. 1838. – Fig. 92.

Agaricus flocculosus DC. in Lam. & DC., Fl. franç., Ed. 3, 5: 45. 1815; *Agaricus flocculosus* DC. :Fr., Syst. mycol. 1: 306. 1821; *Coprinellus flocculosus* (DC. :Fr.) Vilgalys, Hopple & Johnson in Taxon 50: 233. 2001.

MISSAPL. — *Coprinus rostrupianus* sensu J. Lange, Fl. agar. dan. 4: 109. 1939.

SEL. ICON. — Bender & Enderle in Z. Mykol. 54, between 48 and 49. 1988; J. Lange, Fl. agar. dan. 4: pl. 157E. 1939 (as *C. rostrupianus*).

SEL. DESCR. & FIGS. — Bender & Enderle in Z. Mykol. 54: 51. 1988; P.D. Orton & Watl. in Br. Fung. Fl. 2: 60. 1979.

VERN. NAME — Valse viltinktzwam.

Pileus up to 25 × 20 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 45 mm wide, pale dirty ochre or ochre-brown with grey-ochre centre, first covered

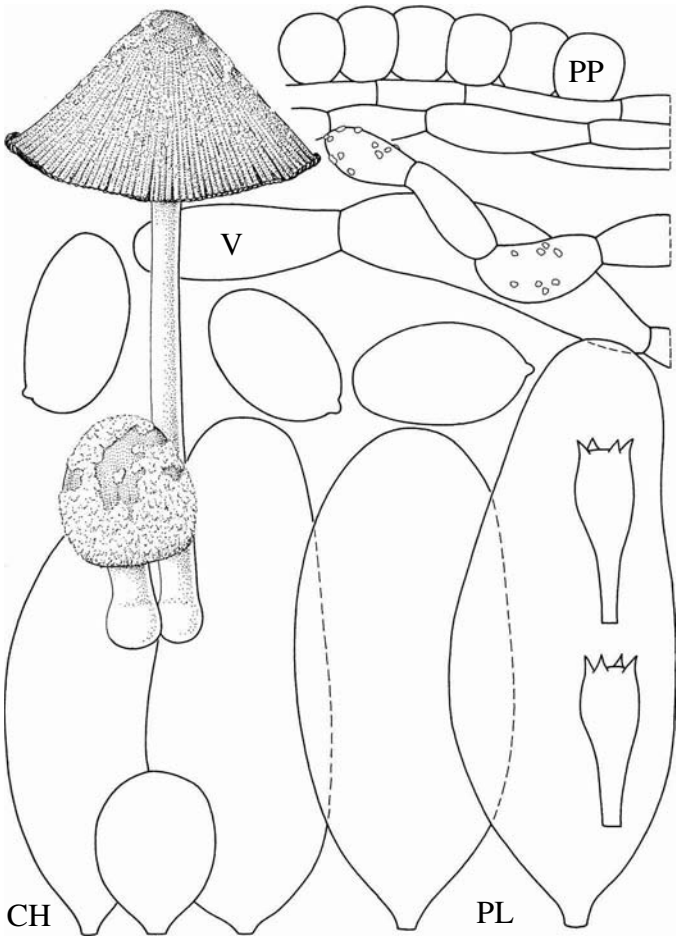


Fig. 92. *Coprinus flocculosus*

with a layer of felty veil, breaking up into small woolly flocks, those becoming ochre to brown at centre. Lamellae, L = 55–60, l = 3–5, free, first white, then grey-brown to black, 3–8 mm broad. Stipe 30–80 × 2–7 mm, white, base clavate sometimes with a volva-like margin.

Spores 10.0–16.5 × 6.5–10.0 µm, Q = 1.35–1.90, av. Q = 1.40–1.80, av. L = 10.9–15.3 µm, av. B = 7.0–9.2 µm, ellipsoid or ovoid, with rounded base and apex, very dark red-brown; germ pore eccentric, 1.2–1.5 µm wide. Basidia 18–40 × 11–16 µm, 4-spored, surrounded by 4–7 pseudoparaphyses. Pleurocystidia 50–100 × 30–70 µm, ellipsoid, ovoid, broadly utriform or subcylindrical. Cheilocystidia 30–90 × 25–50 µm, (sub)globose, ellipsoid, ovoid, sometimes broadly utriform. Caulocystidia absent. Veil 20–80 × 5–55 µm, made up of chains of cylindrical to ellipsoid, fusoid or (sub)globose cells, if (sub)globose then towards end of the chain and 30–55 µm in diam., thin-walled or sometimes slightly thick-walled and brownish towards end of chain and from centre of pileus. Pileipellis an epithelioid hymeniderm. Clamp-connections absent, only pseudoclamps present.

HABITAT & DISTR. — Solitary or subfasciculate on wood-chips or other woody matter; rather rare but widespread in the Netherlands. Jan.–Oct. Known from Europe.

The large spores with eccentric germ pore and the absence of caulocystidia make it easy to recognise *C. flocculosus* among the members of this subsection.

92. Coprinus radians (Desm. :Fr.) Fr., Epicrisis: 248. 1838. – Figs. 93, 94.

Agaricus radians Desm.in Annls Sci. nat. Paris 13: 214. 1828; *Agaricus radians* Desm. :Fr., Syst. mycol. 3, Ind. gen.: 38. 1832; *Coprinellus radians* (Desm.) Vilgalys, Hopple & Johnson in Taxon 50: 234. 2001.

SEL. ICON. — Cetto, Gr. Pilzf. 2: pl. 420. 1978.

SEL. DESCR. & FIGS. — Enderle & Moreno in Bol. Soc. micol. Castellana 9: 112. 1985; P.D. Orton & Watl. in Br. Fung. Fl. 2: 59. 1979.

VERN. NAME — Rosse viltinktzwam.

Pileus up to 30 × 25 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 50 mm wide, cream coloured, centre golden yellow or ochre, covered with a layer of felty, whitish veil, breaking up into small, white to cream woolly flocks, those becoming yellow- to red-brown or dark brown at centre of pileus at age. Lamellae, L = 60–70, l = 3–5, free, first white then grey-brown to black, 3–8(10) mm broad. Stipe 30–80 × 2–7 mm, white, base clavate, sometimes with a volva-like margin and often attached to a rust-coloured ozonium-state, whitish to pale grey rhizomorphs are sometimes present at base of stipe.

Spores 8.5–11.5 × 5.5–7.0 × 5.0–6.0 µm, Q = 1.35–1.70, av. Q = 1.45–1.60, av. L = 9.4 µm, av. B = 6.4 µm, av. W = 5.6 µm, ellipsoid with +/- parallel sides or ellipsoid, in side view a few phaseoliform, with rounded base and apex, medium to dark red-brown; germ pore eccentric, 1.3 µm wide. Basidia 18–34 × 8–9 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia lageniform and 30–60 × 12–20 × 5–10 µm or (sub)globose, ellipsoid, ovoid, broadly utriform and 40–100 × 25–50 µm. Pleurocystidia 50–120 × 30–65 µm, subglobose, ellipsoid, broadly utriform or subcylindrical.Caulocystidia 35–100 × 10–28 × 7–12 µm, lageniform. Veil 20–80 × 5–45 µm, made up of chains of cylindrical to ellipsoid, fusoid or (sub)globose cells, if (sub)globose then towards end of the chain and 25–45 µm in diam., thin-walled to somewhat thick-walled and brownish towards end of chain and from centre of pileus. Pileipellis an epithelioid hymeniderm. Clamp-connections absent, only pseudoclamps found.

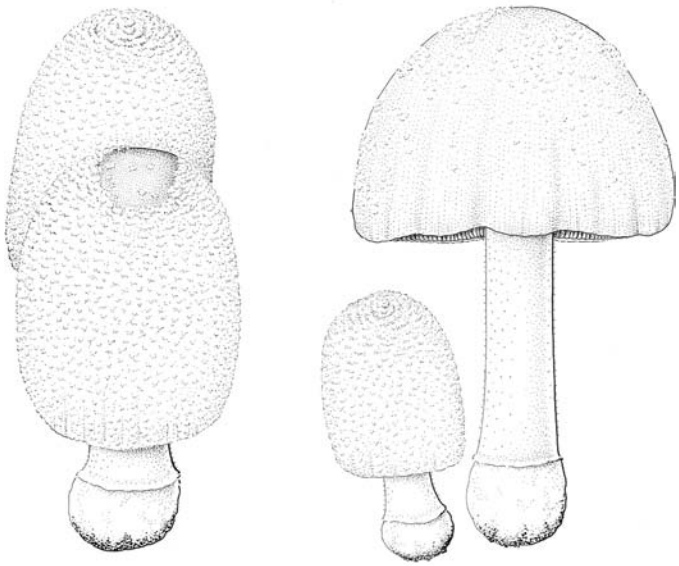


Fig. 93. *Coprinus radians*

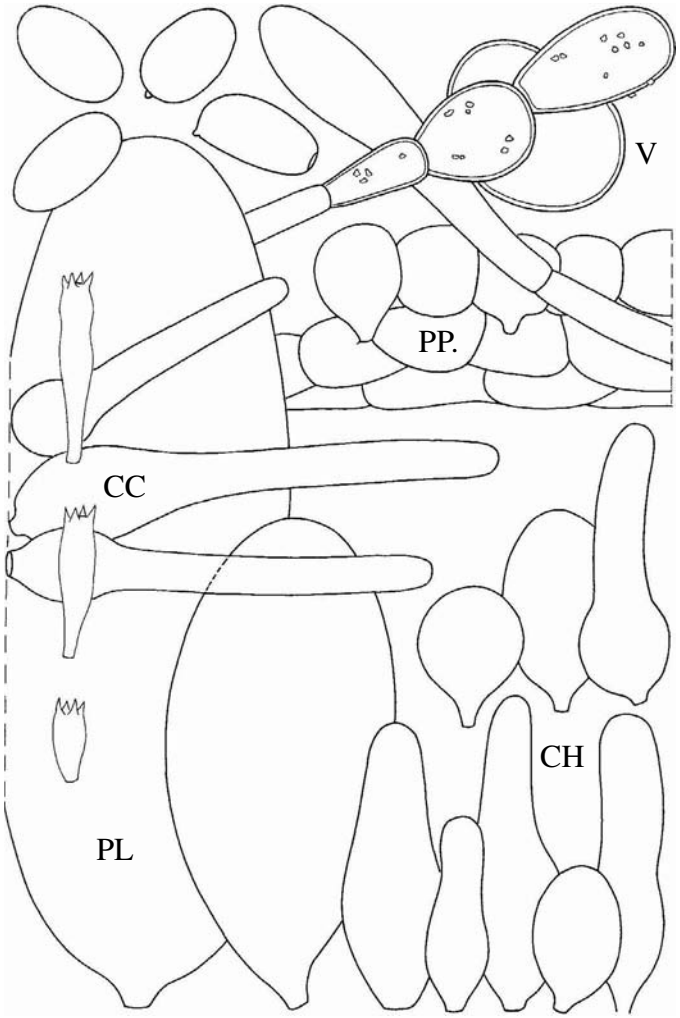


Fig. 94. *Coprinus radians*

HABITAT & DISTR. — Fasciculate, sometimes solitary around trunks or on logs, branches of deciduous trees; not common but widespread in the Netherlands. Jan.–Dec. Known from Europe.

The spores longer than 10 µm and the breadth of 5.5–7.0 µm, and the lageniform cheilocystidia are characters to identify *C. radians*.

93. Coprinus bipellis Romagn. in Bull. trimest. Soc. mycol. Fr. 92: 199. 1976. – Fig. 95.

SEL. DESCR. & FIGS. — Romagn. in Bull. trimest. Soc. mycol. Fr. 92: 198–199, fig. 5. 1976.

VERN. NAME — Plakjesinktzwam.

Pileus up to 40 × 35 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 70 mm wide, centre pale ochre or dirty rust, paler towards margin, covered with a layer of felty, whitish veil, breaking up into patches (like in *Amanita*), those becoming cream, ochre or somewhat darker brown at centre of pileus. Lamellae, moderately crowded, free, first white, then grey-brown to black, 3–8(10) mm broad. Stipe 30–80 × 2–7 mm, white, base clavate, sometimes with a volva-like margin and often attached to a rust-coloured ozonium-state.

Spores 5.5–10.5 × 4.0–5.5 × 4.0–5.0 µm, Q = 1.30–1.75, av. Q = 1.45–1.60, av. L = 6.1–8.5 µm, av. B = 4.3–5.3 µm, av. W= 4.0–4.6 µm, ovoid or ellipsoid, in side view a few phaseoliform, with rounded base and apex, medium red-brown; germ pore central, c. 1.3 µm wide. Basidia 18–34 × 8–9 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–100 × 30–60 µm, (sub)globose, ellipsoid, ovoid, broadly utriform. Pleurocystidia 50–120 × 30–65 µm, subglobose, ellipsoid, broadly utriform or subcylindrical. Caulocystidia 35–100 ×10–28 × 7–12 µm, lageniform. Veil 20–80 × 5–30 µm, made up of chains of cylindrical to ellipsoid, fusoid or (sub)globose cells, if (sub)globose then towards end of the chain and 25–45 µm in diam., thin-walled to somewhat thick-walled and brownish, the thick-walled in particular from and around centre of pileus. Pileipellis an epithelioid hymeniderm. Clamp-connections absent, only pseudoclamps found.

HABITAT & DISTR. — Fasciculate, sometimes solitary around trunks or on logs, branches of coniferous trees, also on burnt places, in the Netherlands very rare and only known from one locality (Ridderkerk). Aug. Also known from France.

The size and shape of the spores in *C. bipellis* are typical for *C. xanthothrix* too, which also often is entirely covered with very thick veil in young stages, but that species is smaller. The best character to distinguish both species is the shape of the cheilocystidia, which are (sub)globose in *C. bipellis* and in great part lageniform in *C. xanthothrix.*

94. Coprinus domesticus (Bolt. :Fr.) S.F. Gray, Nat. Arr. Br. Pl. 1: 635. 1821. – Fig. 96.

Agaricus domesticus Bolt., Hist. Fung. Halifax: 26. 1788; *Agaricus domesticus* Bolt. :Fr., Syst. mycol. 1: 311. 1821; *Coprinellus domesticus* (Bolt. :Fr.) Vilgalys, Hopple & Johnson in Taxon 50: 233. 2001.

SEL. ICON. — Cetto, Gr. Pilzf. 6: pl. 2171. 1989; M. Lange, Paddestoelengids: 137.1964; R.Phillips, Paddest. Schimm.: 180. 1981.

SEL. DESCR. & FIGS. — Enderle & Moreno in Bol. Soc. micol. Castellana 9: 111. 1985; P.D. Orton & Watl. in Br. Fung. Fl. 2: 56. 1979.

VERN. NAME — Grote viltinktzwam.

Pileus up to 40 × 35 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 70 mm wide, centre pale ochre or dirty rust, paler towards margin, covered with a layer of felty, whitish veil, breaking up into small, woolly flocks, those becoming cream, ochre or somewhat darker brown at centre of pileus. Lamellae, L = 60–75, l = 3–5, free, first white then grey-brown to black, 3–8(10) mm broad. Stipe 40–100 × 4–10 mm, white, base clavate, sometimes with a volva-like margin and often attached to a rust-coloured ozonium-state.

Spores 6.0–9.0 × 3.5–5.0 µm, Q = 1.45–1.90, av. Q = 1.65–1.85, av. L = 7.4–8.3 µm, av. B = 4.2–4.5 µm, subcylindrical, ellipsoid with +/- parallel sides, rarely ovoid or ellipsoid, in part in side view phaseoliform, with rounded base and apex, medium red-brown; germ pore eccentric, 1.2 µm wide. Basidia 18–34 × 8–9 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–100 × 30–60 µm, (sub)globose, ellipsoid, ovoid, broadly utriform. Pleurocystidia 50–120 × 30–65 µm, subglobose, ellipsoid, broadly utriform or subcylindrical. Caulocystidia 50–120 × 18–30 × 5–7 µm, lageniform. Veil 20–80 × 5–30 µm, made up of chains of cylindrical to ellipsoid, fusiform or (sub)globose cells, if (sub)globose then towards end of the chain and 25–45 µm in diam., thin-walled to somewhat thick-walled and brownish, the thick-walled in particular from and around centre of pileus. Pileipellis an epithelioid hymeniderm. Clamp-connections absent, only pseudoclamps found.

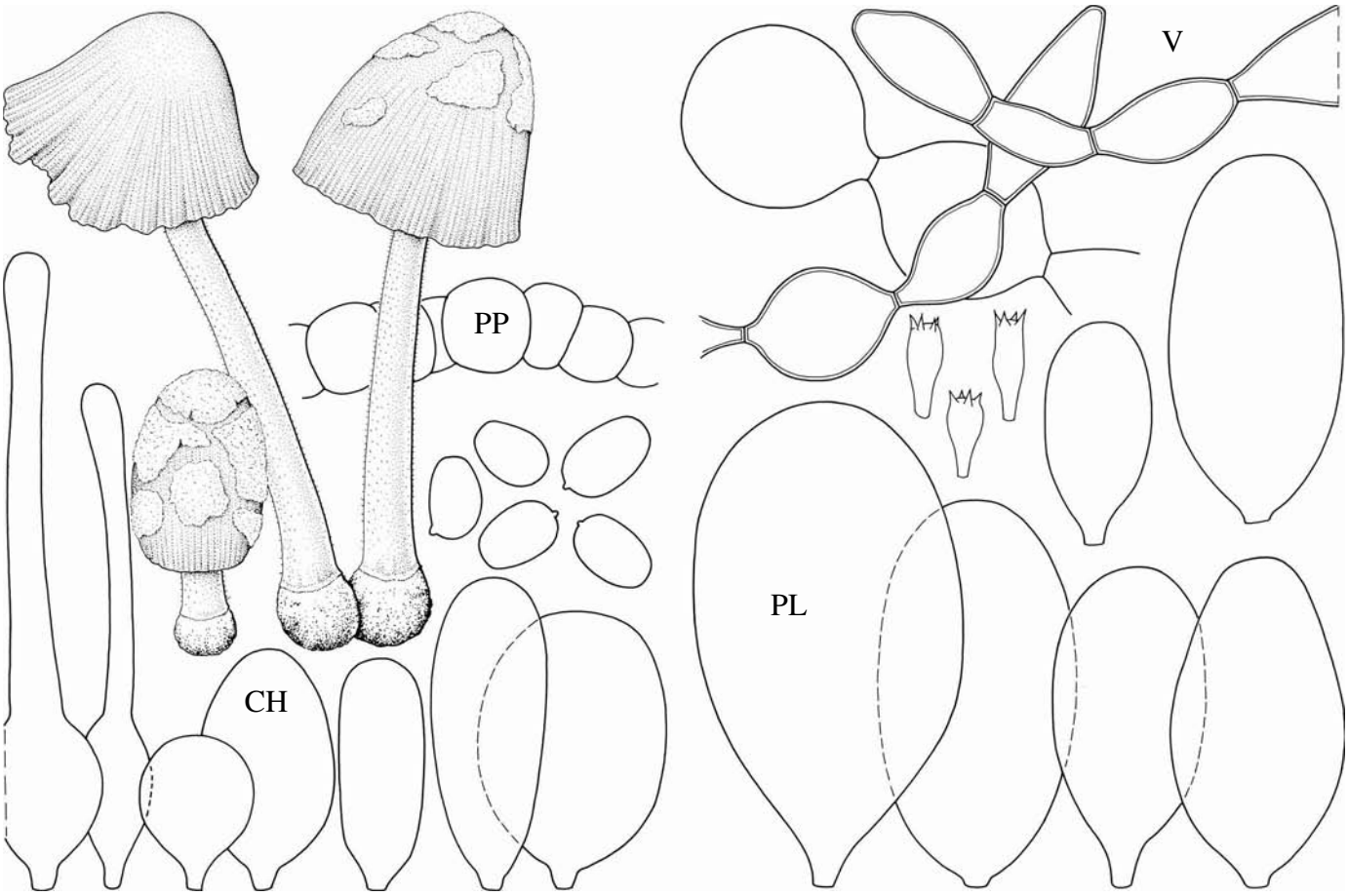


Fig. 95. *Coprinus bipellis*

HABITAT & DISTR. — Fasciculate or gregarious around trunks or on logs and branches of deciduous trees; rarely solitary, very common and widespread in the Netherlands. Jan.–Dec. Throughout Europe, America, Asia, and North Africa.

Coprinus domesticus can be recognised by the subcylindrical spores with an average breadth less than 4.5 µm and at side view phaseoliform for a great part, and the rather large basidiocarps growing usually on or around trunks and dead trees. *Coprinus ellisii* can be distinguished from *C. domesticus* by the still narrower spores, up to 4.0 µm wide.

95. Coprinus ellisii P.D. Orton in Trans. Br. mycol. Soc. 43: 199. 1960. – Fig. 97.

Coprinellus ellisii (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 233. 2001.

SEL. ICON. — Monti, Funghi cenosi Aree bruciate: 80. 1992.

SEL. DESCR. & FIGS. — Enderle & Moreno in Bol. Soc. micol. Castellana 9: 111. 1985; P.D. Orton & Watl. in Br. Fung. Fl. 2: 57. 1979.

VERN. NAME — Sokvoetinktzwam.

Pileus up to 20 × 20 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 40 mm wide, centre pale ochre or ochre-brown, paler towards margin, covered with a layer of felty, whitish veil, breaking up into small, woolly flocks, those becoming ochre or date-brown at centre of pileus. Lamellae vey crowded, free, first white then pale chocolate or umber, finally black, 3–7 mm broad. Stipe 30–70 × 3–7 mm, white, base clavate, sometimes with a volva-like margin.

Spores 5.5–7.0 × 3.0–4.0 µm, Q = 1.60–2.05, av. Q = 1.85, av. L = 6.3 µm, av. B = 3.4 µm, subcylindrical, ellipsoid with +/- parallel sides, rarely ellipsoid or ovoid, in part in side view phaseoliform, with rounded base and apex, medium red-brown; germ pore eccentric, 1 µm wide. Basidia 16–30 × 7.5–8.5 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–70 × 10–40 µm, (sub)globose, ellipsoid, ovoid, broadly utriform. Pleurocystidia 50–120 × 28–45 µm, subglobose, ellipsoid, broadly utriform or subcylindrical. Caulocystidia 40–90 × 18–28 × 5–7 µm, lageniform. Veil 20–70 × 4–28 µm, made up of chains of cylindrical to ellipsoid, fusoid or (sub)globose cells, if (sub)globose then towards end of the chain and 20–40 µm in diam., thin-walled to somewhat thick-walled and brownish, the thick-walled in particular from and around centre of pileus. Pileipellis an epithelioid hymeniderm. Clamp-connections absent.

HABITAT & DISTR. — Solitary or fasciculate, terrestrial, on dead leaves or attached to twigs of deciduous trees; very rare in the Netherlands (Bunnik). Apr.–Dec. Widespread in Europe.

The basidiocarps in *C. ellisii* seem to be usually smaller than in *C. domesticus*, have narrower spores, up to 4.0 µm broad, and have a volva-like base of the stipe.

96. Coprinus xanthothrix Romagn. in Rev. Mycol. 6: 127. 1941. – Figs. 98, 99.

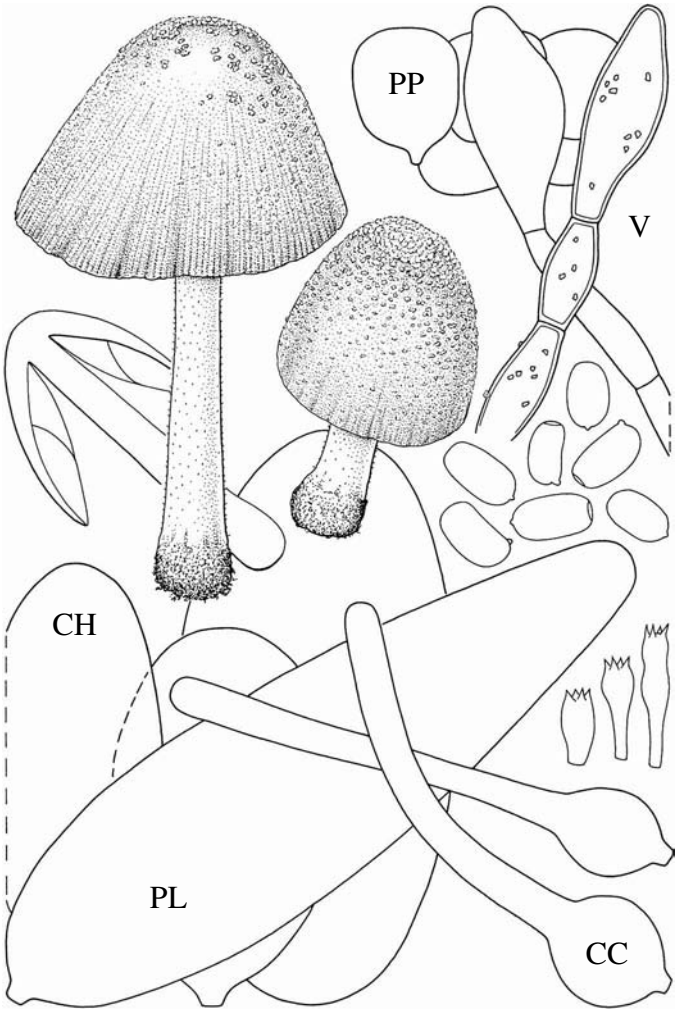


Fig. 96. *Coprinus domesticus*

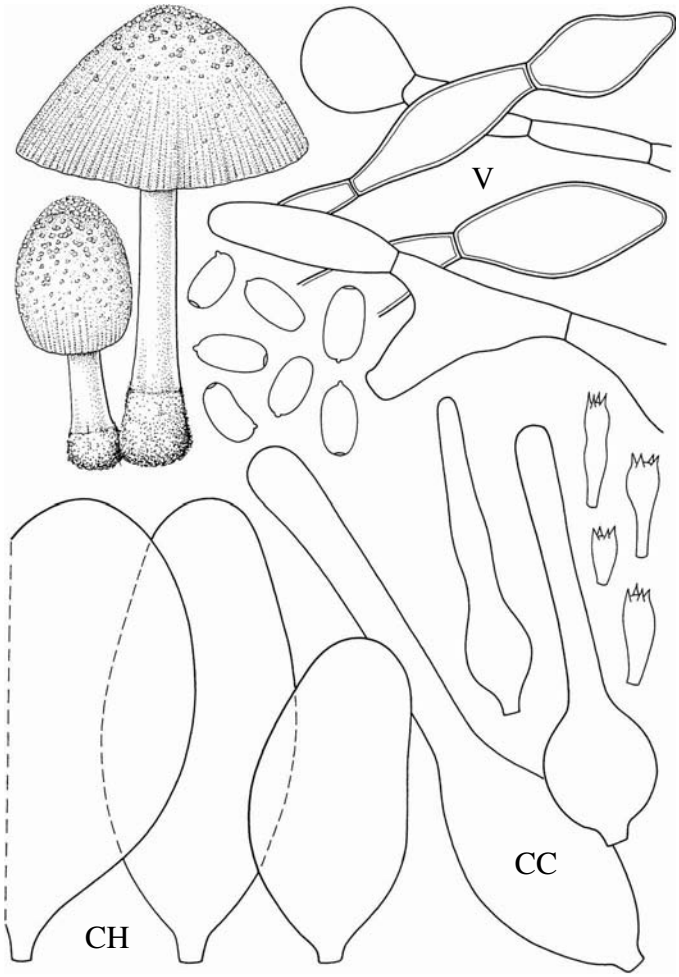


Fig. 97. *Coprinus ellisii*

SEL. ICON. — M. Lange, Paddestoelengids: 137. 1964; R. Phillips, Paddest. Schimm.: 180. 1981; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 307. 1995.

SEL. DESCR. & FIGS. — Enderle & Moreno in Bol. Soc. micol. Castellana 9: 114. 1985; P.D. Orton & Watl. in Br. Fung. Fl. 2: 58. 1979.

VERN. NAME — Kleine viltinktzwam.

Pileus up to 30 × 25 mm when still closed, subglobose, ovoid or ellipsoid, expanding to conical or convex and then up to 50 mm wide, centre pale ochre or dirty rust, paler towards margin, covered with a layer of felty, whitish veil, breaking up into small, woolly flocks, those becoming cream, ochre or somewhat darker brown at centre of pileus. Lamellae, L = 55–60, l = 3–5, free, first white then grey-brown to black, 3–8(10) mm broad. Stipe 40–80 × 3–7 mm, white, base clavate, sometimes with a volva-like margin and often attached to a rust-coloured ozonium-state.

Spores 6.5–10.0 × 4.5–6.5 × 5.0 µm, QB = 1.35–1.85, av. QB = 1.45–1.65, QW = 1.55–1.75, av. QW = 1.55–1.7, av. L = 7.4–8.6 µm, av. B = 4.6–5.9 µm, av. W = 5.0–5.5 µm, ovoid or ellipsoid, in side view a few phaseoliform, with rounded base and apex, medium red-brown; germ pore eccentric, 1.3 µm wide. Basidia 14–34 × 7–9 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–70(100) × 12–28(34) × 5–14(18) µm and lageniform, mixed with

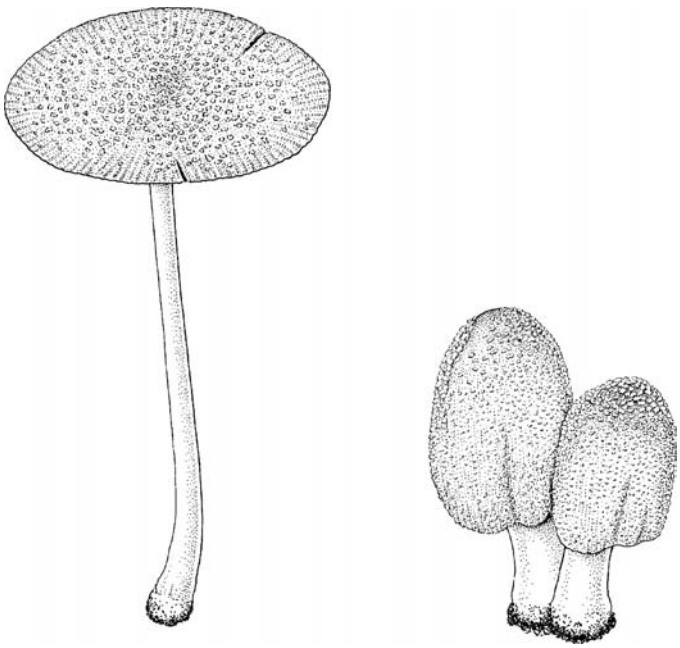


Fig. 98. *Coprinus xanthothrix*

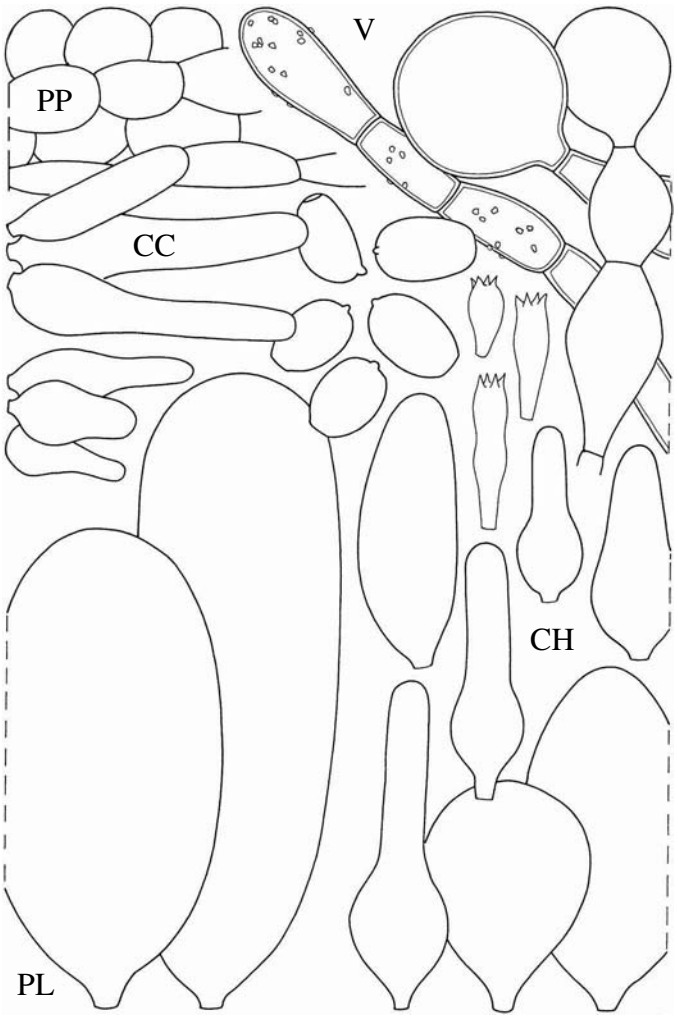


Fig. 99. *Coprinus xanthothrix*

(sub)globose, ellipsoid or ovoid ones similar to pleurocystidia. Pleurocystidia 50–125 × 30–65 µm, subglobose, ellipsoid, broadly utriform or subcylindrical. Caulocystidia 30–130 × 12–38 × 5–14 µm, lageniform. Veil 20–80 × 5–30 µm, made up of chains of cylindrical to ellipsoid, fusoid or (sub)globose cells, if (sub)globose then towards end of the chain and 25–45 µm in diam., thin-walled to somewhat thick-walled and brownish, the thick-walled in particular from and around centre of pileus. Pileipellis an epithelioid hymeniderm. Clamp-connections absent, only pseudoclamps found.

HABITAT & DISTR. — Solitary or subfasciculate on dead branches of deciduous trees, rarely on trunks; very common. r.–Dec. Widespread in Europe, distribution unknown in other regions.

Coprinus xanthothrix can be recognised by the ellipsoid spores with a breadth between 4.6 and 5.9 µm that are usually not phaseoliform in side view. The species usually grows on branches of deciduous trees and the basidiocarps are smaller in general than in *C. domesticus* and *C. radians*.

Subsect. **Nivei** Citérin

Pileus white, cream-coloured, pinkish cream or grey with mealy-powdery veil, made up of globose elements in majority, smooth or covered with crystals or granules; spores without myxosporium; smell indistinct.

97. Coprinus niveus (Pers. :Fr.) Fr., Epicrisis: 246. 1838. – Fig. 100.

Agaricus niveus Pers., Syn. meth. Fung.: 400. 1801; *Agaricus niveus* Pers. :Fr., Syst. mycol. 1: 311. 1821; *Coprinopsis nivea* (Pers. :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001. *Coprinus latisporus* P.D. Orton in Notes R. bot. Gdn Edinb. 32: 140. 1972.

SEL. ICON. — Fillion in Bull. Féd. mycol. Dauph. Savoie 122: 9. 1991; R. Phillips, Paddest. Schimm.: 179. 1981; Tabarés in Bolets Catalunya 5: pl. 215. 1986; Cacialli et al., Schede Micol. 1: 207. 1995.

SEL. DESCR. & FIGS. — Enderle et al. in Z. Mykol. 52: 121. 1986; Uljé & Noordel. in Persoonia 15: 265, fig. 1a. 1993.

VERN. NAME — Witte mestinktzwam.

Pileus (5)15–25 × (3)10–15 mm when still closed, up to 45 mm when expanded, subglobose, ovoid, ellipsoid or cylindrical-ellipsoid, then obtusely conical to convex, finally applanate with reflexed to revolute margin, completely covered with white, powdery veil, centre of pileus often cream-coloured to pale ochraceous; veil at margin, particularly in early stages, somewhat more hairy-floccose. Lamellae, L = 24–38, l = 1–3(5), free, white at first, then grey to black. Stipe up to 100 × 4 mm, attenuate upwards, white, towards base up to 6 mm wide, and often brownish with white velar flocks; base somewhat clavate. No smell.

Spores 12.0–19.0 × 11.0–15.5 × 7.5–9.0 µm, Q = 1.05–1.40, av. Q = 1.10–1.30, av. L = 14.5–17.3 µm, av. B = 11.9–13.9 µm, flattened, ellipsoid with apical papilla ("limoniform") in frontal view, ellipsoid in side view, with rounded base apical papilla, very dark red-brown, almost black; germ pore central to slightly eccentric, 1.8 µm wide.

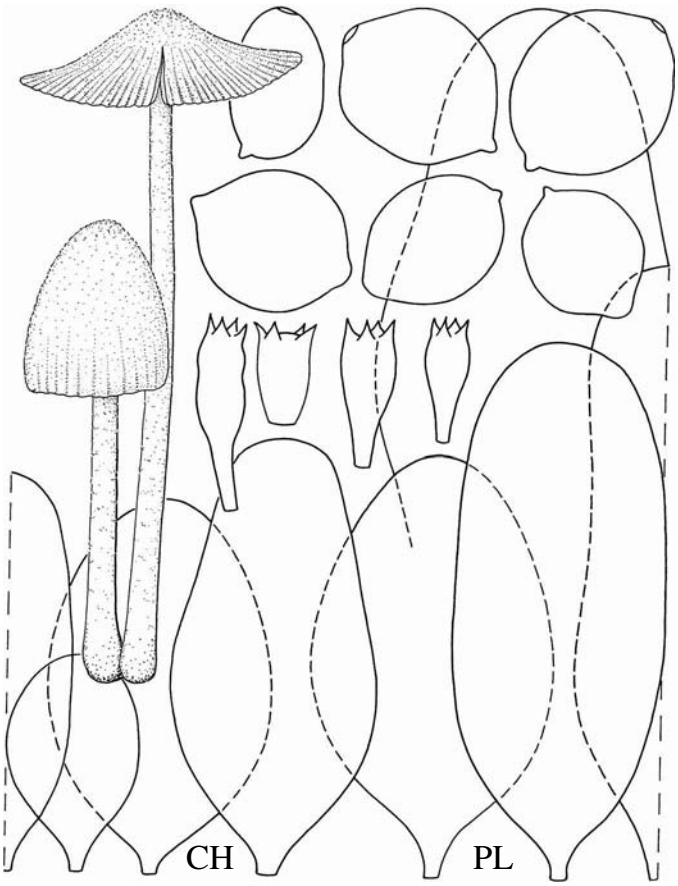


Fig. 100. *Coprinus niveus*

Basidia 25–40 × 12–16 µm, 4-spored, surrounded by 5–7(8) pseudoparaphyses. Cheilocystidia 30–80 × 15–50 µm, similar to pleurocystidia. Pleurocystidia 50–150 × 25–60 µm, broadly utriform, ellipsoid, or subcylindrical. Veil made up of up to 100 µm wide, (sub)globose elements connected by narrow, diverticulate hyphae. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on dung of horse and cow; rather common. March–Dec. Cosmopolitan.

Coprinus niveus can be easily recognised by the very large spores, which are ellipsoid with apical papilla ("limoniform") in frontal view and ellipsoid in side-view, borne on 4-spored basidia. Generally, *C. niveus* has medium-sized basidiocarps, but sometimes they are only a few mm.

98. Coprinus pseudoniveus Bender & Uljé in Uljé & Noordel. in Persoonia 15: 270. 1993. – Fig. 101.

Coprinopsis pseudonivea (Bender & Uljé) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001.

SEL. DESCR. & FIGS. — Bender & Uljé in Uljé & Noordel. in Persoonia 15: 270, fig. 2. 1993.

VERN. NAME — Valse witte mestinktzwam.

Pileus 12–20 × 6–12 mm when still closed, up to 40 mm when expanded, subglobose, ovoid, ellipsoid or cylindrical-ellipsoid, then obtusely conical to convex, finally applanate with reflexed to revolute margin, completely covered with white, cream or greyish, powdery veil; veil at margin, particularly in early stages somewhat more hairy-floccose. Lamellae, L = 22–36, l = 1–3(5), free, white at first, then grey to black with pale edge. Stipe up to 50–120 × 3–5 mm, attenuate upwards, white to greyish, with white velar flocks, at base somewhat swollen, densely white flocculose. Smell somewhat yeast-like.

Spores 9.0–12.5 × 7.5–11.5 × 6.0–8.0 µm, Q = 1.05–1.35, av. Q = 1.15–1.20; av. L = 10.6–11.5 µm µm, av. B = 8.8–9.9 µm, ellipsoid with apical papilla ("limoniform") in frontal view, ellipsoid in side view with rounded base with apical papilla, very dark red-brown, almost black; germ pore central to slightly eccentric, 1.6 µm wide. Basidia 15–40 × 9–13 µm, 4-spored, surrounded by 4–6(7) pseudoparaphyses. Cheilocystidia 40–65 × 20–27 µm, (broadly) utriform, ellipsoid or subcylindrical. Pleurocystidia 75–180 × 25–50 µm, (broadly) utriform or subcylindrical. Veil made up of up to 75 µm wide, (sub)globose elements. Clamp-connections sparse, difficult to find, probably just pseudoclamps.

HABITAT & DISTR. — Solitary or subfasciculate, on cow dung and compost heaps; rather rare in the Netherlands. r.–Nov. Also recorded from Germany.

Coprinus niveus differs in much larger spores and lacking a distinct smell; *C. cothurnatus* has smaller, more hexagonal spores, and is usually devoid of pleurocystidia; *C. pachyspermus* has 2-spored basidia.

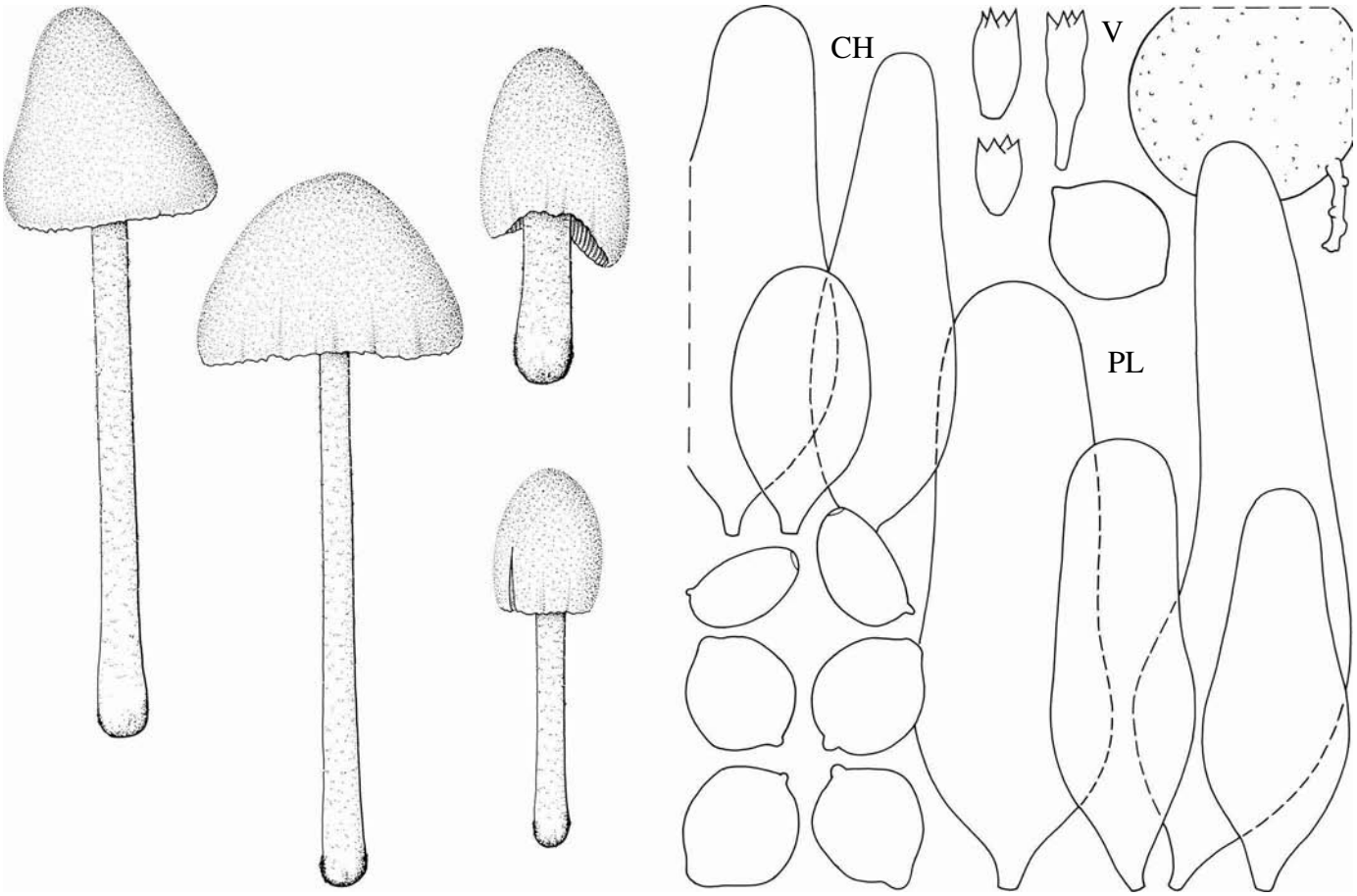


Fig. 101. *Coprinus pseudoniveus*

99. Coprinus cothurnatus Godey in Gillet, Hyménomycètes: 605. 1878. – Fig. 102.

Coprinopsis cothurnata (Godey) Redhead, Vilgalys & Moncalvo in Taxon 50: 227. 2001.

SEL. ICON. — Cetto, Gr. Pilzf. 5: 1719. 1989; Lanconelli et al., Funghi Lughese: 191. 1998.

SEL. DESCR. & FIGS. — Krieglst. et al. in Z. Mykol. 48: 77. 1982; Uljé & Noordel. in Persoonia 15: 271, fig. 3. 1993.

VERN. NAME — Melige mestinktzwam.

Pileus 10–20 × 8–13 mm when still closed, up to 35 mm when expanded, ellipsoid, cylindrical ellipsoid, ovoid or subglobose, then obtusely conical to convex, finally applanate with reflexed to revolute margin, completely covered with white, powdery veil; veil at margin, particularly in early stages somewhat more hairy-floccose. Lamellae, L = 22–30, l = 0–3, free to narrowly adnate, white at first, then grey to black. Stipe up to 100 × 3–5 mm, slightly attenuate upwards, white, flocculose from veil; at base up to 6 mm wide, often brownish, with white velar flocks. Smell absent.

Spores 9.5–15.5 × 6.5–8.5 × 7.0–7.5 µm, Q = 1.45–1.80, av. Q = 1.50–1.55, av. L = 11.9–12.3 µm, av. B = 7.8 µm, more or less 6-angular in frontal view, ellipsoid in side view, with rounded base and apex, very dark red-brown; germ pore central to slightly eccentric, 1.6 µm wide. Basidia 18–50 × 9–13 µm, 4-spored (sometimes also some 2-spored basidia are present), surrounded by 3–5 pseudoparaphyses. Cheilocystidia 30–80 × 15–50 µm, similar to pleurocystidia. Veil made up of up to 100 µm wide, (sub)globose elements. Pleurocystidia sparse, 50–150 × 25–60 µm, broadly utriform, ellipsoid or subcylindrical, sometimes absent. Clamp-connections present.

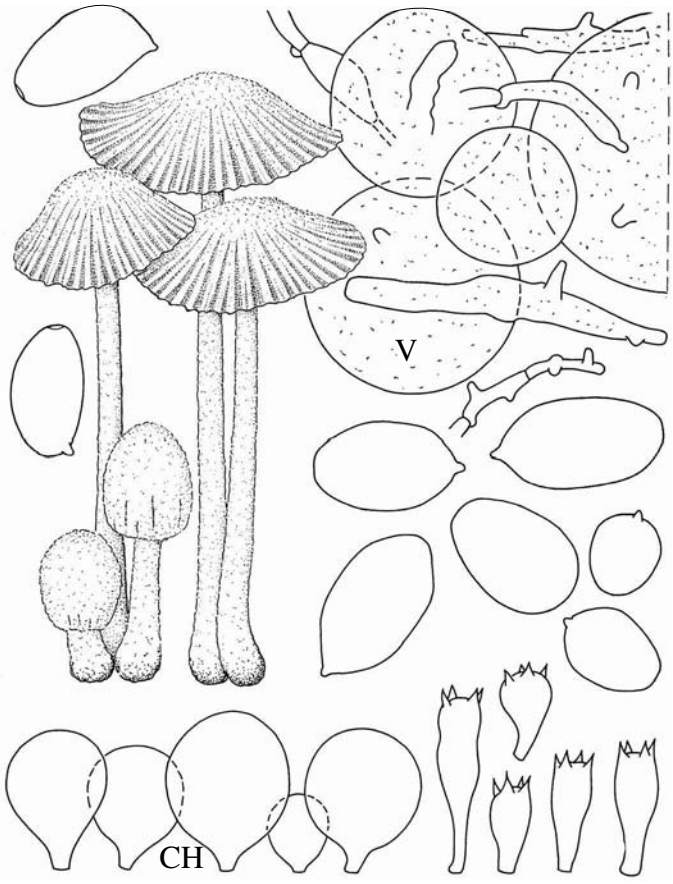


Fig. 102. *Coprinus cothurnatus*

HABITAT & DISTR. — Solitary or subfasciculate, on dungy straw, dung of horse and cow, but also found on rotten stems of *Arctium minus*; rather common in the Netherlands. Feb.–Oct. Not uncommon in Europe.

Coprinus cothurnatus differs from *C. niveus* in having hexagonal spores that are distinctly narrower and in the absence or sparse presence of pleurocystidia.

100. Coprinus pachyspermus P.D. Orton in Notes R. bot. Gdn Edinb. 32: 144. 1972. – Fig. 103.

Coprinopsis pachysperma (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 230. 2001.

SEL. ICON. — Arnolds in Arnolds et al., Overz. Paddest. Nederland: pl. 5B. 1995.

SEL. DESCR. & FIGS — P.D. Orton & Watl. in Br. Fung. Fl. 2: 65. 1979; Uljé & Noordel. in Persoonia 15: 271, fig. 4. 1993.

VERN. NAME — Valse mestinktzwam.

Pileus 15–30 × 10–18 mm when still closed, up to 40 mm when expanded, ellipsoid or ovoid, then obtusely conical to convex, finally applanate with reflexed to revolute margin, completely covered with grey or creamy-grey, powdery veil, at centre of pileus sometimes rather dark sepia-brown at the tips of the scales; veil at margin, particularly in early stages somewhat more hairy-floccose. Lamellae, L = 24–38, l = 1–3(5), free or almost free, white at first, then grey to black. Stipe up to 110 × 4–5 mm, slightly attenuate upwards, white, flocculose from veil; at base up to 6 mm wide, often brownish, with white velar flocks. Smell absent.

Spores 13.5–16.5 × 12.5–15.5 × 8.5–10.0 µm, Q = 1.05–1.20, av. Q = 1.10, av. L = 15.1 µm, av. B = 13.7 µm, flattened, ellipsoid with apical papilla ("limoniform") in frontal view, ellipsoid in side view, with rounded base and apex, very dark red-brown, almost black; germ pore slightly to strongly eccentric, 1.6 µm wide. Basidia 18–38 × 9–13 µm, 2-spored, surrounded by 4–6 pseudoparaphyses. Cheilocystidia 30–90 × 20–50 µm, similar to pleurocystidia. Pleurocystidia 80–160 × 30–60 µm, (broadly) utriform, ellipsoid or subcylindrical. Veil made up of up to 90 µm wide, (sub)globose elements. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on old cow dung; in the Netherlands very rare (Nijswiller). Oct.–Nov. Recorded from Great Britain.

Coprinus pachyspermus differs from *C. niveus* in the 2-spored basidia and the more greyish colour of the basidiocarps.

101. Coprinus utrifer Watling in Notes R. bot. Gdn Edinb. 31: 362. 1972.

Coprinus utrifer Joss. in Bull. trimest. Soc. mycol. Fr. 64: 26. 1948 (invalid, no Latin diagnosis); *Coprinopsis utrifer* (Watling) Redhead, Vilgalys & Moncalvo in Taxon 50: 232. 2001.

SEL. DESCR. & FIGS. — Joss. in Bull. trimest. Soc. mycol. Fr. 64: 27–29, fig. 7. 1948; Uljé & Noordel. in Persoonia 15: 275, fig. 5. 1993; Watling in Notes R. bot. Gdn Edinb. 31: 362. 1972.

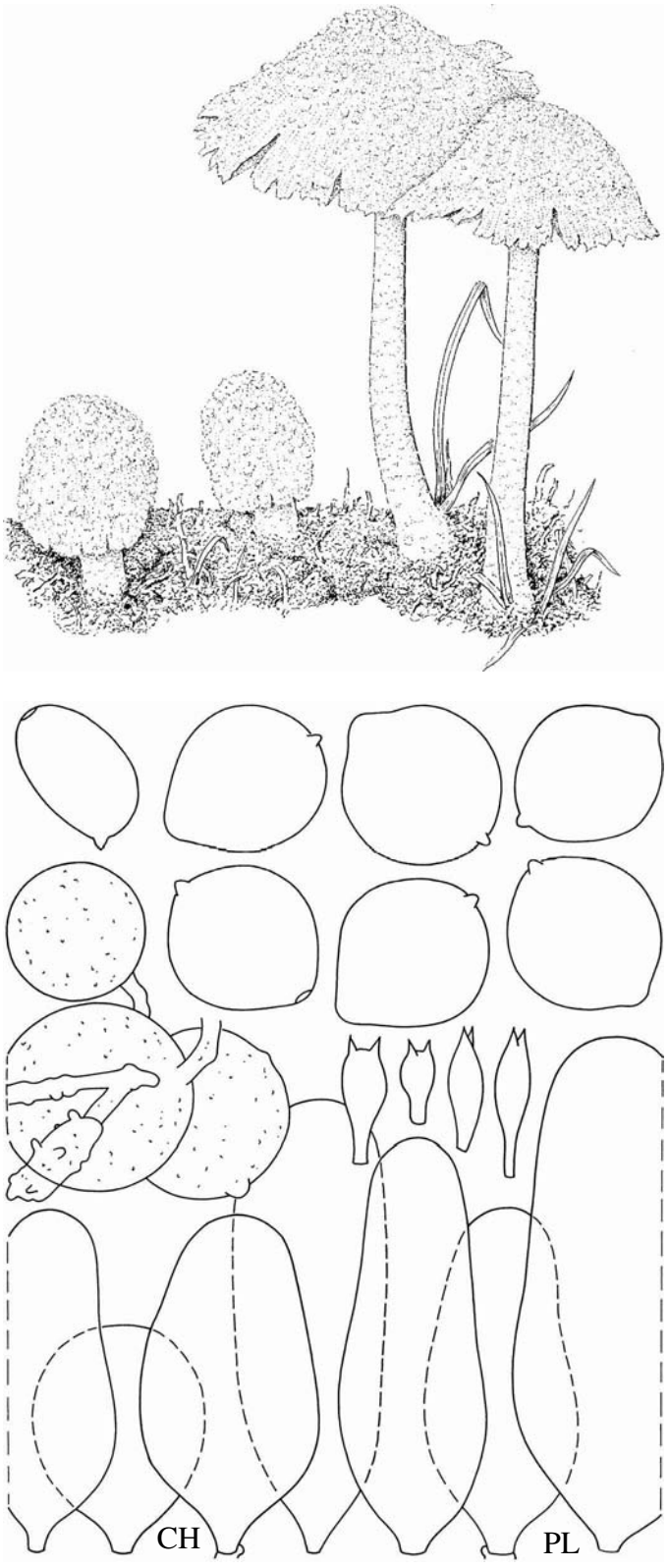


Fig. 103. *Coprinus pachyspermus*

CHARACTERISTICS — Pileus 7–13 × 3–8 mm when still closed, up to 25 mm when expanded, ellipsoid, cylindrical ellipsoid or ovoid, then obtusely conical to convex, finally applanate with reflexed to revolute margin, completely covered with white or creamy-white, powdery veil; veil at margin, particularly in early stages somewhat more hairy-floccose. Lamellae, L = 24–28, l = 0–3, free, white at first then grey (violaceous grey according to Watling) then black with pale edge. Stipe up to 50 × 1–2 mm, attenuate upwards, white to greyish, with small velar flocks, at base somewhat swollen and white hairy-flocculose. Smell absent.

Spores 6.0–7.5 × 4.0–5.0 × 4.0–4.5 µm, Q = 1.35–1.70, av. Q = 1.50; av. L = 7.0 µm, av. B = 4.7 µm, ellipsoid with +/- parallel sides in frontal view, ellipsoid in side-view, red-brown, with rounded base and apex, dark red-brown; germ pore difficult visible, c. 1.3 µm wide. basidia 10–22 × 6–8 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. cheilocystidia 20–50 × 15–35 µm, ellipsoid or (sub)globose; Pleurocystidia 30–55 × 15–35 µm, ellipsoid, (broadly) utriform or subcylindrical; veil made up of (sub)globose elements, 25–60 µm in diam., mixed with fusiform or elongate, 2–15 µm wide elements; clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, on dung of sheep, cow, and horse; not known from the Netherlands, but recorded from France, Great Britain, and Estonia.

102. Coprinus poliomallus Romagn. in Rev. Mycol. 10: 89. 1945. – Fig. 104.

SEL. DESCR. & FIGS. — Enderle & Bender in Z. Mykol. 56: 32. 1990; Uljé & Noordel. in Persoonia 15: 276, fig. 6. 1993.

VERN. NAME — Grijs mestdwergje.

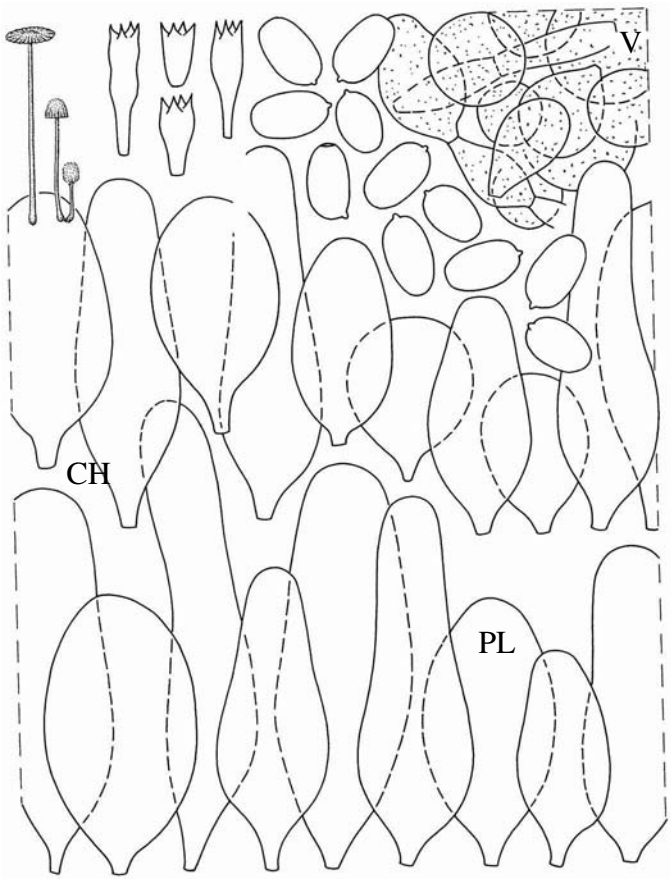


Fig. 104. *Coprinus poliomallus*

Pileus up to 5 × 3 mm when still closed, up to 7 mm broad when expanded, ellipsoid to cylindrical-ellipsoid, in buds dark grey or mouse-grey, becoming paler with age, entirely grey powdery but at margin somewhat hairy-floccose. Lamellae, L = 8–16, l = 0–1, free, rather distant, first white but soon grey to spotted blackish. Stipe up to 20 × 0.5 mm, vitreous, subbulbous at base. Smell absent.

Spores 6.5–10.5 × 4.0–6.0 µm, Q = 1.35–1.95, av. Q = 1.55–1.80, av. L = 7.4–9.3 µm, av. B = 4.5–5.7 µm, ellipsoid with +/- parallel sides, ellipsoid or ovoid, red-brown; germ pore central, 1.3 µm wide. Basidia 12–28 × 7–9 µm, 4-spored, surrounded by (3)4–5(6) pseudoparaphyses. Cheilocystidia 40–90 × 18–32 µm, ellipsoid, utriform or subcylindrical. Pleurocystidia 50–120 × 21–38 µm, ellipsoid, utriform or subcylindrical. Pileipellis consisting of roundish elements covered by narrow hyphae, passing upwards into velar tissue. Velar elements (sub)globose to ellipsoid, up to 50 µm wide, connected by 10–75 µm long and 3–7 µm wide, cylindrical, sometimes fusiform hyphae, hyaline, greyish in part, thin-walled, granular. Veil at margin of pileus and on stipe made up of cylindrical to fusiform or clavate elements for the most part. Clamp-connections absent.

HABITAT & DISTR. — Solitary or in groups; on pure dung, especially of cow; widespread in the Netherlands. r.–Dec. Widespread in Europe, probably also in other regions.

Coprinus coniophorus, the only other species in subsect. *Nivei* with greyish veil, differs from *C. poliomallus* by the larger basidiocarps, amygdaliform spores, gregarious growth, and the habitat on rotten wood.

103. Coprinus pseudocortinatus Cacialli et al., Contributio ad Cognitionem Coprinorum 285. 1999. – Fig. 105.

Coprinus pseudocortinatus Locq. in Bull. trimest. Soc. mycol. Fr. 63: 81. 1947 (invalid, no Latin diagnosis).

SEL. DESCR. & FIGS. — Locq. in Bull. trimest. Soc. mycol. Fr. 63: 81–82, fig. 5. 1947; Uljé & Noordel. in Persoonia 15: 277, fig. 7. 1993.

VERN. NAME — Wit mestdwergje.

Pileus 0.3–4 × 0.2–2.5 mm when still closed, 1–7 mm when expanded, globose, subglobose to ellipsoid, completely covered with white, powdery veil; veil at margin, particularly in early stages, somewhat more hairy-floccose; veil on pileus becoming grey with age. Lamellae, L = 6–12, l = 0–1, free, white at first then greyish to grey with blackish spots. Stipe up to 20 × 0.1–0.7 mm, whitish, vitreous, at base up to 1 mm wide, often brownish, with white velar flocks. Smell absent.

Spores 5.5–7.5 × 3.5–4.5 µm, Q = 1.50–2.00, av. Q = 1.65–1.70, av. L = 6.5–6.6 µm, av. B = 3.9–4.0 µm, ellipsoid or ovoid, with rounded base and apex, red-brown; germ pore central, 1.0 µm wide. Basidia 9–30 × 6–8.5 µm, 4–spored, surrounded by (3)4–6 pseudoparaphyses. Cheilocystidia 30–50 × 15–30 µm, subglobose, ellipsoid, utriform or subcylindrical. Pleurocystidia 50–90 × 20–40 µm, utriform, a few subcylindrical or ellipsoid. Velar elements up to 55 µm wide, globose. Clamp-connections absent.

HABITAT & DISTR. — Solitary, in small groups on dung; rather rare in the Netherlands. March–Oct. Quite uncommon in Europe.

Because of the small size of the basidiocarps, a number of collections of *C. pseudocortinatus* could not be preserved after examination, but the observations on these specimens have been taken into consideration while preparing the description. Other small and rather similar species are *C. poliomallus* and *C. idae*. The former has dark mouse-grey basidiocarps when young, and the latter is terrestrial and has broader, differently shaped spores.

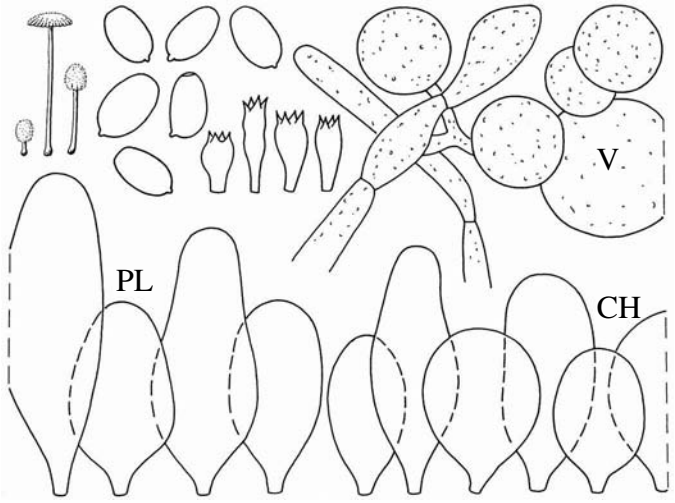


Fig. 105. *Coprinus pseudocortinatus*

104. Coprinus idae Uljé in Persoonia 15: 278. 1993. – Fig. 106.

SEL. DESCR. & FIGS. — Esteve-Rav. & de la Cruz in Persoonia 16: 401–402, fig.1. 1997.

VERN. NAME — Dwergpoederinktzwam.

Pileus up to 3.5 × 2.5 mm when still closed, up to 8 mm wide when expanded, in most cases somewhat smaller, first conical then plano-convex, finally applanate, at first completely white-powdery, soon

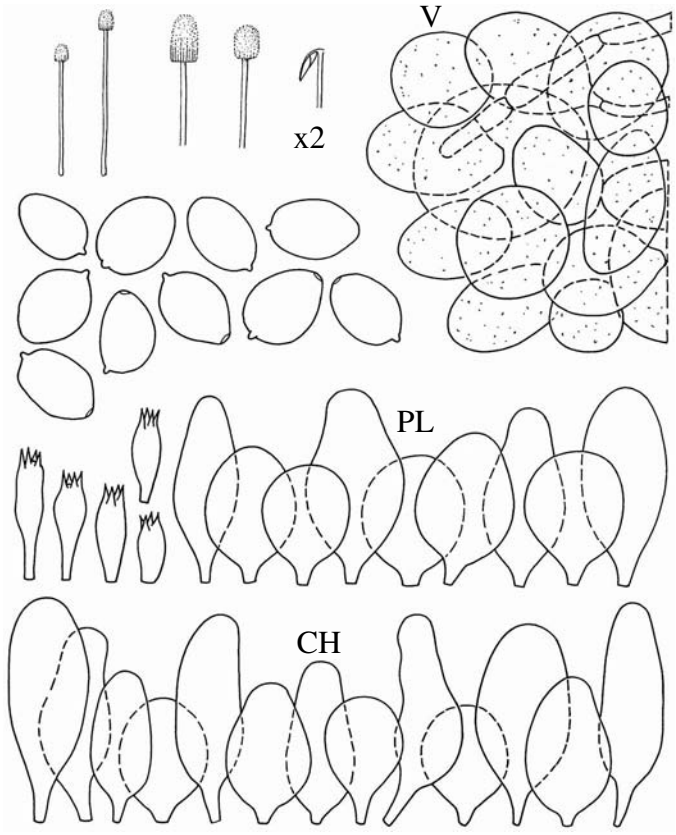


Fig. 106. *Coprinus idae*

becoming greyish. Lamellae, L = 11–18, l = 0–1, free, white at first, then grey to blackish spotted. Stipe up to 35 × 0.2–1 mm, with subbulbous base, whitish-hyaline, covered with white velar flocculi. Smell absent.

Spores 6.5–9.5 × 4.5–7.0 µm, Q = 1.30–1.75, av. Q = 1.50–1.55, av. L = 8.0–8.8 µm, av. B = 5.1–5.9 µm, broadly ellipsoid to oval, with rounded base and apex, rather pale red-brown; germ pore central, 1.0 µm wide. Basidia 16–28 × 6.5–8 µm, 4-spored, surrounded by 4–5 pseudoparaphyses. Cheilocystidia 25–50 × 16–28 µm, similar to pleurocystidia. Pleurocystidia 25–55 × 14–28 µm, (sub)globose, ellipsoid, utriform or (sub)globose. Veil on pileus consisting of smooth or somewhat granular globose and 12–42 µm wide elements and ellipsoid to oval elements, up to 50 × 38 µm, mixed with frequently branching, colourless, thin-walled hyphae with processes. Clamp-connections absent.

HABITAT & DISTR. — Terrestrial in lawn, solitary or subfasciculate, in the Netherlands very rare, known only from Alphen aan den Rijn. June–July. Also recorded from Spain.

Coprinus idae is a very small, white species like *C. pseudocortinatus*. The latter has narrower, differently shaped spores, larger pleurocystidia, and grows on pure dung.

105. Coprinus candidatus Uljé in Persoonia 13: 483. 1988. – Fig. 107.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 15: 279, fig. 9. 1993.

VERN. NAME — Witte poederinktzwam.

Pileus up to 8 × 6 mm when still closed, up to 16(20) mm when expanded, ovoid to subglobose, white to cream, becoming sordid with age, entirely powdery but at margin somewhat hairy-floccose. Lamellae, L = 21–28, l = 0–3, free, first white but soon grey to spotted blackish, with white edge. Stipe 50 × 1.5 mm, attenuated upwards, subbulbous at base, white-flocculose. Smell absent.

Spores 7.5–11.5 × 4.5–6.0 µm, Q = 1.60–2.05, av. Q = 1.70–1.90, av. L = 8.6–10.9 µm, av. B = 5.0–5.8 µm, ellipsoid with +/- parallel sides, with somewhat conical base (in part) and rounded apex, red-brown; germ pore central, 1.5–1.8 µm wide. Basidia 15–35 × 7–10 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia up to 40(50) µm long, with 7–15(25) µm wide ventricose part and 4–10(15) µm wide neck, utriform to more rarely lageniform or (sub)globose, with more or less cylindrical neck and rounded apex. Pleurocystidia absent. Veil made up of colourless to slightly yellowish, smooth to granular, up to 50 µm wide, globose elements. Clamp-connections present.

HABITAT & DISTR. — Solitary or subfasciculate, terrestrial on bare soil, sometimes on or against fallen branchlets; rare in the Netherlands. June–Oct.

Among the species of the *C. cortinatus* group, *C. candidatus* is easily recognised by its utriform cheilocystidia and by its ellipsoid spores with +/- parallel sides.

106. Coprinus cortinatus J. Lange in Dansk bot. Ark. 2 (3): 45. 1915. – Fig. 108.

MISSAPL. — *Coprinus filiformis* sensu Bender & Enderle in Z. Mykol. 54: 49. 1988.

SEL. ICON. — J. Lange, Fl. agar. dan. 4: pl. 159B. 1939.

SEL. DESCR. & FIGS. — Bender & Enderle in Z. Mykol. 54: 49. 1988 (as *C. filiformis*); Uljé & Bas in Persoonia 13: 479–480, figs 1E-H. 1988; Uljé & Noordel. in Persoonia 15: 284, fig. 10. 1993.

VERN. NAME — Kleine poederinktzwam.

Pileus up to 6 mm high and 5 mm wide, up to 15 mm when expanded, first globose, subglobose to ellipsoid, completely covered with powdery white veil, often cream to pale ochraceous at centre, later convex or flat, finally with slightly deflexed margin; veil at margin, particularly in early stages, somewhat more hairy-floccose, veil greying with age. Lamellae, L = 18–24, l = 1–3, free, up to 2 mm wide, white at first, then greyish to grey with blackish spots. Stipe up to 40 × 0.5–1 mm, attenuate upwards, at base up to 1.5 mm wide, white, somewhat hyaline; at base up to 3.5 mm wide, often brownish, with white velar flocks. Smell absent. Spore print dark chocolate brown (Mu. 5 YR 2/1).

Spores 6.0–9.5 × 4.5–6.0 µm, Q = 1.30–1.70, av. Q = 1.45–1.55, av. L = 7.9–8.4 µm, av. B = 5.1–5.4 µm, ellipsoid, sometimes slightly amygdaliform, with rounded base and apex, dark red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 15–26 × 7–8 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilo- and pleurocystidia absent

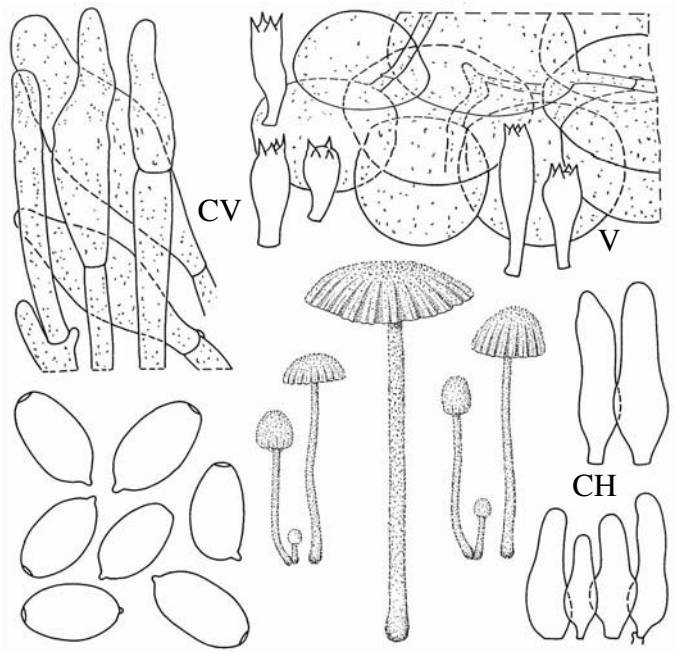


Fig. 107. *Coprinus candidatus*

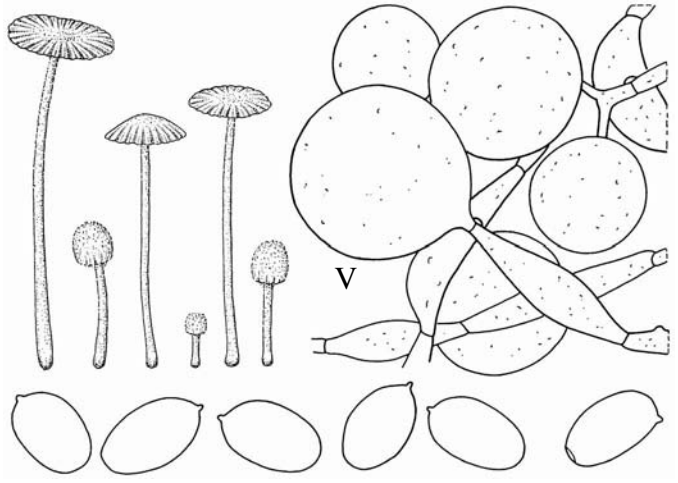


Fig. 108. *Coprinus cortinatus*

but here and there sterile elements (probably somewhat enlarged basidioles) projecting from lamellae and sometimes velar remnants sticking to lamellar edge. Veil made up of colourless to slightly yellowish, smooth to granular, up to 50 µm wide, globose elements, mixed with some hypha-like elements. Clamp-connections present.

HABITAT & DISTR. — Solitary or in small groups; on bare soil or in grassy-mossy places, in most cases under shrubs or trees; rather rare in the Netherlands. Jan.–Dec. Not common in Europe.

The present concept agrees well with that of Lange (in Dansk bot. Ark. 2 (3): 45. 1915), who did not mention hymenial cystidia. A number of collections were close to *C. cortinatus*, but possessed distinct, broadly clavate to ellipsoid cheilocystidia. More studies need to be undertaken in the complex of *C. cortinatus*.

107. Coprinus bellulus Uljé in Persoonia 13: 481. 1988. – Fig. 109.

SEL. ICON. — Cetto, Gr. Pilzf. 7: pl. 2608. 1993. Enderle & Bender in Z. Mykol. 56: 24. 1990; Lanconelli et al., Funghi Lughese: 193. 1998.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 15: 285, fig. 11. 1993.

VERN. NAME — Sneeuwwitje.

Pileus up to 12 mm high and 9 mm wide when still closed, up to 25(35) mm when expanded, completely covered with powdery white veil, but very young buds and centre of pileus of more advanced stages often cream to pale ochraceous (Mu. 10 YR 8/3); veil at margin, particularly in early stages, somewhat more hairy-floccose, with age greying.

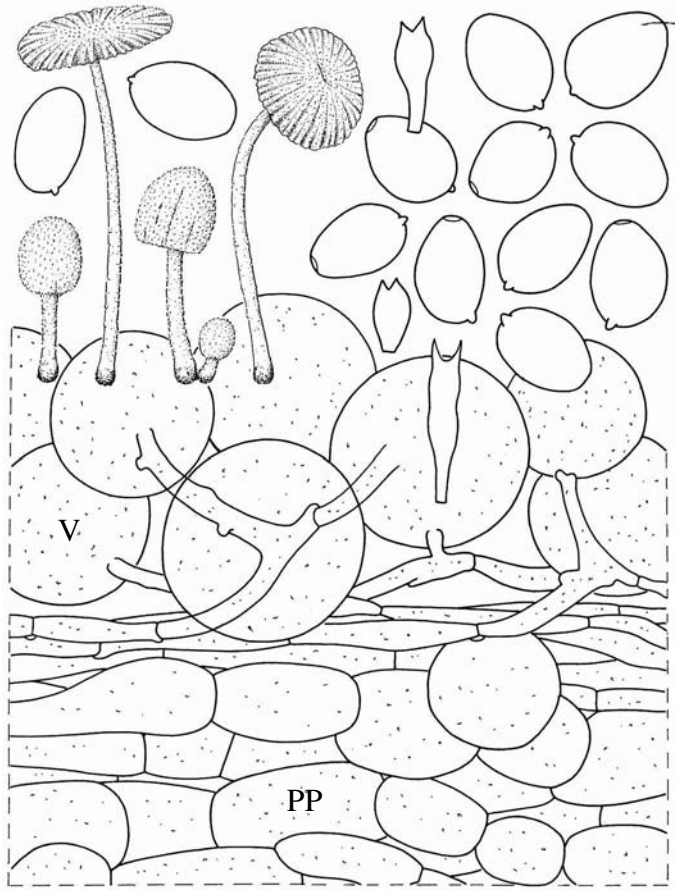


Fig. 109. *Coprinus bellulus*

Lamellae, L = 20–36, l = 1–3, free, up to 2 mm wide, white at first, then greyish to grey with blackish spots. Stipe up to 80 × 2.5 mm, attenuate upwards, at apex up to 1.5 mm wide, white but at apex often somewhat hyaline and brownish towards subbulbous, up to 3.5 mm wide base, with white velar flocks. Smell absent. Spore print dark chocolate brown (5 YR 2/1).

Spores 7.5–10.5 × 6.0–8.0 × 5.0–7.1 µm, Q = 1.20–1.65, av. Q = 1.40–1.50, av. L = 9.6–9.9 µm, av. B = 6.6–7.1 µm, in frontal view broadly ellipsoid, sometimes with slightly flattened side, but often somewhat irregularly shaped, with rounded base and somewhat attenuate apex, dark red-brown; germ pore central, 1.4–1.6 µm wide. Basidia 15–32 × 7–9 µm, 2-spored, surrounded by 3–5 pseudoparaphyses. Cheilo- and pleurocystidia absent but here and there sterile elements (probably somewhat enlarged basidioles) projecting from lamellae and sometimes velar remnants sticking to lamellar edge. Velar elements up to 50 µm in diam., (sub)globose. Clamp-connections present.

HABITAT & DISTR. — Mostly in small groups, more rarely in bundles of up to 40 specimens, but sometimes also solitary, on bare soil or at grassy-mossy places, usually under shrubs or trees, but also in lawns; rather rare in the Netherlands. May–Oct. Also recorded from Germany, Italy, and Japan.

Coprinus bellulus is easily distinguished from the other members of the *C. cortinatus*-group by the 2-spored basidia, the absence of pleuro- and cheilocystidia, and the somewhat irregular, broadly ellipsoid spores.

108. Coprinus cordisporus Gibbs in The Naturalist: 100. 1908. – Fig. 110.

Coprinus patouillardii subsp. *isabellinus* Locq. in Bull. trimest. Soc. mycol. Fr. 63: 83. 1947 (invalid, no Latin diagnosis).

MISSAPL. — *Coprinis patouillardii* sensu Caccialli et al. in Schede Micol. 1: 213. 1995; Enderle et al. in Z. Mykol. 52: 124. 1986; *C. patouillardii* subsp. *isabellinus* sensu Locq. in Bull. trimest. Soc. mycol. Fr. 63: 83–84, fig. 6. 1947.

SEL. ICON. — Cacialli et al., Schede Micol. 1: 213. 1995 (as *C. patouillardii*).

SEL. DESCR. & FIGS. — Enderle et al. in Z. Mykol. 52: 124. 1986. (as *C. patouillardii*); Locq. in Bull. trimest. Soc. mycol. Fr. 63: 83–84, fig. 6. 1947 (as *C. patouillardii* subsp. isabellinus); Uljé & Noordel. in Persoonia 15: 286–287, fig. 12. 1993.

VERN. NAME — Korrelige mestinktzwam.

Pileus up to 12 mm high and 8 mm wide when still closed, up to 25 mm when expanded, globose, subglobose, ellipsoid or cylindrical ellipsoid, later conical or convex, finally applanate, completely covered with powdery, pale pinkish brown veil (Mu. 7.5 YR 5/4, K. & W. 6C4 at centre), which forms small conical flocks at centre of pileus; at margin, particularly in early stages, with somewhat more hairy-floccose veil. Lamellae, L = 18–24, l = 0–3, free, up to 1.5 mm wide, white at first, then greyish to black. Stipe up to 60 × 0.5–1.5 mm, white, somewhat hyaline, at base clavate, up to 2.5 mm wide, often brownish, with white velar flocks, often building a small, volva-like, erect collar. Smell absent.

Spores 7.5–11.5 × 6.5–10.0 µm, Q = 0.95–1.25, av. Q = 1.05–1.20, av. L = 7.9–10.2 µm, av. B = 7.1–9.4 µm, rectangular ellipsoid with conical papilla, flattened, with rounded to convex base and with apical papilla; dark red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 12–32 × 7–10 µm, 4-spored (sometimes 2-spored and then spore-size about equal to that of the 4-spored collections), surrounded by (3)4–6 pseudoparaphyses. Cheilocystidia 20–50 × 17–32 µm, utriform, subglobose to ellipsoid or subcylindrical, mixed with lageniform ones

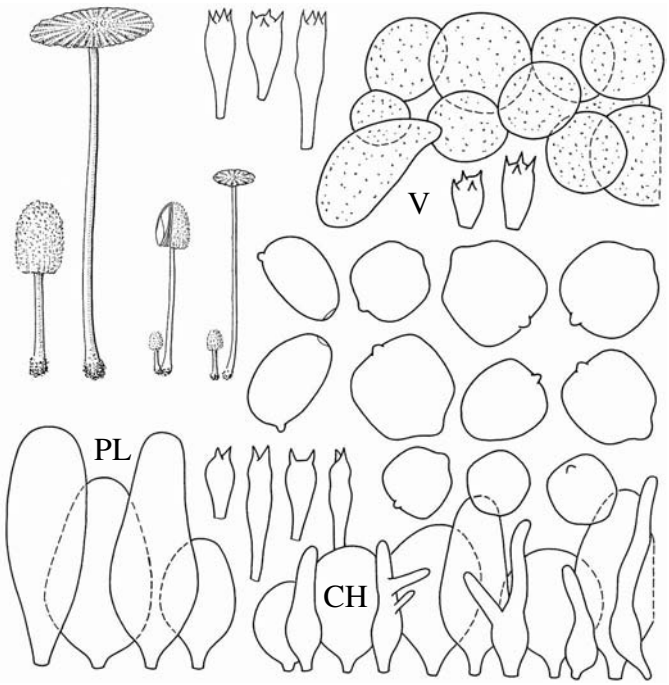


Fig. 110. *Coprinus cordisporus*

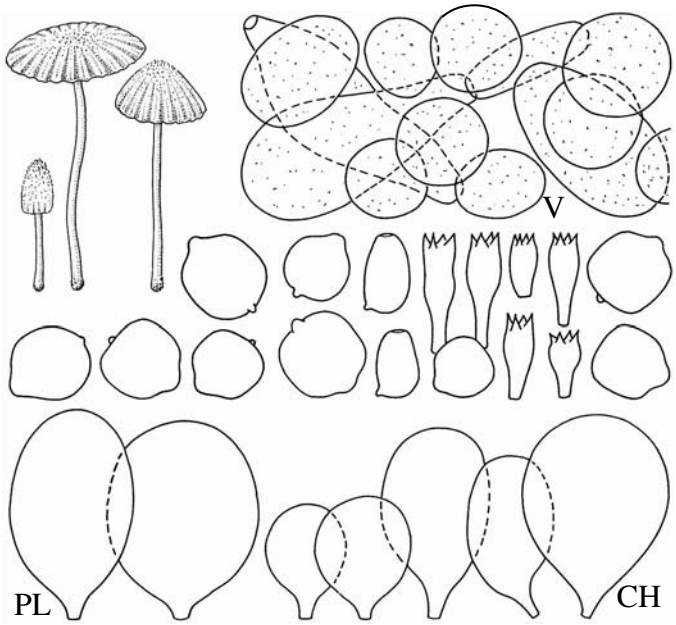


Fig. 111. *Coprinus patouillardii*

(20–50 × 8–12 × 3–5 µm). Pleurocystidia 40–80 × 16–28 µm, utriform, subglobose to ellipsoid or subcylindrical. Veil made up of (sub)globose to ellipsoid elements, smooth to granular, up to 50 µm wide. Clamp-connections absent.

HABITAT & DISTR. — Solitary or in small groups; on dung of several kinds of animals; rather common in the Netherlands. Jan.–Dec. Not uncommon in Europe.

Coprinus cordisporus differs from *C. patouillardii* in the presence of lageniform cheilocystidia and the habitat on dung. *Coprinus ephemeroides*, also a dung-inhabiting species, is smaller and has a small ring. *Coprinus cardiasporus* has differently shaped spores.

109. Coprinus patouillardii Quél. in Pat., Tab. anal. Fung. 1: 107. 1884. – Fig. 111.

Coprinus patouillardii var. lipophilus Heim & Romagn. in Bull. trimest. Soc. mycol. Fr. 50: 187. 1934.

EXCL. — *Coprinis patouillardii* sensu Caccialli et al. in Schede Micol. 1: 213. 1995; Enderle et al. in Z. Mykol. 52: 124. 1986; *C. patouillardii* subsp. *isabellinus* sensu Locq. in Bull. trimest. Soc. mycol. Fr. 63: 83–84, fig. 6. 1947 (= *C. cordisporus*).

MISSAPL. — *Coprinus angulatus* sensu J. Lange, Fl. agar. dan. 4: 118. 1939.

SEL. DESCR. & FIGS. — Heim & Romagn. in Bull. trimest. Soc. mycol. Fr. 50: 187–188. 1934 (as *C. patouillardii* var. *lipophilus*); J. Lange, Fl. agar. dan. 4: pl. 157D 1939 (as *C. angulatus*); Uljé & Noordel. in Persoonia 15: 289, fig. 13. 1993.

VERN. NAME — Korrelige inktzwam.

Pileus up to 5(8) mm high and 4 mm wide when still closed, up to 15(22) mm when expanded, globose, subglobose, ellipsoid or cylindrical ellipsoid, completely covered with powdery, pale pinkish brown veil (Mu. 7.5 YR 5/4, K. & W. 6C4 at centre), producing small conical flocks at centre of pileus; veil at margin, particularly in early stages, somewhat more hairy-floccose; expanded pileus up to 15(22) mm wide, conical or convex, later flat. Lamellae, L = 16–22, l = 0–3, free, up to 1.5 mm wide, white at first, then greyish to black. Stipe up to 50 × 0.5–1 mm, white, somewhat hyaline. Base of stipe clavate, up to 1.5 mm wide, often brownish, with white velar flocks, often forming a small erect collar. Smell absent.

Spores 6.0–9.0 × 6.0–8.0 µm, Q = 1.00–1.35, av. Q = 1.05–1.20, av. L = 7.4–8.0 µm, av. B = 6.6–7.0 µm, rectangular globose to ellipsoid with apical papilla, flattened, with rounded to convex base, dark red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 15–30 × 7–8 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 20–45 × 15–35 µm, globose, subglobose to ellipsoid. Pleurocystidia 30–50 × 35–40 µm, subglobose to ellipsoid. Pileipellis made up of (sub)globose to ellipsoid elements, smooth to granular, up to 50 µm wide. Clamp-connections absent.

HABITAT & DISTR. — Solitary or in small groups on compost heaps; rather rare in the Netherlands. Feb.–Dec. Known from Europe and Japan.

Coprinus patouillardii is very similar to *C. cordisporus* but develops on vegetable refuse, while *C. cordisporus* grows on dung. Microscopically *C. patouillardii* only has globose cheilocystidia.

110. Coprinus cardiasporus Bender in Z. Mykol. 52: 102. 1986. – Fig. 112.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 15: 289, 292, fig. 14. 1993.

VERN. NAME — Hartjesinktzwam.

Pileus up to 7 mm high and 4 mm wide when still closed, up to 10 mm wide when expanded, ellipsoid or cylindrical ellipsoid, completely covered with powdery, white, cream-coloured or pale pinkish ochre veil, at centre of pileus somewhat granular flocculose. Lamellae, L = 18–25, l = 0–3, free or narrowly adnate, 1 mm wide, white at first, then greyish to black. Stipe up to 35 × 0.5–1 mm, white, somewhat hyaline,

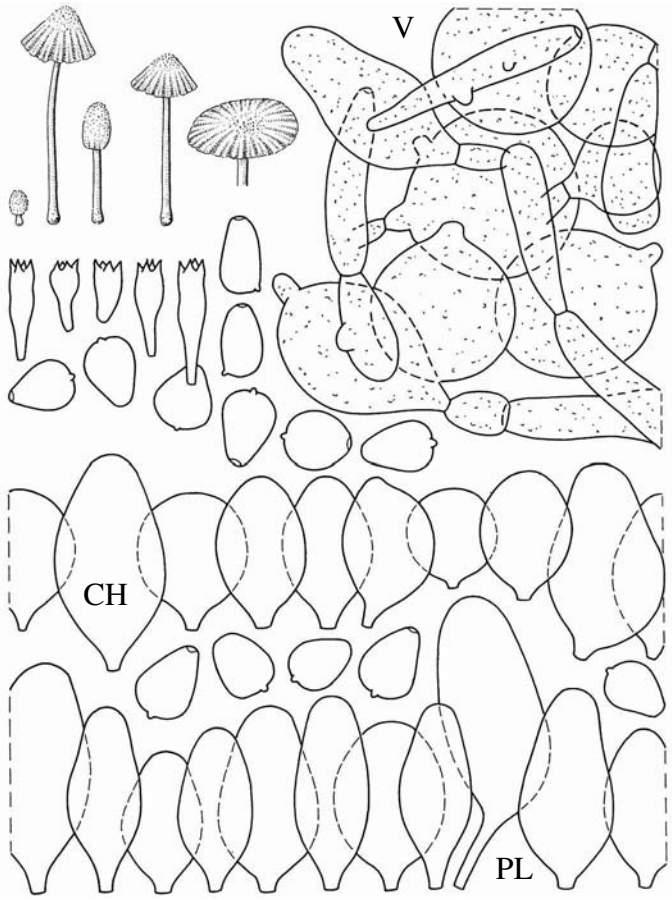


Fig. 112. *Coprinus cardiasporus*

minutely floccose, at base clavate, up to 1.5 mm wide, often pale brownish, felty. Smell absent.

Spores 5.5–8.5 × 5.0–6.5 × 3.5–4.5 µm, Q = 1.00–1.40, av. Q = 1.10–1.20, av. L = 6.1–7.3 µm, av. B = 5.3–5.5 µm, heart-shaped, flattened, with rounded to convex base and apical papilla, red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 12–28 × 7–8 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 25–50 × 15–30 µm, subglobose, ellipsoid or utriform. Pleurocystidia 30–55 × 15–26 µm, (sub)globose, utriform or ellipsoid. Veil made up of (sub)globose to ellipsoid elements, smooth to granular, up to 50 µm wide. Clamp-connections absent.

HABITAT & DISTR. — Solitary or in small groups; on compost heaps and horse dung mixed with soil and wood-chips; very rare in the Netherlands, and only known from Alphen aan den Rijn. July–Nov. Also known from one locality in Germany.

Coprinus cardiasporus is similar to *C. patouillardii*. It differs by having spores that are narrowing towards the germ pore, whereas the spores are rounded angular in *C. patouillardii*. The spores of *Coprinus cordisporus* are differently shaped (see key).

111. Coprinus ephemeroides (DC. :Fr.) Fr., Epicrisis: 250. 1838. – Fig. 113.

Agaricus ephemeroides DC. in DC. & Lam., *Fl. franç.,* Ed. 3, 2: 145. 1805; *Agaricus ephemeroides* DC. :Fr., Syst. mycol. 1: 313. 1821. *Agaricus hendersonii* Berk. in Hooker, Engl. Fl. 5: 122. 1836; *Coprinus hendersonii* (Berk.) Fr., Epicrisis: 250. 1838. *Coprinus bulbillosus* Pat., Tab. anal. Fung. 2: 60. 1889.

SEL. ICON. — Cortés in Bolets Catalunya 21: pl. 1007. 2002

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 15: 292, fig. 15. 1993.

VERN. NAME — Geringde korrelinktzwam.

Pileus up to 5(7) mm high and 3 mm wide when still closed, up to 10(13) mm when expanded, subglobose, ellipsoid, cylindrical ellipsoid or ovoid, completely covered with powdery, pale pinkish brown or yellowish veil, forming small conical flocks at centre of pileus. Lamellae, L = 14–23, l = 0–3, free, white at first, then greyish to black. Stipe up to 50 × 0.5–1 mm, white, somewhat hyaline; at base clavate, up to 1.5 mm wide, with yellowish or pale brown velar flocks, forming a small erect collar when very young, later forming the ring about halfway down the stipe or lower. Smell absent.

Spores 6.0–9.0 × 5.5–8.0 × 4.5–5.0 µm, Q = 0.95–1.20, av. Q = 1.05–1.15, av. L = 6.7–8.6 µm, av. B = 6.3–7.6 µm, rectangular globose to broadly ellipsoid with apical papilla, flattened, with rounded to convex base, dark red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 13–28 × 7–9 µm, 4-spored, surrounded by (3)4–7(8) pseudoparaphyses. Cheilocystidia 20–60 × 15–35 µm, utriform, (sub)globose, (sub)globose or ellipsoid. Pleurocystidia 30–60 × 20–35 µm, (sub)globose, utriform, ellipsoid, cylindrical ellipsoid. Veil made up of (sub)globose to ellipsoid elements, smooth to granular, up to 50 µm wide. Clamp-connections absent.

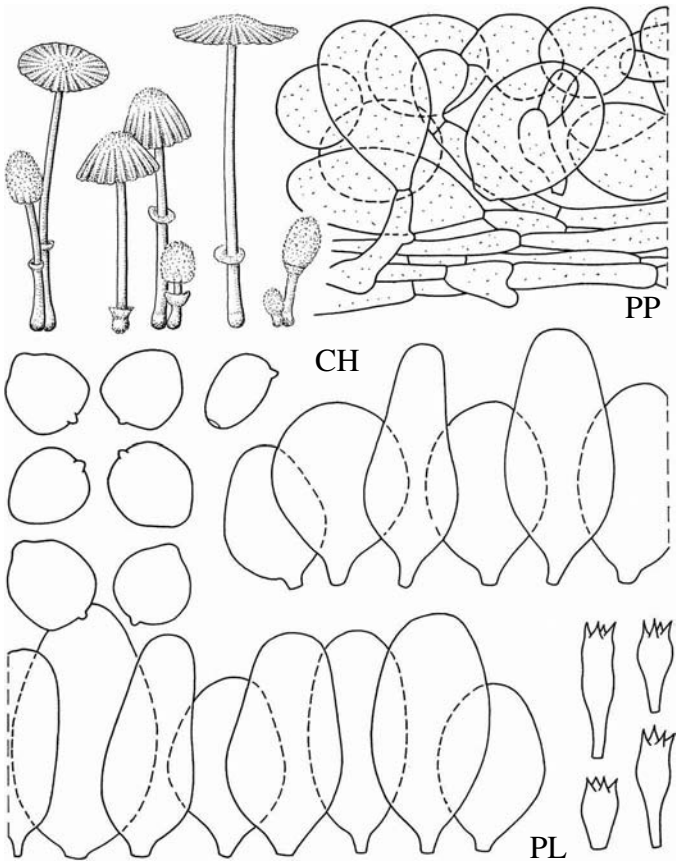


Fig. 113. *Coprinus ephemeroides*

HABITAT & DISTR. — Solitary or in small groups; on dung, especially from horse; rather common in the Netherlands. Jan.–Dec. Not uncommon in Europe.

Coprinus ephemeroides is a species close to *C. patouillardii* and *C. cordisporus*, differing by having a small annulus and by the colour of the pileus, which usually is more yellowish. The sparse lageniform cheilocystidia, similar to those found in *C. cordisporus,* were also noted in *C. ephemeroides*.

112. Coprinus iocularis Uljé in Persoonia 13: 485. 1988. – Fig. 114.

SEL. DESCR. & FIGS. — Uljé & Noordel. in Persoonia 15: 293–294, fig. 16. 1993.

VERN. NAME — Jokerinktzwam.

Pileus 27 mm wide when expanded, plano-convex, completely white-powdery. Lamellae L = 26, l = 1–3, free, first white, then grey to blackish spotted. Stipe 45 × 1.5 mm, with subbulbous base, whitish-hyaline, covered with white velar flocculi. Smell absent.

Spores 6.0–8.5 × 5.0–6.0 × 4.0–4.5 µm, Q = 1.05–1.45, av. Q = 1.25, av. L = 6.7–6.8 µm, av. B = 5.3–5.4 µm, in frontal view more or less hexagonal but frequently with two rounded lateral nodules at each side because of slightly depressed lateral sides, with somewhat conical base and slightly truncate apex, red-brown; germ pore central, 1.3–1.5 µm wide. Basidia 13–32 × 6–8 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia 20–35 × 8.5–15.5 µm, mostly utriform; neck 6–9.5 µm wide. Pleurocystidia absent. Veil on pileus consisting of up to 50 µm wide, smooth or somewhat granular globose elements mixed with frequently branching, colourless, thin-walled hyphae with processes. Clamp-connections present.

HABITAT & DISTR. — Solitary or in small groups, terrestrial on lawn on sandy or clayey soil; in the Netherlands very rare (Alphen aan den Rijn, Boskoop, Rijswijk). Aug.–Sept. Not yet known from other countries.

Coprinus iocularis can be recognised immediately by the characteristic shape of its spores. In frontal view the spores are more or less hexagonal (because of the two rounded lateral nodules at each side), in side view elliptical.

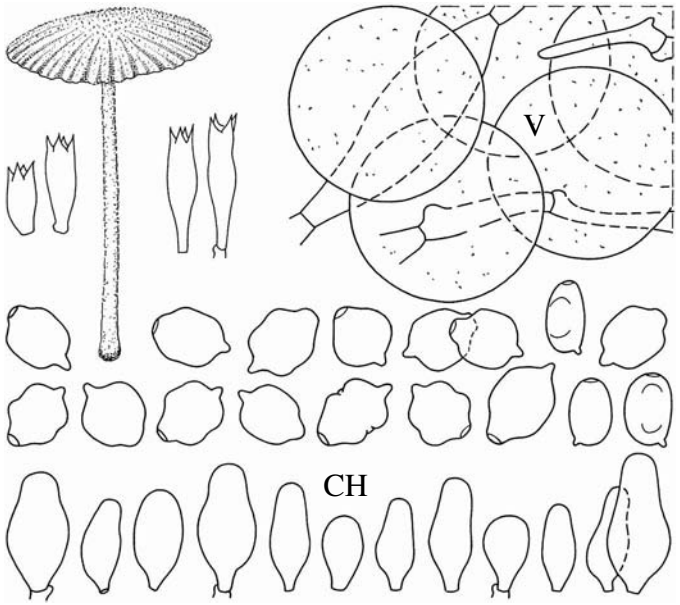


Fig. 114. *Coprinus iocularis*

113. Coprinus coniophorus Romagn. in Rev. Mycol. 6: 126. 1941. – Fig. 115.

Coprinopsis coniophora (Romagn.) Redhead, Vilgalys & Moncalvo in Taxon 50: 227. 2001.

SEL. DESCR. & FIGS. — Romagn. in Rev. Mycol. 6: 126. 1941; Uljé & Noordel. in Persoonia 15: 295, fig. 19. 1993.

VERN. NAME — Grijsvlokzwerminktzwam.

Pileus up to 7 mm high and 5 mm wide when still closed, up to 12(15) mm when expanded, globose, subglobose or ellipsoid, completely covered with powdery, dark grey-brown veil (Mu. 10 YR 3–5/2, 7.5 YR 6–7/4), often with olive-green hue (5 Y 3/1–2, 2.5 Y 5/4, 5 Y 5/3), forming small granular flocks at centre of pileus; veil at margin quickly disappearing, showing the white pileal surface. Lamellae, L = 14–24, l = 0–3, narrowly adnate, white at first then greyish to black. Stipe up to 30 × 0.5–1 mm, white, somewhat hyaline, at base clavate, up to 1.5 mm wide, often with brownish velar flocks. Smell absent.

Spores 6.5–9.0 × 4.0–5.0 µm, Q = 1.45–2.10, av. Q = 1.70–1.85, av. L = 7.3–7.9 µm, av. B = 4.0–4.6 µm, amygdaliform or ovoid, with rounded base and apex, medium red-brown; germ pore central, 1.2–1.4 µm wide. Basidia 13–30 × 6–8 µm, 4-spored, surrounded by 4–5 pseudoparaphyses. Cheilocystidia 10–28 × 8–15 µm, variably shaped, narrowly clavate, clavate, ellipsoid, broadly utriform or subglobose, sometimes with median constriction. Pleurocystidia absent. Veil made up of (sub)globose to ellipsoid or fusiform elements, smooth to (usually) strongly granular, up to 50 µm wide. Clamp-connections present.

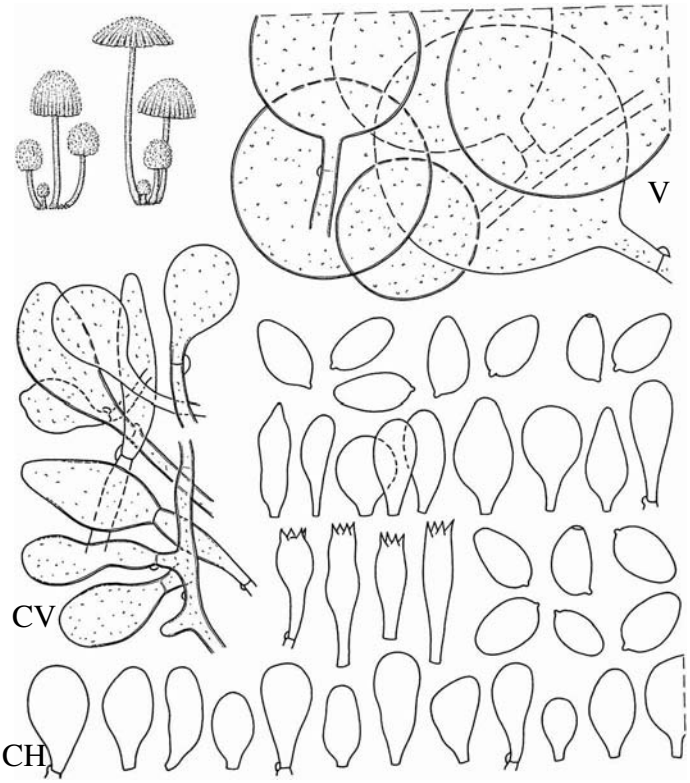


Fig. 115. *Coprinus coniophorus*

HABITAT & DISTR. — Gregarious, on and around stumps of deciduous trees; rare in the Netherlands. Aug.–Oct. Also known from Germany and France.

Coprinus coniophorus is very easy to identify, but the caespitose growth and shape of the basidiocarps (similar to *C. disseminatus*) cause it to be easily unrecognised. Contrary to *C. disseminatus,* the primordia are not cream-coloured but dark grey. Later, when the pileus is expanding, the white colour of the pileus becomes visible as the veil disappears. Young specimens of *C. coniophorus* may have a weak olivaceous tint, which is visible only under certain circumstances. Microscopically the shape of the cheilocystidia and size and shape of the spores are important diagnostic features. Sometimes the spores are ovoid for the most part, but usually they are distinctly amygdaliform, protruding to the germ pore. Cheilocystidia are not always easy to find, sometimes sparse, but anyway characteristically shaped. *Coprinus poliomallus*, another small mouse-grey species, grows on dung, solitary or in small groups. It has always elliptical or ovate spores and distinct pleurocystidia.

Subsect. **Narcotici** Uljé & Noordel.

Pileus mouse-grey with mealy-powdery veil (white in *C. stercoreus*), made up of globose elements in majority, with persistent, nipple-shaped warts that do not dissolve in HCl; spores usually with distinct, rarely indistinct or absent myxosporium.

114. Coprinus stercoreus Fr., Epicrisis: 251. 1838. – Fig. 116.

Coprinopsis stercorea (Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001.

MISSAPL. — *Coprinus stercorarius* sensu Kühn. & Romagn., Fl. anal. Champ. sup.: 385. 1953. — *Coprinus velox* sensu Kits v. Wav. in Persoonia 5: 154. 1968.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 303. 1995; Cetto, Gr. Pilzf. 6: pl. 2180. 1989; Mos. & Jül., Farbatl. Basidiomyc. III: 6. 1988; Cacialli et al., Schede Micol. 1: 201. 1995.

SEL. DESCR. & FIGS. — Kits v. Wav. in Persoonia 5: 154–157, figs 22-23, 32, 38–39, 45–47. 1968; Kits v. Wav. in Coolia 15: 6, fig. 5–6. 1971 (both as *C. velox*).

VERN. NAME — Kleine korrelinktzwam.

Pileus up to 7 × 5 mm when still closed, up to 12 mm when expanded, subglobose, cylindrical, oblong or parabolical, purely white, only late becoming grey, densely covered with mealy to granulose, later hairy floccose veil. Lamellae, L = 20–26, l = 0–1, free, white, quickly becoming black. Stipe 20–50 × 0.5–1 mm, whitish; base somewhat clavate, usually not rooting. Smell strong, awful (narcotic).

Spores 5.5–7.5 × 3.0–4.0 µm, Q = 1.40–2.00, av. Q = 1.65–1.80, av. L = 6.2–7.1 µm, av. B = 3.5–3.9 µm, cylindrical ellipsoid or ellipsoid, with rounded base and apex, medium red-brown; germ pore central, 1.0–1.1 µm wide; myxosporium sparse, smooth, up to 0.7 µm wide in places. Basidia 9–18 × 6.5–7.5 µm, 4-spored, surrounded by 3–5(6) pseudoparaphyses. Cheilocystidia 20–45 × 10–20 µm, (sub)globose, ellipsoid, oblong or utriform. Pleurocystidia 25–65 × 12–23 µm, utriform or oblong. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 80(100) µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections not found.

HABITAT & DISTR. — Gregarious, on dung, very common in the Netherlands the whole year round when circumstances are favourable. Widespread and common all over Europe.

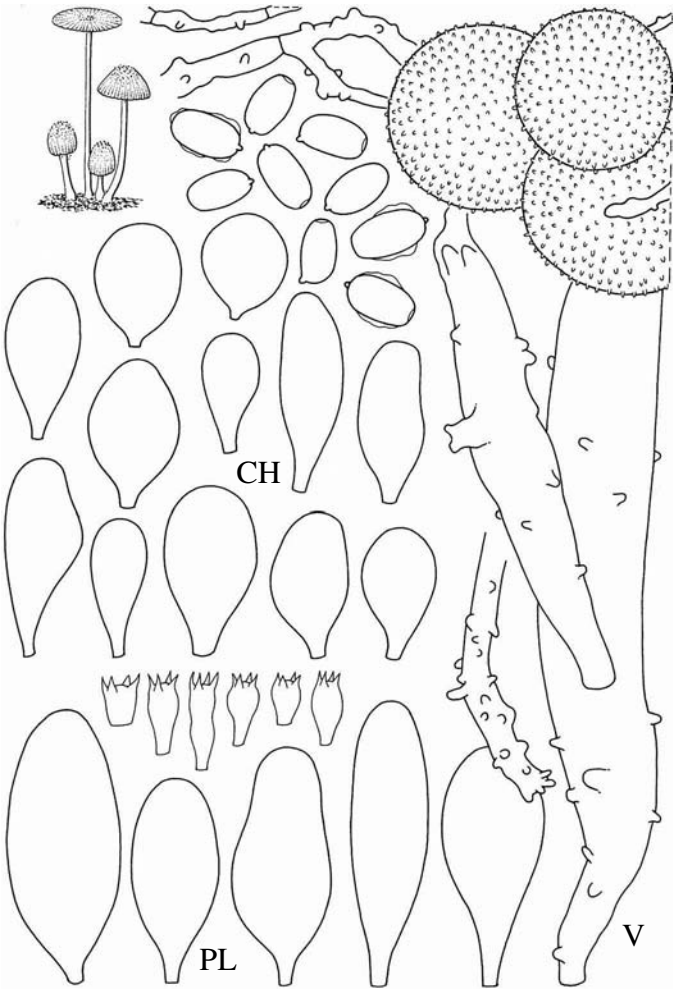


Fig. 116. *Coprinus stercoreus*

Coprinus stercoreus is a very small, whitish species, easily recognised by its small spores with a breadth less than 4.2 µm in combination with the characters of the veil. All other species in subsect. *Narcotici* have much broader spores.

115. Coprinus tuberosus Quél. in Bull. Soc. bot. Fr. 25: 289, pl. 3 fig. 2. ('1878')1879. – Fig. 117.

Coprinus sclerotiger Watling in Notes R. bot. Gdn Edinb. 32: 130. 1972; *Coprinopsis sclerotiger* (Watling) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001; — *Coprinus rufolanatus* Springael & Imler in Sterbeeckia 11: 7. 1977.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 305. 1995; Lanconelli et al., Funghi Lughese: 193. 1998.

VERN. NAME — Grijze korrelinktzwam.

Pileus up to 15 × 8 mm when still closed, up to 20(25) mm when expanded, subglobose to oblong, densely covered with mealy to hairy floccose veil, pale (pinkish-)grey to mouse grey. Lamellae, L = 25–40, l = 0–3, free, white to black. Stipe 40–80 × 1–2 mm, whitish; base somewhat clavate and usually connected to a dark brown to blackish sclerotium. Smell faint of raw potatoes.

Spores 8.0–11.0 × 5.0–6.5 µm, Q = 1.45–2.00, av. Q = 1.65, av. L = 9.1–9.9 µm, av. B = 5.6–5.9 µm, ellipsoid or ovoid, with rounded base

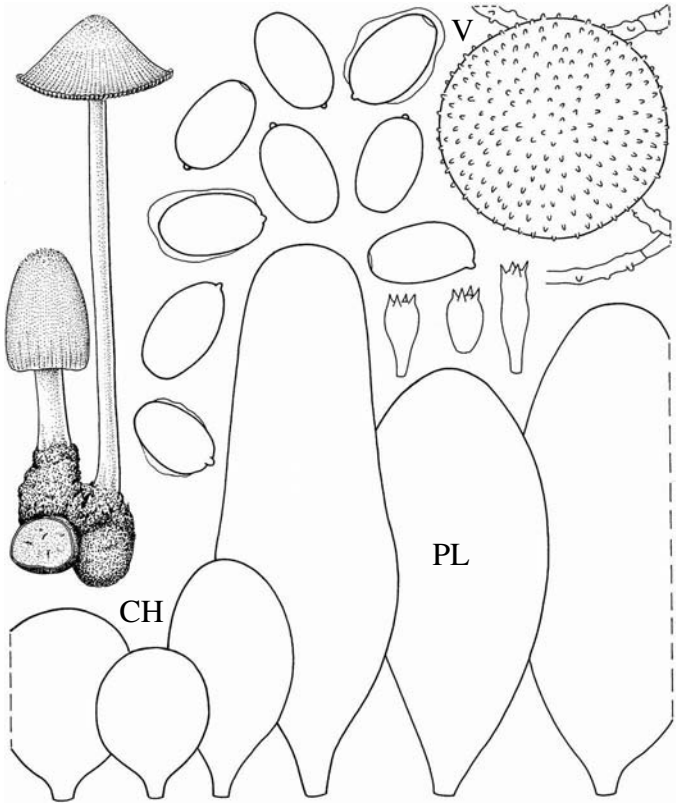


Fig. 117. *Coprinus tuberosus*

and apex, dark red-brown; germ pore central, 1.2–1.4 µm wide; myxosporium sparse, smooth, up to 1 µm wide in places. Basidia 10–28 × 6–9 µm, 4-spored, surrounded by 3–5(6) pseudoparaphyses. Cheilocystidia 20–70 × 18–40 µm, (sub)globose, ellipsoid, oblong or utriform. Pleurocystidia 30–100 × 22–50 µm, utriform or oblong. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 100(125) µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections not found.

HABITAT & DISTR. — Solitary or fasciculate, on mixed dung or compost heaps; rather common in the Netherlands. Jan.–Dec. Widespread in Europe.

The sclerotium is the best character to recognise *C. tuberosus*. If lacking, the species is recognisable by the size of the basidiocarps and the spores with rounded base and smooth, sparse myxosporium. Only *C. foetidellus* has similar spores, but that species is very small, up to 7 mm wide when expanding and grows on pure dung. Kits van Waveren (in Persoonia 5: 164–174. 1968) included *C. tuberosus* in the wide species concept of *C. stercorarius*, together with species like *C. saccharomyces*, and probably also *C. foetidellus*. Here, the name *stercorarius* is regarded as a nomen dubium, and Kits van Waveren's *C. stercorarius* is split up into a number of distinct, albeit closely related species.

116. Coprinus foetidellus P.D. Orton in Notes R. bot. Gdn Edinb. 31: 139. 1971. – Fig. 118.

SEL. DESCR. & FIGS. — P.D. Orton & Watl. in Br. Fung. Fl. 2: 76. 1979.

VERN. NAME — Stinkende mestinktzwam.

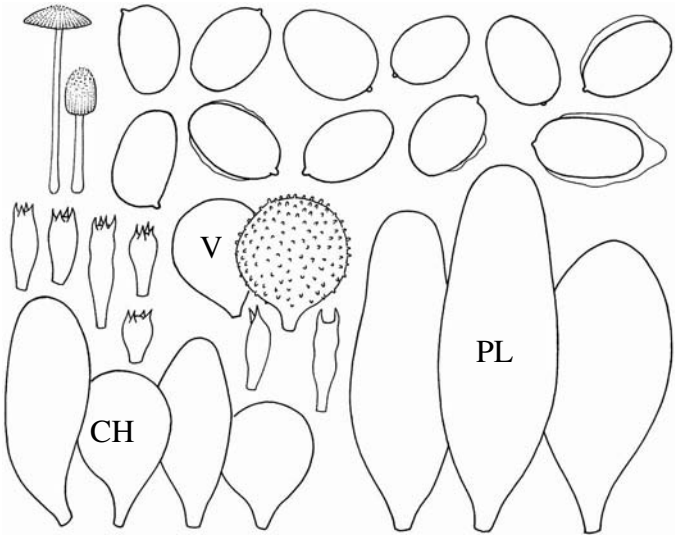


Fig. 118. *Coprinus foetidellus*

Pileus up to 6 × 4 mm when still closed, up to 7(10) mm when expanded, subglobose to oblong, densely covered with mealy to hairy floccose veil, pale grey to mouse grey. Lamellae free, white to black. Stipe 15–40(60) × 0.5–1 mm, whitish; base somewhat clavate. Smell strong, narcotic.

Spores 7.5–11.0 × 4.5–7.0 µm, Q = 1.40–1.65, av. Q = 1.50–1.60, av. L = 9.0–9.8 µm, av. B = 5.5–6.1 µm, ellipsoid or ovoid, with rounded base and apex, dark red-brown; germ pore central, 1.2–1.4 µm wide; myxosporium sparse, smooth, up to 1 µm wide in places. Basidia 18–20 × 6–8 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia 20–50 × 14–22 µm, (sub)globose, ellipsoid, oblong or utriform. Pleurocystidia 50–90 × 18–30 µm, utriform or oblong. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 60(70) µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections not found.

HABITAT & DISTR. — Solitary or fasciculate, on pure dung, or dung mixed with straw; very rare in the Netherlands (Leiden, Tilburg). May–Sept. Also recorded from Great Britain.

The absence of sclerotia, the presence of a strong narcotic smell, and the small basidiocarps are characters to recognise *C. foetidellus*. *Coprinus tuberosus* usually grows from sclerotia, does not have a narcotic smell, and has larger basidiocarps. *Coprinus trisporus* has 3-spored basidia.

117. Coprinus trisporus Kemp & Watl. in Notes R. bot. Gdn Edinb. 32: 128. 1972. – Fig. 119.

Coprinopsis trispora (Kemp & Watl.) Redhead, Vilgalys & Moncalvo in Taxon 50: 232. 2001. — *Coprinus triplex* P.D. Orton in Notes R. bot. Gdn Edinb. 35: 147. 1976.

SEL. DESCR. & FIGS. — P.D. Orton & Watl. in Br. Fung. Fl. 2: 75. 1979.

VERN. NAME — Driesporige inktzwam.

Pileus up to 17 × 9 mm when still closed, up to 25 mm when expanded, subglobose to oblong, densely covered with mealy to hairy floccose veil, first greyish white, then pale grey to mouse grey. Lamellae free, white to black. Stipe 15–50(60) × 1–3 mm, whitish; base somewhat clavate. Smell strong, narcotic.

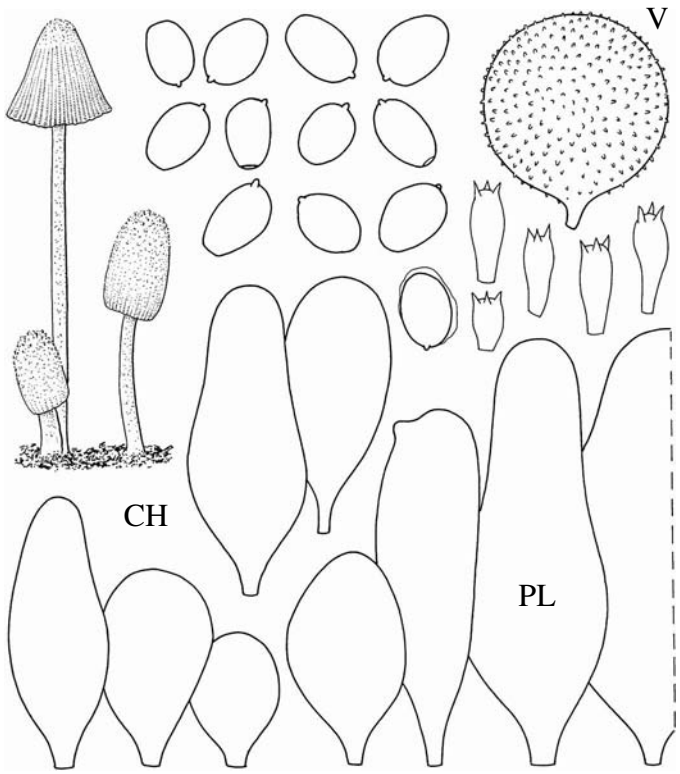


Fig. 119. *Coprinus trisporus*

Spores 6.5–9.0 × 4.5–5.5 µm, Q = 1.25–1.80, av. Q = 1.40–1.60, av. L = 7.1–7.8 µm, av. B = 4.9–5.0 µm, ellipsoid or ovoid, with rounded base and apex, dark red-brown; germ pore central, 1.2–1.4 µm wide; myxosporium weakly developed, smooth, up to 1 µm wide in places. Basidia 10–24 × 6–9 µm, 3-spored, sometimes partly 2- or 4-spored, surrounded by 3–5(6) pseudoparaphyses. Cheilocystidia 30–70 × 15–45 µm, (sub)globose, ellipsoid, oblong, utriform or subcylindrical. Pleurocystidia 50–100 × 22–50 µm, utriform, oblong or subcylindrical. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 75 µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections not found.

HABITAT & DISTR. — Solitary or fasciculate, on dung of horse and cow; very rare in the Netherlands (Vledderveen; southern Limburg). July–Sept. Also known from England.

118. Coprinus saccharomyces P.D. Orton in Trans. Br. mycol. Soc. 43: 202. 1960. – Fig. 120.

SEL. DESCR. & FIGS. — P.D. Orton & Watl. in Br. Fung. Fl. 2: 81. 1979.

VERN. NAME — Gistgeurinktzwam.

Pileus up to 20 × 15 mm when still closed, up to 30 mm when expanded, subglobose to oblong, densely covered with mealy to hairy floccose veil, mouse grey. Lamellae, L = 40, l = 0–3 free, white to black. Stipe 60(80) × 1–5 mm, whitish; base somewhat clavate. Smell somewhat of yeast or none.

Spores 11.5–16.0 × 7.5–8.5 µm, Q = 1.50–1.90, av. Q = 1.70–1.75, av. L = 13.9–14.9 µm, av. B = 8.1–8.7 µm, ellipsoid or ovoid, with rounded base and apex, dark red-brown; germ pore central, 1.5–1.8 µm wide; myxosporium smooth, up to 1.3 µm wide in places. Basidia 16–38 × 8–12 µm, 2-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 40–90 × 30–50 µm, (sub)globose, ellipsoid, oblong, utriform or subcylindrical. Pleurocystidia 60–100 × 30–45 µm, utriform, oblong or subcylindrical. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 80 µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections not distinct, if present very sparse, probably only pseudoclamps.

HABITAT & DISTR. — Solitary or fasciculate, terrestrial on wet places, among moss and grasses in sandy soil; very rare in the Netherlands, only known from Vogelenzang. May–Oct. Recorded from England.

The spores with rounded base and apex distinguish *C. saccharomyces* from the also 2-spored species *C. cinereofloccosus*, which has narrower spores with a conical base.

119. Coprinus cinereofloccosus P.D. Orton in Trans. Br. mycol. Soc. 43: 198. 1960.

Coprinopsis cinereofloccosa (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 227. 2001.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 268. 1995.

SEL. DESCR. & FIGS. — Kits v. Wav. in Persoonia 5: 150–154, figs. 24, 33. 1968; P.D. Orton & Watl. in Br. Fung. Fl. 2: 73. 1979

VERN. NAME — Reukloze inktzwam.

CHARACTERISTICS — Pileus up to 22 × 20 mm when still closed, up to 35 mm when expanded, subglobose to oblong, densely covered with mealy to hairy floccose veil, first greyish white, then pale grey to mouse grey. Lamellae free, white to black. Stipe 30–60 × 2–4 mm, whitish; base somewhat clavate. Smell none.

Spores 11.5–14.0 × 5.5–7.5 µm, Q = 1.75–2.15, av. Q = 1.90–2.00, av. L = 12.9–13.0 µm, av. B = 6.5–6.6 µm, ellipsoid or ovoid, with conical base and rounded apex, dark red-brown; germ pore central,

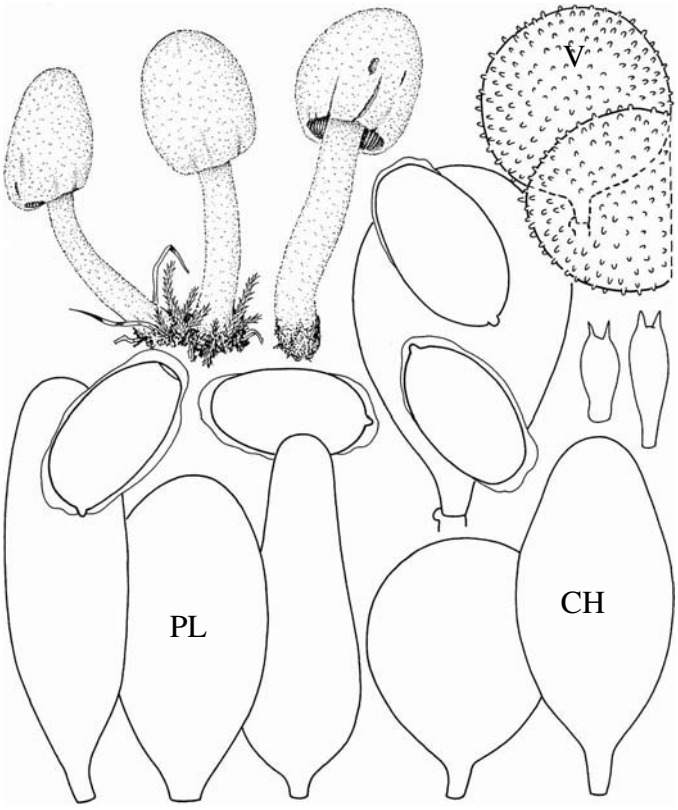


Fig. 120. *Coprinus saccharomyces*

1.5–1.8 µm wide; myxosporium smooth, up to 2 µm wide in places. Basidia 20–32 × 8–9.5 µm, 2-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–90 × 20–45 µm, (sub)globose, ellipsoid, oblong, utriform or subcylindrical. Pleurocystidia 50–120 × 22–40 µm, utriform, oblong or subcylindrical. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 80 µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections not found.

HABITAT & DISTR. — Solitary or fasciculate, terrestrial among grasses in sandy soil; not known yet from the Netherlands, recorded from England and Switzerland.

The spores with conical base distinguish *C. cinereofloccosus* from the also 2-spored species *C. saccharomyces*, which has broader spores with rounded base.

120. Coprinus martinii P.D. Orton in Trans. Br. mycol. Soc. 43: 201. 1960. – Fig. 121.

Coprinus martinii J. Favre in Bull. trimest. Soc. mycol. Fr. 53: 286–290. 1937 (invalid, no Latin diagnosis); *Coprinopsis martinii* (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 293. 1995.

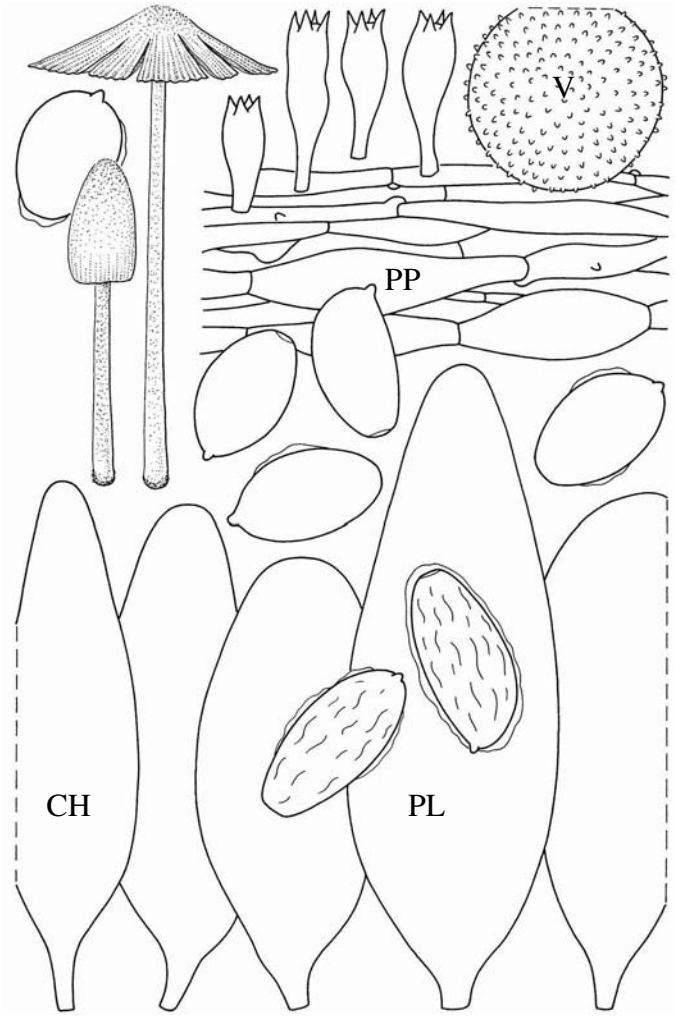


Fig. 121. *Coprinus martinii*

SEL. DESCR. & FIGS. — J. Favre in Bull. trimest. Soc. mycol. Fr. 53: 286–290, figs 6 & 7. 1937; Kits v. Wav. in Persoonia 5: 161–163, fig. 14, 40. 1968; P.D. Orton & Watl. in Br. Fung. Fl. 2: 80. 1979.

VERN. NAME — Zompinktzwam.

Pileus up to 24 × 17 mm when still closed, up to 30 mm when expanded, subglobose to oblong, densely covered with mealy to hairy floccose veil, grey to grey-brown. Lamellae free, white to black. Stipe 30–60 × 1–3 mm, whitish; base somewhat clavate. Smell none or somewhat rotten.

Spores 11.0–15.5 × 6.5–9.5 µm, Q = 1.30–1.95, av. Q = 1.45–1.75, av. L = 11.8–13.5 µm, av. B = 7.6–8.7 µm, ovoid, seldom ellipsoid, with conical or rounded base and rounded apex, dark red-brown; germ pore central, 1.4–1.6 µm wide; myxosporium weakly developed, smooth, up to 1 µm wide in places. Basidia 20–38(50) × 8–11 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 30–120 × 22–50(60) µm, (sub)globose, ellipsoid, oblong, utriform or subcylindrical. Pleurocystidia 70–120 × 30–45 µm, utriform, subglobose, ellipsoid, oblong or subcylindrical. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 80(120) µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections indistinct, if present sparse.

HABITAT & DISTR. — Solitary or fasciculate, terrestrial between or on mosses and grasses in sandy or peaty soil; frequent in mountainous areas, and rare in the Netherlands. Apr.–Nov. Known from France, Great Britain, Greenland, Norway, and Switzerland.

Coprinus martinii represents a species complex, representing taxa from different habitats and latitudes, which is in need of a critical revision. The current description is based on collections from lowland areas, characterised by rather broad, 6.5–9.5 µm wide spores.

121. Coprinus semitalis P.D. Orton in Notes R. bot. Gdn Edinb. 32: 147. 1972. – Fig. 122.

Coprinopsis semitalis (P.D. Orton) Redhead, Vilgalys & Moncalvo in Taxon 50: 231. 2001. — *Coprinus cinereofloccosus* var. *angustisporus* D. Reid in Fung. rar. Ic. Col. 6: 22. 1972

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 301. 1995; D. Reid in Fung. rar. Ic. col. 6: pl. 44d. 1972 (as *C. cinereofloccosus* var. *angustisporus*).

SEL. DESCR. & FIGS. — Jalink & Vellinga in Coolia 35: 37–41. 1992; P.D. Orton & Watl. in *Br. Fung. Fl.* 2: 72. 1979; D. Reid in Fung. rar. Ic. col. 6: 22. 1972 (as *C. cinereofloccosus* var. *angustisporus*).

VERN. NAME — Aardgeurinktzwam.

Pileus up to 22 × 11 mm when still closed, up to 35 mm when expanded, subglobose to oblong, densely covered with mealy to hairy floccose veil, grey to grey-brown. Lamellae free, white to black. Stipe up to 60(95) × 1–3 mm, whitish; base somewhat clavate. Smell none or somewhat muddy.

Spores 9.5–12.5 × 4.5–5.5 µm, Q = 1.75–2.50, av. Q = 1.95–2.30, av. L = 10.6–11.9 µm, av. B = 5.1–5.5 µm, ellipsoid or ovoid, with conical base and rounded to somewhat truncate apex, dark red-brown; germ pore central, 1.4–1.6 µm wide; myxosporium strongly developed, smooth, up to 2 µm wide in places. Basidia 16–30 × 8–10 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia 30–90 × 20–45 µm, (sub)globose, ellipsoid, oblong, utriform or subcylindrical. Pleurocystidia 50–130 × 20–35 µm, utriform, oblong or subcylindrical. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 70 µm

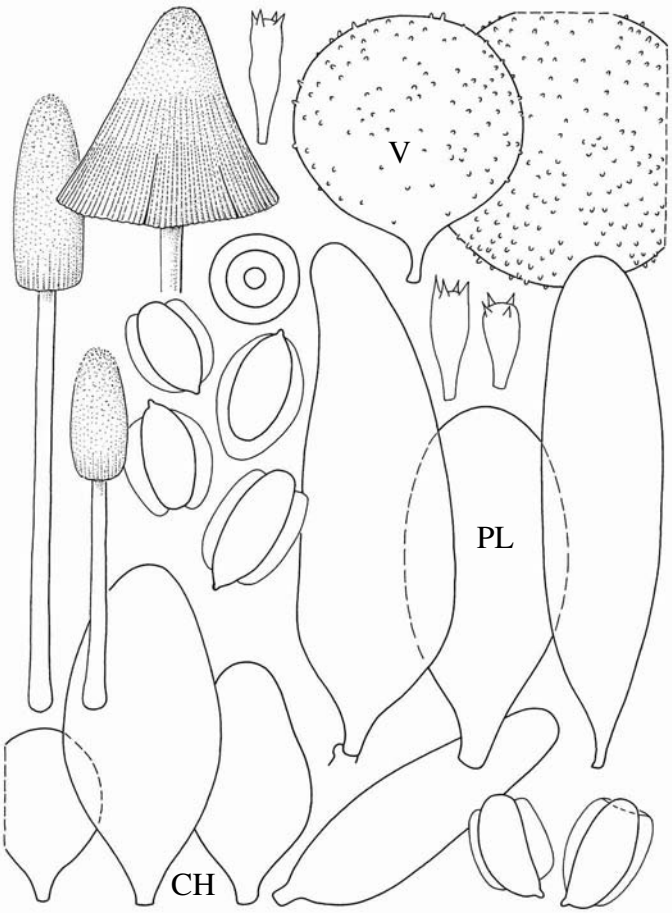


Fig. 122. *Coprinus semitalis*

wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections indistinct, if present sparse.

HABITAT & DISTR. — Solitary or fasciculate, terrestrial on wet places, among moss and grasses on sandy soil; rare in the Netherlands. May–Dec. Only known from Europe.

Coprinus semitalis can be recognised by the narrow spores with conical base with a very broad, smooth myxosporium and the absence of narcotic smell.

122. Coprinus narcoticus (Batsch :Fr.) Fr., Epicrisis: 250. 1838. – Fig. 123.

Agaricus narcoticus Batsch, Elench. Fung., Cont. 1: 79. 1786; *Agaricus narcoticus* Batsch :Fr., Syst. mycol. 1: 311. 1821; *Coprinopsis narcotica* (Batsch :Fr.) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001.

SEL. ICON. — R. Phillips, Paddest. Schimm. 179. 1981.

SEL. DESCR. & FIGS. — Kits v. Wav. in Persoonia 5: 142–143, fig. 1, 9, 15–17, 28. 1968; P.D. Orton & Watl. in Br. Fung. Fl. 2: 69. 1979.

VERN. NAME — Bedwelmende inktzwam.

Pileus up to 15 × 10 mm when still closed, up to 25 mm when expanded, subglobose to oblong, densely covered with mealy to hairy floccose veil, pale grey to mouse-grey. Lamellae free, white to black. Stipe up to 75 × 1–3 mm, whitish; base somewhat clavate; usually not rooting. Smell strongly narcotic.

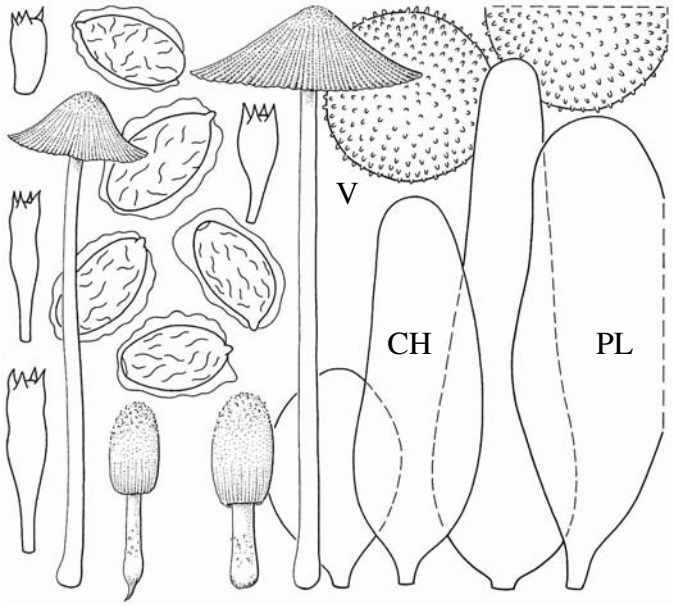


Fig. 123. *Coprinus narcoticus*

Spores 9.0–13.5 × 5.0–6.5 µm, Q = 1.70–2.15, av. Q = 1.85, av. L = 11.3 µm, av. B = 5.9 µm, ellipsoid or ovoid, with conical base and rounded to somewhat truncate apex, dark red-brown; germ pore central, 1.4–1.6 µm wide; myxosporium strongly developed, smooth, up to 1.3 µm wide in places. Basidia 20–36 × 8–11 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia 40–90 × 20–50 µm, (sub)globose, ellipsoid, oblong, utriform or subcylindrical. Pleurocystidia 50–140 × 20–45 µm, utriform, oblong or subcylindrical. Pileipellis a cutis, made up of hyphal elements. Elements of veil up to 100(–110) µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections indistinct, if present sparse.

HABITAT & DISTR. — Solitary or fasciculate, terrestrial on clayey or sandy soil, also on compost heaps and on dung mixed with vegetable refuse; rather common in the Netherlands. June–Dec. Widespread in Europe and probably other regions.

Coprinus narcoticus can be recognised by the spores that have a conical base and wrinkled myxosporium and the strong narcotic smell. The species usually grows on bare soil, but also on vegetable refuse and less common on dung. *Coprinus radicans* is described as a very similar species, differing by the much larger spores and longer pseudorhiza. Indeed some collections fitting the original concept of Romagnesi (in Rev. Mycol. 16: 127. 1951) have been encountered. But, since intermediate collections occur with smaller spores, and less distinct root, the status of *C. radicans* as an independent species remains unclear.

123. Coprinus laanii Kits v. Wav. in Persoonia 5: 146. 1968. – Fig. 124.

Coprinopsis laanii (Kits v. Wav.) Redhead, Vilgalys & Moncalvo in Taxon 50: 229. 2001.

SEL. ICON. — Arnolds in Arnolds et al., Overz. Paddest. Nederland: pl. 4D. 1995; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 286. 1995.

SEL. DESCR. & FIGS. — Kits v. Wav. in Persoonia 5: 146–149, figs 2–4, 10, 18–21, 29–31. 1968; P.D. Orton & Watl. in Br. Fung. Fl. 2: 69. 1979.

VERN. NAME — Zaagvlakinktzwam.

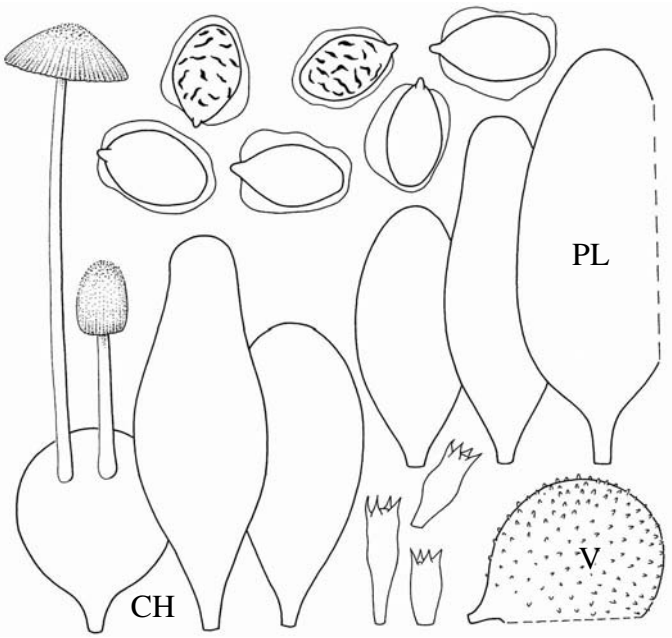


Fig. 124. *Coprinus laanii*

Pileus up to 17 × 10 mm when still closed, up to 20 mm when expanded, subglobose to oblong, densely covered with mealy then hairy floccose veil, grey to grey-brown. Lamellae free, white to black. Stipe up to 50 × 1–3 mm, whitish, sparsely but towards base increasingly covered with fine, white fibrils; base somewhat clavate. Smell none.

Spores 9.0–12.5 × 5.0–6.5 µm, Q = 1.50–2.00, av. Q = 1.55–1.95, av. L = 9.2–11.3 µm, av. B = 5.4–5.9 µm, ellipsoid or ovoid, with conical base and rounded or somewhat truncate apex, dark red-brown; germ pore central, 1.4–1.6 µm wide; myxosporium strongly developed, wrinkled, up to 1.7 µm wide in places. Basidia 18–32 × 8–10 µm, 4-spored, surrounded by 3–6 pseudoparaphyses. Cheilocystidia 40–100 × 25–40 µm, (sub)globose, ellipsoid, oblong, utriform or subcylindrical. Pleurocystidia 50–100 × 20–40 µm, utriform, oblong or subcylindrical. Pileipellis made up of hyphal elements. Elements of veil up to 80(100) µm wide, made up of globose, warty cells connected with narrow, diverticulate hyphae. Clamp-connections not found.

HABITAT & DISTR. — Solitary or fasciculate on moss- or algae-covered horizontal cut surfaces of trunks of coniferous and deciduous trees; rare in the Netherlands. Jan.–Nov. Also recorded from Great Britain and Switzerland.

Coprinus laanii can be recognised by the habitat, the narrow spores with conical base and wrinkled myxosporium, and the absence of a narcotic smell.

Sect. **Coprinus**

Subsect. **Coprinus**

Pileus 20–150 mm high before expanding, whitish, with cream, ochre or grey-brown centre, scaly from persistent veil, the tips often upturned. Stipe 20–300 × 3–20 mm, white, with movable ring on lower half. Elements of veil less than 25 µm wide. Pleurocystidia absent.

124. Coprinus comatus (O.F. Müll. :Fr.) Pers., Syn. meth. Fung.: 395. 1801. – Fig. 125.

Agaricus comatus O.F. Müll., Fl. dan.: pl. 834 1780; *Agaricus comatus* O.F. Müll. :Fr., Syst. mycol. 1: 307. 1821

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 270. 1995; R. Phillips, Paddest. Schimm.: 177. 1981; Cetto, Gr. Pilzf. 1: pl. 37. 1975.

SEL. DESCR. & FIGS. — P.D. Orton & Watl. in Br. Fung. Fl. 2: 29. 1979.

VERN. NAME — Geschubde inktzwam.

Pileus 50–200 × 25–70 mm when still closed, ellipsoid to oblong or subcylindrical, length divided by width often 2 or more, expanding to conical and then up to 100 mm wide, first white with adpressed, persistent scales, veil then breaking up into upturned scales except at centre, that stays smooth and becomes pale to medium grey- or ochre-brown. Lamellae, L = >> 50, l = 3–7, first white, then grey to black. Stipe 100–250 × 10–20 mm with movable ring on lower part with up to 30 mm wide, subbulbous base, hollow, with central strand. Context white, dull in pileus and wine-red when damaged, shiny in stipe. Smell spicy fungoid.

Spores 9.0–13.0 × 7.0–9.5 µm, Q = 1.20–1.70, av. Q = 1.35–1.55, av. L = 10.6–11.9 µm, av. B = 7.7–7.9 µm, ovoid with rounded (sometimes slightly conical) base and apex, dark red-brown; germ pore central

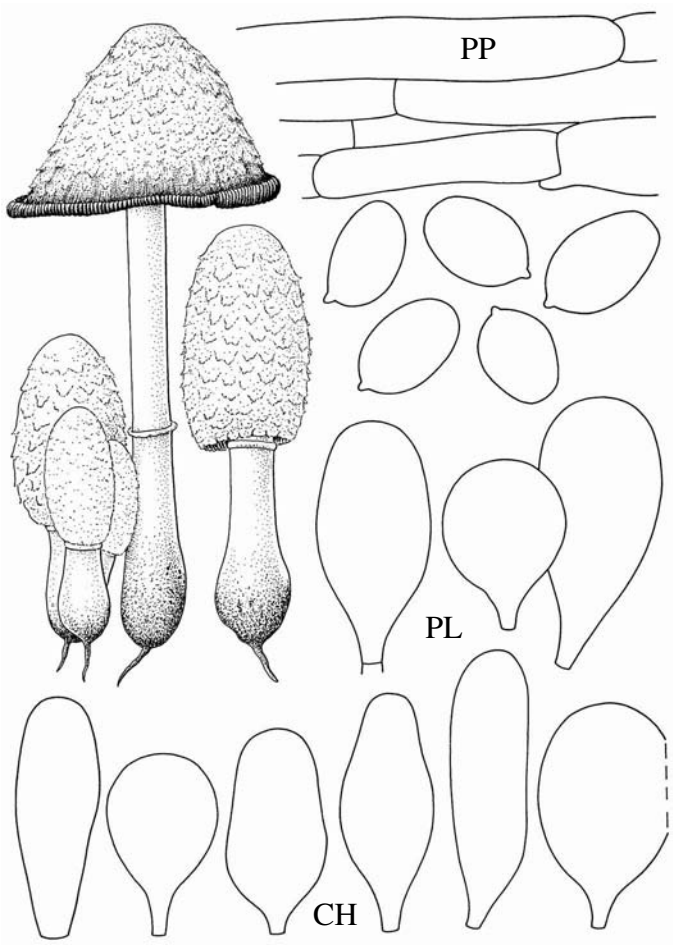


Fig. 125. *Coprinus comatus*

to slightly eccentric, 1.8–2.0 µm wide. Basidia 28–43 × 10–13 µm, 4-spored, surrounded by 5–8 pseudoparaphyses. Cheilocystidia 40–110 × 15–40 µm, ellipsoid, ovoid, oblong, utriform or subcylindrical. Pleurocystidia absent. Elements of veil 40–250 × 7–27 µm, in chains. Only pseudoclamps present.

HABITAT & DISTR. — Solitary, in groups, on recently disturbed ground, grassy places, and roadsides; very common in the Netherlands. Jan.–Dec. Probably cosmopolitan.

Coprinus comatus differs from *C. calyptratus* in having much smaller spores. *Coprinus sterquilinus* and *C. spadiceisporus*, two other species with a ring, grow on dung.

Ko et al. (in Mycol. Res. 105: 1519–1526. 2001) showed that there are molecular differences in collections from different geographical regions of the world, indicating that there might be more than one species involved.

125. Coprinus sterquilinus (Fr. :Fr.) Fr., Epicrisis: 242. 1838. – Fig. 126.

Agaricus sterquilinus Fr. :Fr., Syst. mycol. 1: 308. 1821.

SEL. ICON. — M. Lange, Paddestoelengids: 137. 1964; R. Phillips, Paddest. Schimm.: 177. 1981; Cacialli et al., Schede Micol. 1: 145. 1995.

SEL. DESCR. & FIGS. — Bender et al. in Z. Mykol. 50: 18. 1984; P.D. Orton & Watl. in Br. Fung. Fl. 2: 30. 1979; Cacialli et al., Schede Micol. 1: 145. 1995.

VERN. NAME — Geringde inktzwam.

Pileus 40–60 × 20–30 mm when still closed, ellipsoid or ovoid, expanding to conical and then up to 60 mm wide, first white, first fibrillose flocculose, then more coarsely scaly with pale or deep cream centre. Lamellae, L = >> 50, l = 3–7, very crowded, first white, then grey to black. Stipe 80–150 × 4–8 mm with movable ring on lower part; base up to 12 mm and subbulbous; hollow with central strand.

Spores c. 17.0–26.0 × 10.0–15.0 µm, Q = 1.55–1.85, av. Q = 1.65, av. L = 23.0–24.2 µm, av. B = 14.0–14.6 µm, ellipsoid or ovoid with rounded base and apex, very dark red-brown, almost black; germ pore slightly eccentric, 2.5–2.8 µm wide. Basidia 32–54 × 13–16 µm, 4-spored, surrounded by 5–8 pseudoparaphyses. Cheilocystidia 35–60 × 18–25 µm, ellipsoid, ovoid or broadly utriform. Pleurocystidia absent. Elements of veil 30–200 × 8–25 µm, in chains. Only pseudoclamps present.

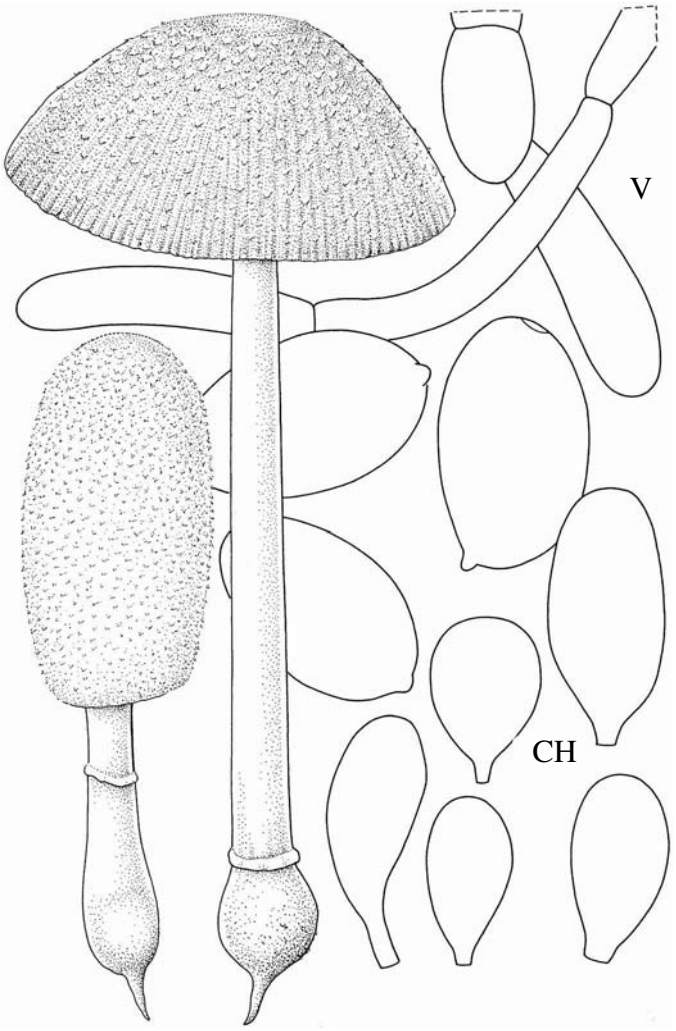


Fig. 126. *Coprinus sterquilinus*

HABITAT & DISTR. — Solitary, on dung or mixed dung with vegetal debris or straw, usually of horse; widespread, but rare in the Netherlands. May–Sept. Rare in Europe, Asia, and America.

Coprinus sterquilinus is easy to recognise by the very large, ellipsoid spores and the habitat on dung.

Bolbitiaceae Sing.

Eef Arnolds and Marijke M. Nauta

Bolbitiaceae Sing. in Papers Mich. Acad. Sci., Arts Letters 32: 147. ('1946'). 1948.

Basidiocarp small to medium, collybioid, mycenoid, coprinoid, pluteoid, or tricholomatoid; pileus conical, convex or applanate, exceptionally with depressed centre, dry or glutinous, smooth or pubescent; lamellae adnate, adnexed or free, occasionally weakly deliquescent as in *Coprinus*, irregular in secotoid taxa, when mature yellow-brown, rusty brown to dark brown; stipe central, cylindrical or bulbous, dry, often pruinose or pubescent; veil absent or present, leaving appendiculate flocks along margin of pileus or a weak annular zone to membranaceous annulus on the stipe, rarely volva-like remains at base of stipe; spore print most often orange-brown to rusty brown, also ochraceous, dark yellow-brown to dark red-brown or dark brown to umber.

Spores smooth, rarely verrucose, exceptionally gibbous (in the extralimital genus *Pseudoconocybe* Hongo), usually with germ pore, more rarely with callus or without pore, with thin to thick, pale yellow to brown wall, pigment not soluble in sulphuric acid (H_2S0_4); basidia clavate, often short and broad, 4- or 2-spored, in part of the species separated by sterile inflated cells (pavement cells or pseudoparaphyses); lamella edge heterogeneous or sterile with numerous cheilocystidia; pleurocystidia usually absent but well-developed in some species; hymenophoral trama regular, often with a mediostratum of parallel, subcylindrical hyphae surrounded by strongly inflated cells; pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate cells, often intermixed with pileocystidia, occasionally covered by a gelatinous layer; pigmentation intracellular, parietal or incrusting; clamp-connections usually present. Development paravelangiocarpic, hemiangiocarpic or gymnocarpic, rarely bivelioangiocarpic, and usually hymenocarpic; rarely pileiostipitocarpic. – Type genus *Bolbitius* Fr.

Habitat & distr. — Solitary, gregarious or exceptionally fasciculate, saprotrophic, rarely necrotrophic, most often terrestrial or coprophytic, occasionally on dead wood, rarely on living trees, in all kinds of habitats, often in disturbed places, often on substrates rich in nutrients, in particular nitrogen, widespread and cosmopolitan.

The Bolbitiaceae are characterised in the first place by the hymenidermal pileipellis in combination with brown spores. However, recent molecular research suggests that the Bolbitiaceae do not form a natural entity and is polyphyletic (Moncalvo et al. in Mol. Phylogen. Evol. 23: 357–400. 2002). The three analysed species of *Agrocybe* represent one clade that is not necessarily closely related to the other genera of the Bolbitiaceae. Moncalvo et al. restrict the Bolbitiaceae to the genera *Bolbitius*, *Conocybe*, *Pholiotina,* and the secoid genus *Gastrocybe* Watling. Within the Bolbitiaceae two clades were recognised: the conocyboid clade, including the genera *Conocybe* and *Gastrocybe*, and the bolbitioid clade, comprising *Bolbitius* and *Pholiotina*. This result is surprising since *Conocybe* and *Pholiotina* show much similarity in morphological characters and they are often united into one genus. However, the results of this molecular research need to be verified in more extensive material since *Conocybe*, *Pholiotina,* and *Gastrocybe* were represented in this analysis with only one species, *Bolbitius* with two species.

The Panaeoloideae, comprising the genera *Panaeolus*, *Panaeolina,* and *Copelandia*, is usually placed in the Coprinaceae, but Moncalvo et al. suggested that this clade is possibly closer to the Bolbitiaceae (excluding *Agrocybe*).

Members of the Bolbitiaceae are important in natural and man-made environments as decomposers of litter, humus, and dung, but their practical use is limited. Some species of *Agrocybe* are edible and cultivated on a limited scale for commercial harvests. Some species of *Conocybe* contain psilocybin and are apparently hallucinogenic. However, they are not cultivated and hardly used as drug.

KEY TO THE GENERA

1. Pileus viscid to glutinous, membranous or thin-fleshed, densely sulcate-striate when mature; lamellae free; entire basidiocarp soon collapsing and decaying; basidia in young basidiocarps separated by large sterile cells (pseudoparaphyses); cheilocystidia never lecythiform . . . . . 1. **Bolbitius**
1. Pileus usually dry or slightly greasy, when viscid not membranous and not sulcate-striate; lamellae adnexed to adnate, rarely almost free; basidiocarp more persistent; basidia rarely separated by pseudoparaphyses and then cheilocystidia lecythiform.
   2. Cheilocystidia regularly lecythiform with swollen basal part suddenly passing into short, thin, cylindrical neck (1.0–2.0 μm), crowned with globose capitulum (Fig. 127a); pleurocystidia absent . . . . . 2. **Conocybe**
   2. Cheilocystidia subcylindrical, lageniform, utriform or globose, sometimes lecythiform but then usually irregular and basal part gradually passing into neck (Fig. 127b); pleurocystidia sometimes present
      3. Basidiocarp collybioid to tricholomatoid; pileus relatively fleshy, usually not translucently striate, rarely weakly translucent-striate when moist; lamellae subhorizontal, not ascending; spore print mostly dark red-brown, occasionally dark yellow-brown; base of stipe often with rhizomorphs; pleurocystidia often present . . 3. **Agrocybe**
      3. Basidiocarp usually mycenoid; pileus submembranous, often strongly translucently striate when moist; lamellae usually ascending; spore print orange-brown to rusty brown; base of stipe without rhizomorphs; pleurocystidia absent . . . . . 4. **Pholiotina**

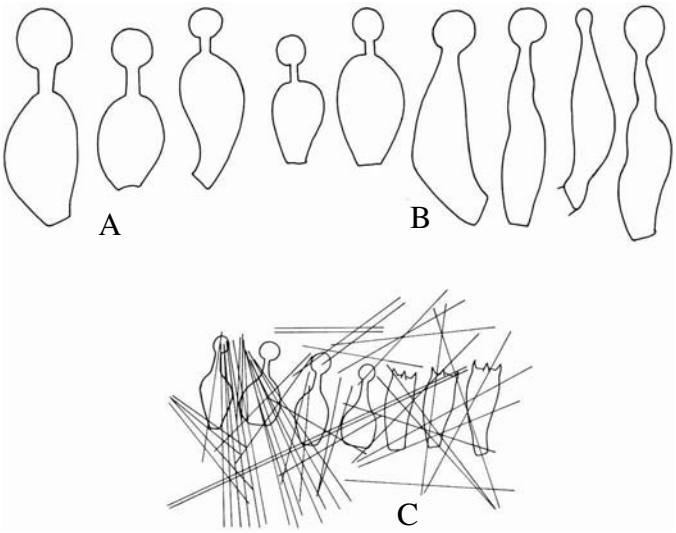


Fig. 127. Bolbitiaceae characters. A. Lecythiform cystidia of *Conocybe*-type. B. Lecythiform cystidia of *Pholiotina*. C. Needle-like crystals in some species of sect. *Conocybe* (ammonia-reaction).

1. Bolbitius Fr.

Eef Arnolds

Bolbitius Fr., Epicrisis: 253. 1838. – *Pluteolus* (Fr.) Gillet, Hyménomycètes: 549. 1876.

Selected Literature — Sing. in Sydowia 30: 216–220. 1977; Enderle et al. in Mittbl. Arbeitsgem. Pilzk. Niederrhein 3: 5–30. 1985; Watl. & Gregory in Biblthеca mycol. 82: 65–81. 1981; Watling in Br. Fung. Fl. 3: 31–38. 1982.

Basidiocarp mycenoid to coprinoid, fragile, soon collapsing; pileus paraboloid or ellipsoid at first, becoming fully expanded with striate-sulcate margin, glabrous, viscid to glutinous; lamellae free or narrowly adnexed, orange-brown when mature; stipe central, widely fistulose, fragile, white or pale coloured, pruinose at least at apex; veil absent; spore print orange-brown, chocolate-brown to rusty brown.

Spores smooth, slightly to clearly thick-walled, yellow-brown to orange-brown, with distinct germ pore; basidia clavate, 4-spored, surrounded by sterile, inflated cells (pseudoparaphyses or pavement cells); cheilocystidia present, clavate, utriform or lageniform; pleurocystidia absent or scattered; hymenophoral trama regular; pileipellis an epithelioid hymeniderm, made up of clavate elements, sometimes intermixed with hyphae, embedded in gelatinous matter; stipitipellis a cutis with clusters of caulocystidia; clamp connections absent, rarely present. Development paravelangiocarpic. – Lectotype species: *Bolbitius vitellinus* (Pers. :Fr.) Fr.

Habitat & distr. — Saprotrophic on dung, rotting plant remains and wood, usually in places rich in nutrients. Widespread, with world-wide distribution.

KEY TO THE SPECIES

1. Pileus yellow or olive-yellow, occasionally olive-brown, becoming brownish with age; spores 9.5–15.0 × 6.0–9.0 × 5.5–8.0 µm, rather thick-walled (0.5–1.0 µm) . . . . . **1. B. titubans**
1. Pileus without bright yellow colours but whitish, pinkish, greyish or brownish, occasionally with weak olivaceous tone but then spores smaller: 7.0–11.0 × 3.5–5.5 µm and thin-walled
   2. Pileus 30–70 mm, pale pink, pale orangeish to flesh-coloured at first, gradually fading to brownish; spores 11.5–16.0(16.5) × 8.0–11.0 × 6.5–9.5 µm, flattened, on the average over 13.0 µm long; growing on dung . . . . . **3. B. coprophilus**
   2. Pileus usually with whitish, brown, grey or violaceous colours, occasionally pinkish but then smaller than 30 mm; spores 7.0–13.0 × 4.0–7.5 µm, not flattened, on the average less than 12.0 µm long; on soil, plant remains or wood, rarely on dung
      3. Pileus whitish, cream-coloured or pale pinkish and small, up to 17(20) mm broad
         4. Spores (10.0)10.5–13.0(14.0) × (5.5)6.0–7.5 µm, av. 11.5–12.0 × 6.6–7.0 µm; growing on soil or plant remains in grasslands . . . . . **2. B. lacteus**
         4. Spores 7.0–11.0(11.5) × 4.0–5.5(6.5) µm, av. 8.3–9.5 × 4.5–5.2 µm; usually on decayed wood, occasionally on soil, in forests . . . . . **5b. B. reticulatus** var. **pluteoides**
      3. Pileus pale to dark grey, brownish or violaceous and usually larger, 12–45(70) mm broad
         5. Pileus 30–70 mm broad; stipe 50–100 × 3–5 mm; spores (9.5)10.5–13.0 × (5.5)6.5–7.0(7.5) µm, on the average larger than 11.1 × 6.5 µm; on soil or plant remains, recorded from glasshouses. . . **4. B. demangei**
         5. Pileus 12–45 mm broad; stipe 17–55 × 1–3(4) mm; spores (6.5)7.0–12.0(12.5) × (3.5)4.0–5.5(6.5) µm, on the average less than 10.0 × 5.2 µm; usually on wood, rarely on soil in forests. . . . . **5a. B. reticulatus** var. **reticulatus**

1. Bolbitius titubans (Bull. :Fr.) Fr., Epicrisis: 254. 1838. – Fig. 128.

Agaricus titubans Bull., Herb. France: pl. 425, fig. 1. 1789; *Agaricus titubans* Bull. :Fr., Syst. mycol. 1: 304. 1821; *Pluteolus titubans* (Bull. :Fr.) Quél., Fl. mycol. France: 83. 1888; *Bolbitius vitellinus* ssp. *titubans* (Bull. :Fr.) Konr. & M., Ic. sel. Fung. 2: pl. 171, fig. 2. 1932; *Bolbitius vitellinus* var. *titubans* (Bull. :Fr.) Bon & Courtec. in Doc. mycol. 18 (69): 37. 1987. – *Agaricus vitellinus* Pers., Syn. meth. Fung.: 402. 1801; *Agaricus vitellinus* Pers. :Fr., Syst. mycol. 1: 303. 1821; *Bolbitius vitellinus* (Pers. :Fr.) Fr., Epicrisis: 254. 1838; *Pluteolus vitellinus* (Pers. :Fr.) Quél., Fl. mycol. France: 83. 1888. – *Agaricus fragilis*

L., Spec. Pl.: 1175. 1753; *Bolbitius fragilis* (L.) Fr., Epicrisis: 254. 1838; *Pluteolus vitellinus* var. fragilis (L.) Quél., Fl. mycol. France: 83. 1888; *Bolbitius vitellinus* ssp. *fragilis* (L.) Konr. & M., Ic. sel. Fung. 2: pl. 171. fig. 1. 1932; *Bolbitius vitellinus* var. *fragilis* (L.) Bon & Courtec. in Doc. mycol. 18 (69): 37. 1987.

KEY TO THE VARIETIES

1. Pileus entirely bright lemon-yellow to egg-yellow at first, becoming beige to brown in broad marginal zone when maturing, retaining bright yellow colour at centre; surface usually smooth, occasionally rugulose to reticulate with yellow veins, concolorous with background . . . . . 1a. var. **titubans**
1. Pileus ochre-yellow, olivaceous yellow to olive-brown at first, becoming brownish in broad marginal zone on maturing, retaining yellowish or greenish colour at centre; surface often rugulose to reticulate with veins darker than background, occasionally smooth 1b. var. **olivaceus**

1a. var. **titubans** – Fig. 128A

EXCL. — *Bolbitius vitellinus* sensu Dähncke, *1200* Pilze: 586. 1993 (= *B. vitellinus* var. *olivaceus*).

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987 (as *B. vitellinus* and *B. vitellinus* var. *fragilis*); Breitenb. & Kränzl., Pilze Schweiz 4: pl. 372. 1995 (as *B. vitellinus*); Cetto, Funghi Vero 3: pl. 907. 1979 (as *B. vitellinus*); Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1308. 1994 (as *B. vitellinus*); Dähncke, 1200 Pilze: 587. 1993; Gerhardt, Gr. Pilzf.: 318. 1997 (as *B. vitellinus*); Kytövuori in Sieni Lehti 49: 84, pl. 2. 1997 (as *B. vitellinus*); J. Lange, Fl. agar. dan. 4: pl. 132A. 1939 (as *B. vitellinus*); Ludwig, Micol. Veget. medit. 1: pl. 5. 4, figs. A, B. 2000; Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 219 (as *B. vitellinus*), 220. 1985.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 286. ('1982') 1983 (as *B. vitellinus*); Breitenb. & Kränzl., Pilze Schweiz 4: 296, figs. A–E. 1995 (as *B. vitellinus*); Enderle et al. in Mittbl. Arbeitsgem. Pilzk. Niederrhein 3: 5–9, figs. A–F. 1985 (as *B. vitellinus*); Horak, Syn. Gen. Agar.: 123–124. 1968 (as *B. vitellinus*); Ludwig, in Pilzkompendium 1: 34–35. 2001; Watling in Br. Fung. Fl. 3: 33–34, figs. 4a–c; 35–36, figs. 1, 3, 7, 69. 1982 (as *B. vitellinus*).

VERN. NAME — Dooiergele mestzwam.

Pileus (10)15–65 mm broad, ovoid to ellipsoid at first, then conico-convex, soon plano-convex to applanate, often with small obtuse umbo, finally often with depressed centre, rapidly deliquescent, not hygrophanous, entirely lemon-yellow, golden-yellow to egg-yellow (K. & W. 2A5–7; 3A6–8, 4A7) at first, occasionally at centre orange-yellow, then broad marginal zone becoming ochraceous, beige, flesh-coloured brown or greyish brown, retaining bright yellow colour at centre, first translucently striate at margin, radially sulcate-striate when mature, smooth or in large basidiocarps occasionally rugulose or reticulate around centre, surface viscid to glutinous when moist. Lamellae, L = 28–50, l = 1–3, crowded, free, segmentiform, thin, whitish to straw-yellow at first, soon pale greyish brown, then yellow-brown to brownish orange (e.g., 5C7), soon deliquescent. Stipe 25–100 × 1.5–7 mm, cylindrical or gradually tapering to apex, widely fistulose, fragile, white to lemon-yellow, entirely pruinose-floccose or at apex only. Context fragile, in pileus membranous or thin (up to 2 mm thick), concolorous with surface, in stipe white or yellow. Smell and taste weak, not distinctive. Spore print orange-brown to rusty brown (6D8, 7D8).

Spores (8.5)9.5–15.0(15.5) × 6.0–9.0 × 5.5–8.0 µm, av. 10.4–12.6 × 6.7–7.9 × 6.5–7.3 µm, in some collections not or weakly flattened, in others many clearly flattened, ellipsoid(-oblong) to ovoid(-oblong), Q = 1.3–1.8, Qav. = 1.5–1.75, in frontal view; ellipsoid-oblong to subamygdaliform, occasionally some phaseoliform in side-view, Q = (1.4)1.5–2.0, Qav. = 1.6–1.85, bright yellow-brown to orange-brown (5C8, 6C8, 6D8) in alkali, rather thick-walled (0.5–1.0 µm) with large, central to slightly eccentric germ pore, 1.5–2.5 µm wide. Basidia 22–30 × 11–14 µm, clavate, 4-spored, often surrounded by pseudoparaphyses. Lamella edge sterile or heterogeneous. Cheilocystidia 34–80 × 12–24 µm, variable, lageniform with cylindrical neck, 5.0–8.0 µm broad, utriform with rounded apex, 8.0–16 µm broad, subcylindrical and clavate. Pleurocystidia absent or scattered, similar to cheilocystidia. Pseudoparaphyses 16–30 × 11–23 µm, broadly clavate or spheropedunculate, often difficult to find in older basidiocarps. Hymenophoral trama made up of subcylindrical elements, 4.0–15 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate cells, 26–84 × 8.0–26 µm, with thin hyaline wall and yellow intracellular pigment, embedded in gelatinous layer up to 150 µm thick, not well visible in exsiccata. Pileocystidia absent. Stipitipellis a cutis, made up of cylindrical hyphae, 2.0–6.0 µm broad, with clusters of caulocystidia. Caulocystidia 18–52 × 7.0–18 µm, as variable as cheilocystidia, often furcate or with irregular projections. Clamp-connections absent.

HABITAT & DISTR. — Saprotrophic, solitary or subgregarious, occasionally subfasciculate, on excrements of mammals, dung heaps, straw, rotting hay and grass, piles of sawdust and on wood-chips mixed with fertile soil, in grasslands, ruderal sites, gardens, parks, greenhouses, rarely in forests, on all kinds of soil rich in nutrients. Widespread and common in the Netherlands. April–Nov. Widespread in Europe, also recorded from Asia, North Africa, and North America.

Bolbitius titubans var. *titubans* is easily recognised by the bright yellow viscid pileus and the fragile, deliquescent nature of the basidiocarps with free, orange-brown lamellae. It is better known under the name *Bolbitius vitellinus*. Both names *Agaricus titubans* and *A. vitellinus* were sanctioned by Fries but the former name has priority since it is based on the oldest name, viz. *Agaricus titubans* Bull. 1789.

Some authors distinguish two or three taxa (species, subspecies, or varieties) within this species. *Bolbitius titubans* sensu stricto is said to be characterised by small basidiocarps with strongly striate, bright yellow pileus and yellow stipe. *Bolbitius fragilis* is said to differ in the paler yellow pileus and nonstriate pileus; *B. vitellinus* in the larger basidiocarps and white stipe (e.g. Bon in Doc. mycol. 21 (84): 61. 1992; Watling in Br. Fung. Fl. 3. 1982). Occasionally also subtle differences in spore size are reported. These differences could not be established in collections from the Netherlands. All characters are completely intergrading. Therefore, *B. fragilis* and *B. vitellinus* are regarded as phenotypic variants of *B. titubans* without taxonomic relevance. As in many other coprophytic species, the size and stature of basidiocarps is quite variable and dependent on size and quality of the substrate (see Arnolds in Persoonia 18: 204. 2003). For an extensive discussion of this subject, see Enderle et al. in Mittbl. Arbeitsgem. Pilzk. Niederrhein 3: 17–21. 1985).

1b. var. **olivaceus** (Gillet) Arnolds in Persoonia 18: 204. 2003. – Fig. 128B.

Bolbitius vitellinus var. *olivaceus* Gillet in Rea, Brit. Basidiomyc.: 497. 1922. – *Bolbitius variicolor* Atk., Studies Amer. Fungi: 164. 1900; *Mycena variicolor* (Atk.) Murrill in N. Amer. Fl. 10: 191. 1917; *Bolbitius vitellinus* var. *variicolor* (Atk.) Krieglst. in Beitr. Kenntn. Pilze Mitteleur. 7: 62. 1991.

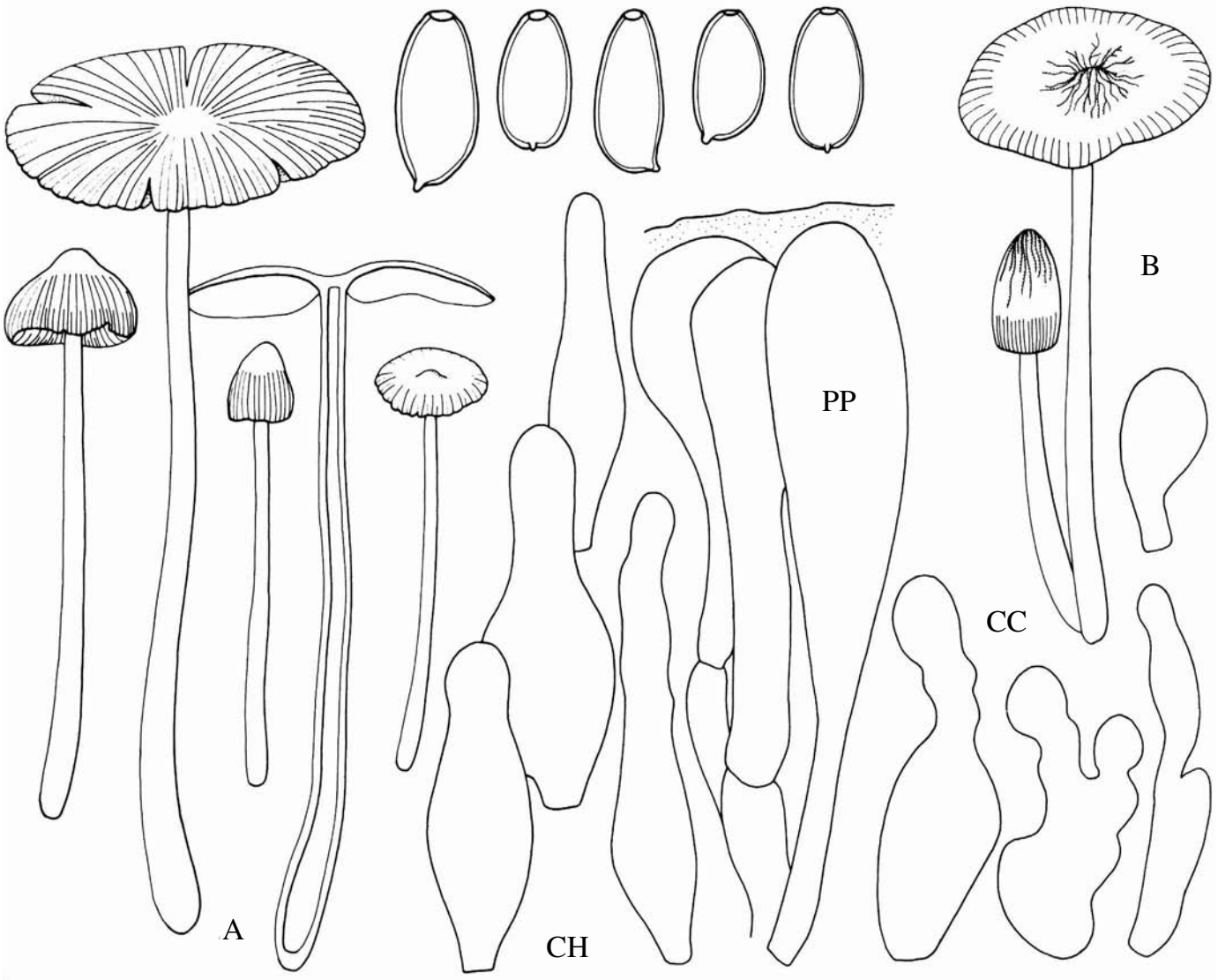


Fig. 128. *Bolbitius titubans*. A. var. *titubans*. B. var. *olivaceus*.

MISAPPL. — *Bolbitius vitellinus* sensu Dähncke, 1200 Pilze: 586. 1993.

SEL. ICON. — Baumgartner in Schweiz. Z. Pilzk. 77: 21. 1991 (as *B. variicolor*); Breitenb. & Kränzl., Pilze Schweiz 4: pl. 373. 1995 (as *B. variicolor*); Cetto, Funghi Vero 3: pl. 906. 1979 (as *B. variicolor*); Consiglio in Micol. Veget. medit. 14: 100. 1999 (as *B. variicolor*); Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1309. 1994 (as *B. variicolor*); Dähncke, 1200 Pilze: 586. 1993 (as *B. vitellinus*); Enderle et al. in Mittbl. Arbeitsgem. Pilzk. Niederrhein 3: 12. 1985 (as *B. variicolor*); Furrer-Ziogas in Mycol. helv. 3: 475, pl. 1–9. 1990 (as *B. variicolor*); A. Hauskn. in Boll. Gruppo micol. G. Bres. 34: 138, pl. 1. 1991 (as *B. variicolor*); Lohmeyer et al. in Z. Mykol. 59; 195–196, fig. 1. 1994 (as *B. vitellinus* var. *variicolor*); Ludwig, Micol. Veget. medit. 1: pl. 5.5. A, B. 2000 (as *B. titubans* var. *variicolor*); Moreno in Bol. Soc. micol. Madrid 21: 306. 1996 (as *B. variicolor*).

SEL. DESCR. & FIGS. — M. Bon in Doc. mycol. 21 (84): 61. 1992 (as *B. variicolor*); Breitenb. & Kränzl., Pilze Schweiz 4: 298, figs. A–E. 1995 (as *B. variicolor*); Consiglio in Micol. Veget. medit. 14: 98–99. 1999 (as *B. variicolor*); Enderle et al. in Mittbl. Arbeitsgem. Pilzk. Niederrhein 3: 10–11. 1985 (as *B. variicolor*); Furrer-Ziogas in Mycol. helv. 3: 467–472. 1990 (as *B. variicolor*); A. Hauskn. in Boll. Gruppo micol. G. Bres. 34: 138–139. 1991(as *B. variicolor*); Hauskn. & Rücker in Z. Mykol. 55: 106–108, fig. 2. 1989 (as *B. variicolor*); Krieglst. in Z. Mykol. 49: 91–92. 1983 (as *B. variicolor*); Lohmeyer et al. in Z. Mykol. 59: 193–195, fig. 1. 1993 (as *B. variicolor*); Ludwig, Pilzkompendium 1: 35. 2001 (as *B. titubans* var. *variicolor*); Watling in Br. Fung. Fl 3: 34–35. 1982 (as *B. variicolor*).

VERN. NAME — Verkleurend kleefhoedje.

CHARACTERISTICS — Differing from var. *titubans* in duller colours, ranging from olive-brown to olivaceous yellow or brownish yellow when young, and the pileus surface that is often darker brown rugulose or reticulate at centre. Spores 10.5–14.0(15.0) × 6.5–8.5(9.0) × 6.0–7.5 µm, av. 11.0–12.3 × 6.8–7.5 × 6.5–7.0 µm, not to moderately flattened as var. *titubans*.

HABITAT & DISTR. — Usually gregarious, often subfasciculate, occasionally solitary, saprotrophic, on excrements, fertilised soil, dung mixed with straw in grasslands, mainly in the coastal dunes and in cold glasshouses, e.g., with cucumber; in glasshouses the entire year. Very

rare in the Netherlands but abundant in some glasshouses (Wassenaar; Kortenhoef; recorded from several other localities but no material available). Sept.–Nov. Rare in Europe, more common in North America. Possibly introduced in Europe.

Bolbitius titubans var. *olivaceus* is often regarded as a separate species with the correct name *B. variicolor*. However, the epithet *olivaceus* has priority at the rank of variety (see Arnolds in Persoonia 18: 204–205. 2003).

The microscopic characters of var. *olivaceus* are identical with those of var. *titubans*. The pileus surface is frequently rugulose to reticulate at centre, but this is also occasionally the case in large basidiocarps of var. *titubans*. It is also said that var. *olivaceus* differs in the (sub)fasciculate growth, but this character obviously depends on the substrate. Both var. *olivaceus* and var. *titubans* may occur in fascicles on large, homogeneous substrates, such as soil mixed with dung and on woodchips. On excrements var. *olivaceus* grows solitary, like var. *titubans*. The only remaining difference is the duller, more or less olivaceous colour in var. *olivaceus*.

A collection made in 1938 near Domburg (prov. Zeeland) differs in very large spores: (13.0)14.–17.5 × 8.0–10.0 × 7.5–9.0 µm, av. 14.9 × 9.1 × 8.2 µm. It may represent a different taxon. Unfortunately the exsiccatum is in bad condition.

2. Bolbitius lacteus J. Lange, *Fl. agar. dan.* 5, Appendix: II. 1940. – Fig. 129.

EXCL. — *Bolbitius lacteus* sensu Watl. & Knudsen in Svampe 4: 78. 1981 (= *B. reticulatus* var. *pluteoides*); *Bolbitius lacteus* sensu Watling in Nordic J. Bot. 3: 265. 1983 (= *B. reticulatus* var. *pluteoides*); *Bolbitius lacteus* sensu M. Bon, Mushr. Toadst.: 261. 1987 (= Conocybe apala).

SEL. ICON. — Cetto, Funghi Vero 6: pl. 2209. 1989; Dähncke, 1200 Pilze: 585. 1993; J. Lange, Fl. agar. dan. 5: pl. 196D. 1940.

SEL. DESCR. & FIGS. — Krisai in Libri bot. 6: 119. 1992; J. Lange, Fl. agar. dan. 5: 104. 1940.

VERN. NAME — Wit kleefhoedje.

Pileus 8–15(20) mm broad, conico-convex at first, then plano-convex to flattened, milk-white (K. & W. 1A1/A2) with cream-coloured (2A2) centre at first, from the margin becoming isabella to pale brown, at centre retaining pale colour, smooth, sulcate-striate up to 3/4 of the radius, viscid, soon deliquescent. Lamellae, L = 24–34, l = 1–3, free, crowded, segmentiform, very thin, whitish at first then brownish orange to orange-brown, with white fimbriate edge, occasionaly weeping hyaline droplets, soon deliquescent. Stipe 27–50 × 1–2(3) mm, cylindrical, fistulose, fragile, white to cream-coloured, entirely pruinose-flocculose. Context submembranaceous, fragile, in pileus white, in stipe pale yellow. Smell and taste weak, not distinctive. Spore print not recorded.

Spores (10.0)10.5–13.0(14.0) × (5.5)6.0–7.5 µm, av. 11.5–12.0 × 6.6–7.0 µm, Q = (1.5)1.6=1.9, Qav. = 1.7–1.8, not to distinctly flattened, in frontal view ellipsoid- to ovoid-oblong, in side-view ellipsoid-oblong to subamygdaliform, rarely subphaseoliform, orange-brown in ammonia and KOH (6C8, 6D8), fairly thick-walled (0.5–1.0 µm) with blunt central to slightly eccentric germ pore, 1.7–2.5 µm wide. Basidia 17.5–25 × 10.5–13 µm, clavate, 4-spored, often surrounded by pseudoparaphyses. Lamella edge heterogeneous. Cheilocystidia 23–37 × 11–18 µm, clavate, utriform or broadly lageniform with neck 6.0–7.5 µm broad. Pleurocystidia absent. Pseudoparaphyses broadly clavate to spherical, 10–22 µm broad, often difficult to find in older basidiocarps. Hymenophoral trama subregular, made up of slender, cylindrical hyphae, 4.0–12 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate cells, 28–50 × 10–22 µm, with thin hyaline wall, covered by a thin gelatinous layer, not well visible in exsiccata. Pileocystidia absent. Stipitipellis a cutis of slender, hyaline hyphae, 2.0–6.0 µm broad, with clusters of caulocystidia. Caulocystidia 13–50 × 6.5–13 µm, subcylindrical, clavate, utriform or broadly lageniform, sometimes in short chains or with irregular projections. Clamp-connections not seen.

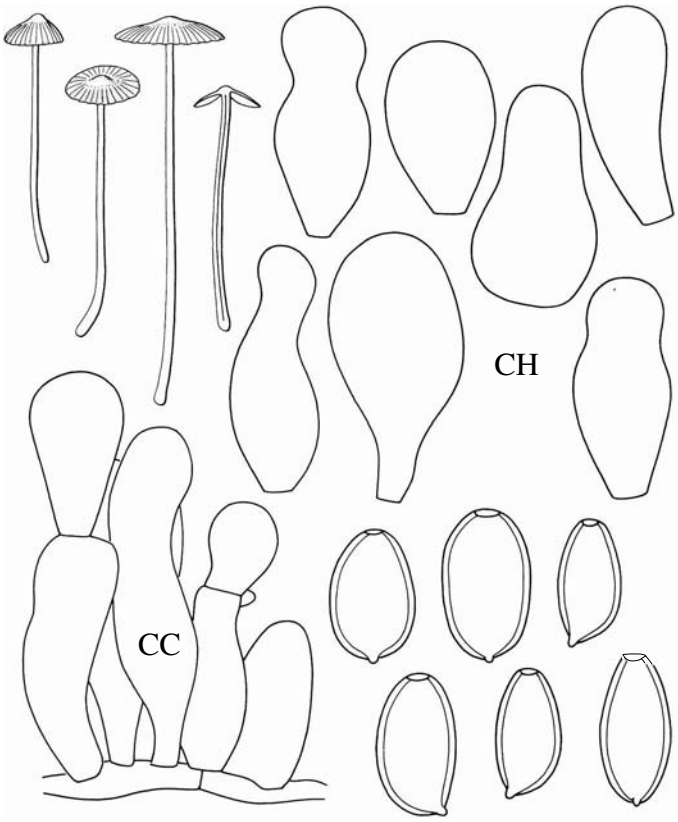


Fig. 129. *Bolbitius lacteus*

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on dead clumps of grasses or on soil, in grasslands on dry, calcareous, loamy soil and along forest edges. Very rare in the Netherlands (Beilen, Schepping; Wittem, Nijswiller) but probably overlooked. July–Sept. Also recorded from Denmark, Germany, and Italy.

Bolbitius lacteus is a little-known species and subject of both taxonomic and nomenclatural confusion. After its introduction by Lange (in Fl. agar. dan. 5. 1940) it was not redescribed until 1983 (Watling in Nord. J. Bot. 3: 265. 1983). Watling claimed that his material agrees with the original diagnosis in all ways but in fact it differs considerably in spore size (Watling: 8.5–10.0(11.0) × 5.0–6.0(6.5) µm; Lange: 10.5–11.5 × 6.0–6.3 µm). Therefore, *B. lacteus* sensu Watling is considered identical with *B. reticulatus* var. *pluteoides*. Several Dutch collections, labeled as *Bolbitius lacteus*, appeared also to belong to *B. reticulatus* var. *pluteoides*. The two taxa can be easily separated by spore size (see also Arnolds in Persoonia 18: 206. 2003) and usually also by habitat. *Bolbitius reticulatus* var. *pluteoides* occurs in forests, usually on decayed wood, whereas *B. lacteus* grows on dead grass remains in meadows and roadside verges.

In nomenclatural respect *Bolbitius lacteus* has been confused with *Conocybe apala*, until recently known under the name *C. lactea*. *Conocybe apala* is placed in the genus *Bolbitius* by some authors (e.g., Bon in

Doc. mycol. 21(84) 62. 1992). In fact, the plate of *B. lacteus* in Bon (Mushr. Toadst.: 261. 1987) represents *Conocybe apala*, readily recognised by the elongated, campanulate not expanding pileus and microscopically by the lecythiform cheilocystidia.

Bolbitius lacteus may be a variant of *B. titubans* with very small and pale basidiocarps. More research is needed to clarify this relationship. See also Enderle et al. in Mittbl. Arbeitsgem. Pilzk. Niederrhein 3: 21–22. 1985.

3. Bolbitius coprophilus (Peck) Hongo in Mem. Fac. Educ. Shiga Univ. Nat. Sci. 9: 82. 1959. – Fig. 130.

Pluteolus coprophilus Peck in Rep. N.Y. St. Mus. Nat. Hist. 45: 59. 1893. – *Bolbitius radians* Morgan in J. Cincinnati Soc. Nat. Hist. 18: 36. 1895.

SEL. ICON. — Bender in Z. Mykol. 49: opposite 88. 1983; Gerhardt, Gr. Pilzf.: 318. 1997; Hauskn. & Zucch. in Boll. Gruppo micol. G. Bres. 36: 36, pl. 1. 1993; Kytövuori in Sieni Lehti 49: 84, pl. 1. 1997; Ludwig, Pilzkompendium 1: pl. 13, fig. 5. 2000; Strandberg in Svampe 24: 9, fig. 3. 1991.

SEL. DESCR. & FIGS. — M. Bon in *Doc. mycol.* 21(84): 61. 1992; Daams in *Coolia* 13: 99–100. 1967; Enderle in *Ulmer Pilzfl.* 4: 48–50. 1996; Hauskn. & Zucch. in *Boll. Gruppo micol. G. Bres.* 36: 36–37. 1993; Hübsch in *Mykol. Mittbl.* 28: 47–50, figs. 1–4. 1985; Krieglst. in *Z. Mykol.* 49: 90–91. 1983; Rald & Strandberg in *Svampe* 24: 7–10, figs. 1–2. 1991; Täglich in *Boletus* 15: 8–9. 1991; Watling in Br. Fung. Fl. 3: 33, fig. 5. 1982.

VERN. NAME — Roze kleefhoedje.

Pileus 30–80 mm broad, obtusely conical or ovoid at first, soon convex to plano-convex, finally applanate to slightly depressed, occasionally with small umbo, not or weakly hygrophanous, at first orangeish white, pale pink, pale flesh-coloured or isabella (K. & W. 5B4, 5A4, 4B5) at centre, to the margin very pale pink or whitish, soon discolouring at centre ochre-yellow, to the margin cream-coloured, finally from margin becoming ochre-grey to pale brown, densely translucently striate-sulcate up to at least two-thirds of the radius, glutinous at first, then viscid. Lamellae, L = 50–80, l= 1–3 , free, crowded, segmentiform, very thin, up to 6 mm broad, whitish at first, soon pale ochre-yellow, then brownish orange or ochre-brown, occasionally with greyish tone, with slightly paler crenulate edge, easily deliquescent. Stipe 50–120(160) × 2–8(13) mm, gradually broadening downwards to subclavate base, 4–13 mm wide, fistulose, white at first, occasionally turning pale pinkish or pale ochraceous in age, minutely pruinose to flocculose at least in upper half. Context thin, fragile, white. Smell and taste weak, fungoid, not distinctive. Spore print chocolate-brown.

Spores 11.5–16.0(16.5) × 8.0–11.0 × 6.5–9.5 µm, av. 13.2–14.0 × 8.7–9.7 × 7.4–8.2 µm, distinctly flattened, ellipsoid to ovoid, sometimes weakly angular, Q = 1.3–1.6(1.7), Qav. = 1.45–1.5 in frontal view, ellipsoid- to ovoid-oblong or subamygdaliform in side-view, Q = 1.6–1.9, Qav. = 1.7–1.8, brownish orange to orange-brown (6C8, D8, 7D8) in alkali, thick-walled (1.0–1.8 µm) with eccentric germ pore, 1.2–2.5 µm wide. Basidia 17–25 × 12–15 µm, clavate, 4-spored, often surrounded by pseudoparaphyses. Lamella edge heterogeneous. Cheilocystidia 25–55 × 7.0–19 µm, subcylindrical, utriform, clavate and broadly lageniform with neck 6.0–7.0 µm broad, thin-walled, often collapsed in exsiccata. Pleurocystidia absent or rare, similar. Pseudoparaphyses subglobose to broadly clavate, 10–15 µm broad, often difficult to find. Hymenophoral trama subregular, made up of elongated, subcylindrical elements, 3.0–22 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate cells, 20–63 × 6.5–15 µm, with thin hyaline wall and pink intracellular pigment when fresh, covered with thin gelatinous layer. Pileocystidia absent. Stipitipellis a cutis, made up of cylindrical, thin hyphae, 3.0–8.0 µm broad, with clusters of caulocystidia. Caulocystidia 15–50 × 10–19 µm, similar to cheilocystidia, varying from subcylindrical to clavate, utriform and broadly lageniform with neck 6.0–8.0 µm broad. Clamp-connections absent.

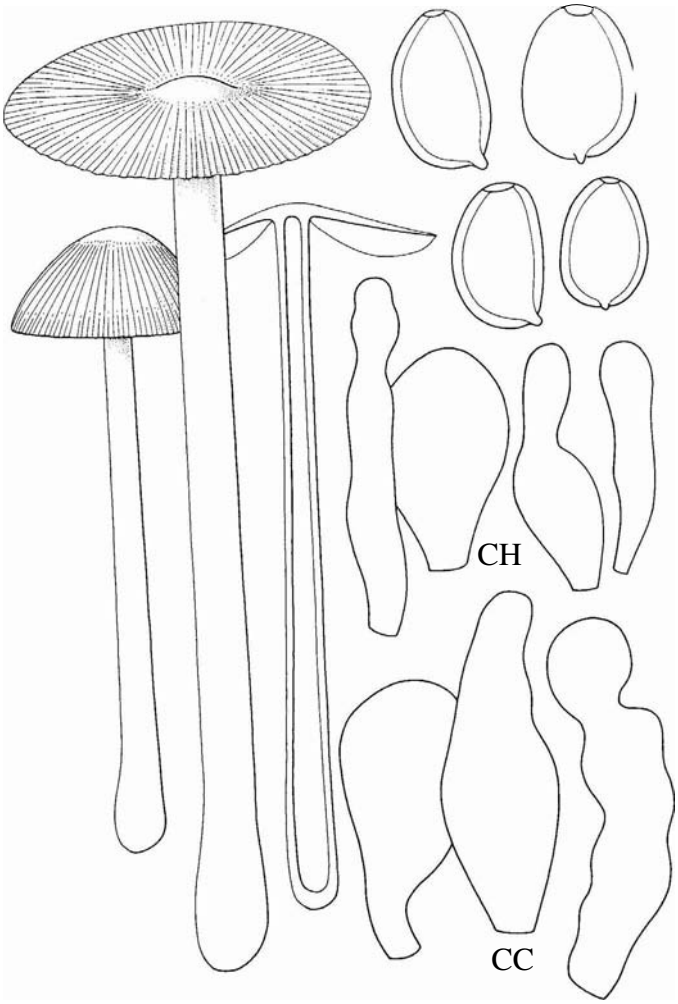


Fig. 130. *Bolbitius coprophilus*

HABITAT & DISTR. — Saprotrophic, usually gregarious to subcespitose, on organic substrates rich in nutrients, such as dung, compost, and straw mixed with manured soil, in the Netherlands very rare (Kortenhoef; 's-Graveland) and only known from (unheated) glasshouses, but locally abundant; probably wider distributed in this poorly investigated habitat. In glasshouses fruiting throughout the year. Rare in west, central, and south Europe but locally common, for instance in Berlin (Gerhardt, Gr. Pilzf.: 318. 1997). There also recorded outside buildings. Also in North America; in Europe probably introduced.

Bolbitius coprophilus differs from *B. titubans* not only in the pale pinkish pileus, lacking bright yellow colours, but also in slightly larger, clearly flattened spores with thicker wall and eccentric germ pore

Bolbitius incarnatus Hongo (in J. jap. Bot. 33: 42. 1958) was originally described from Japan. In Europe it has been recorded from Italy

(Moser & Cetto in Boll. Gruppo micol. G. Bres. 30: 26, pl. 1987; also plate in Cetto, Funghi Vero 6: pl. 2211. 1989). It was also described and illustrated under the name *B. demangei* by Narducci & Petrucci (in Riv. Micol. 37: 259. 1994). *Bolbitius incarnatus* is said to be different from *B. coprophilus* in the considerably darker flesh-coloured pileus, but it may very well be identical with the latter.

4. Bolbitius demangei (Quél.) Sacc. & D. Sacc. in Sacc., Syll. Fung. 17: 74. 1905. – Fig. 131.

Pluteolus demangei Quél. in C. r. Ass. Franc. Av. Sci. 13(2): 495. ('1901') 1902 (Champ. Jura Vosges 22).

EXCL. — *Bolbitius demangei* sensu Narducci & Petrucci in Riv. Micol. 37: 259. 1994 (= *B. incarnatus*).

SEL. DESCR. & FIGS. — Guzmán in Bol. Soc. argent. Bot. 18: 200. 1977; Sing. in Lilloa 25: 318–319 ('1951') 1952.

VERN. NAME — Kaskleefhoedje.

Pileus 30–70 mm broad, ovoid at first, then conico-convex, soon plano-convex to flattened, not hygrophanous, pale to dark violaceous grey, becoming sulcate-striate up to centre, smooth or wrinkled-rugulose around centre, viscid when moist. Lamellae, L = 35–52, l = 1–3, crowded, free, segmentiform, thin, white or pale yellow at first, then greyish brown ('dark café-au-lait'). Stipe 50–100 × 3–5 mm, gradually thickened to base, up to 8 mm thick, fistulose, fragile, white or pale yellow, pruinose-floccose. Context fragile, in pileus submembranous. Smell and taste not recorded. Spore print not recorded.

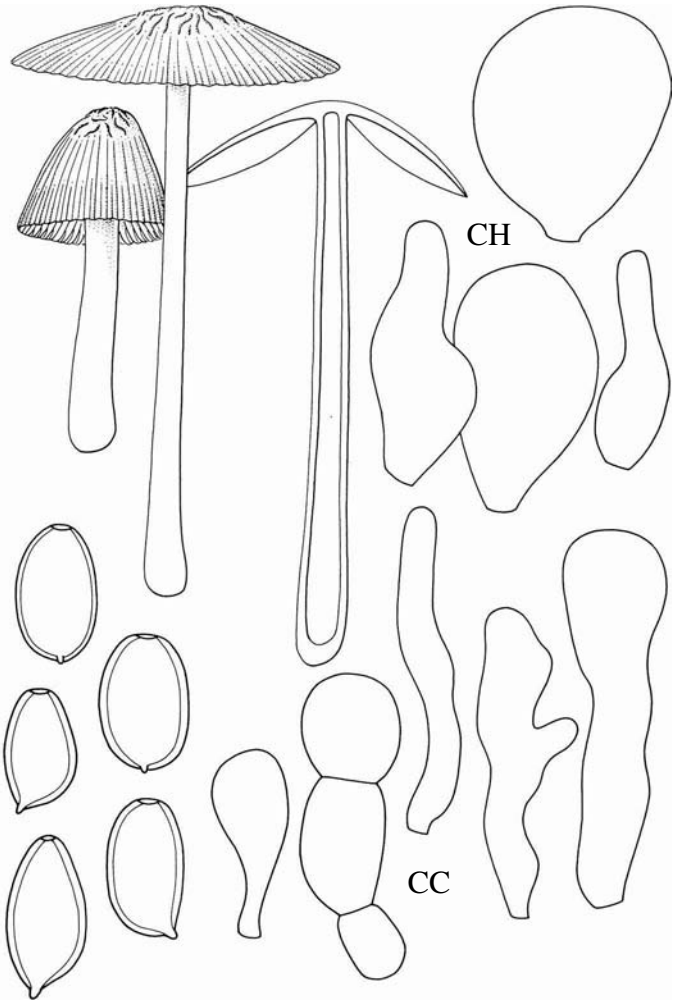


Fig. 131. *Bolbitius demangei*

Spores (9.5)10.5–13.0 × (5.5)6.5–7.0(7.5) µm, av. 11.1–11.7 × 6.5–6.8 µm, Q = 1.6–2.0, not or slightly flattened, in frontal view ellipsoid- to ovoid-oblong, in side-view ellipsoid-oblong to subamygdaliform, brownish orange in ammonia, rather thick-walled (0.5–1.0 µm), with central to slightly eccentric germ pore, 1.2–2.0 µm wide. Basidia 16–21 × 9.0–11 µm, 4-spored, surrounded by pseudoparaphyses. Lamella edge sterile. Cheilocystidia 30–52 × 9.0–28 µm, broadly clavate, utriform or lageniform with neck 4.0–10 µm broad. Pleurocystidia absent. Pseudoparaphyses 13–17 × 11–13 µm, spheropedunculate. Hymenophoral trama made up of subcylindrical hyphae, 4.0–10 µm broad, with thin, hyaline wall. Pileipellis an epithelioid hymeniderm, made up of clavate elements, sometimes furcate, 26–52 × 6.5–12 µm, hyaline, thin-walled. Pileocystidia absent. Stipitipellis a cutis, made up of slender hyphae, 2.0–5.0 µm broad, with thin, hyaline wall, with clusters of caulocystidia. Caulocystidia 24–54 × 4.0–13 µm, variable, subcylindrical, clavate or lageniform with neck 4.0–5.0 µm broad, often irregular with some projections, thin-walled, hyaline. Clamp-connections absent.

HABITAT & DISTR. — Saprotrophic, subgregarious on straw-rich substrate in unheated glasshouses with cucumber cultures, not yet found outside buildings. Very rare in the Netherlands ('s-Graveland), probably introduced from other regions. June. Also recorded from France (Vosges) and Argentina.

Initially the Dutch collections were identified as *Bolbitius* cf. *reticulatus*, with more robust basidiocarps and larger and broader spores. They fit well, however, with the original description of *Bolbitius demangei* from dung in a roadside verge in France (Vosges) with a lilac-brown, 30–40 mm broad pileus and spores 12.0–14.0 µm long. The stipe in *B. demangei* is said to be white at first then becoming pink below. A pink colour was lacking in the studied collections.

Some authors suggest that *Bolbitius demangei* may be identical with *B. coprophilus* (see Enderle et al. in Mittbl. Arbeitsgem. Pilzk. Niederrhein 3: 25–27. 1985). However, both colours of the young basidiocarps and spore size are different in Dutch collections of the two species.

5. Bolbitius reticulatus (Pers. :Fr.) Rick., Blätterpilze 1: 68. 1915. – Fig. 132.

Agaricus reticulatus Pers., Syn. meth. Fung.: 341. 1801; *Agaricus reticulatus* Pers. :Fr., Syst. mycol. 1: 238. 1821; *Pluteolus reticulatus* (Pers. :Fr.) Gillet, Champ. France: pl. 373. 1878; *Pluteolus aleuriatus* var. *reticulatus* (Pers. :Fr.) J. Lange in Dansk bot. Ark. 9(6): 49. 1938. – *Agaricus aleuriatus* Fr., Observ. mycol. 1: 49. 1815; *Agaricus aleuriatus* Fr. :Fr., Syst. mycol. 1: 238. 1821; *Pluteolus aleuriatus* (Fr. :Fr.) P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 428. 1879; *Bolbitius aleuriatus* (Fr. :Fr.) Sing. in Lilloa 22: 490. (1949) 1951; *Bolbitius reticulatus* var. *aleuriatus* (Fr. :Fr.) M. Bon in Doc. mycol. 20(78): 39. 1990; *Bolbitius reticulatus* f. *aleuriatus* (Fr. :Fr.) Enderle in Ulmer Pilzfl. 4: 50. 1996; *Bolbitius pluteoides* Mos. in Fung. rar. Ic. col. 7: 27. 1978.

KEY TO THE VARIETIES AND FORMAE

1. Pileus 5–17 mm, stipe 15–45 × 0.5–1(1.5) mm; pileus paler: whitish, pale beige, pinkish or pale violaceous grey . . . . 5b. var. **pluteoides**

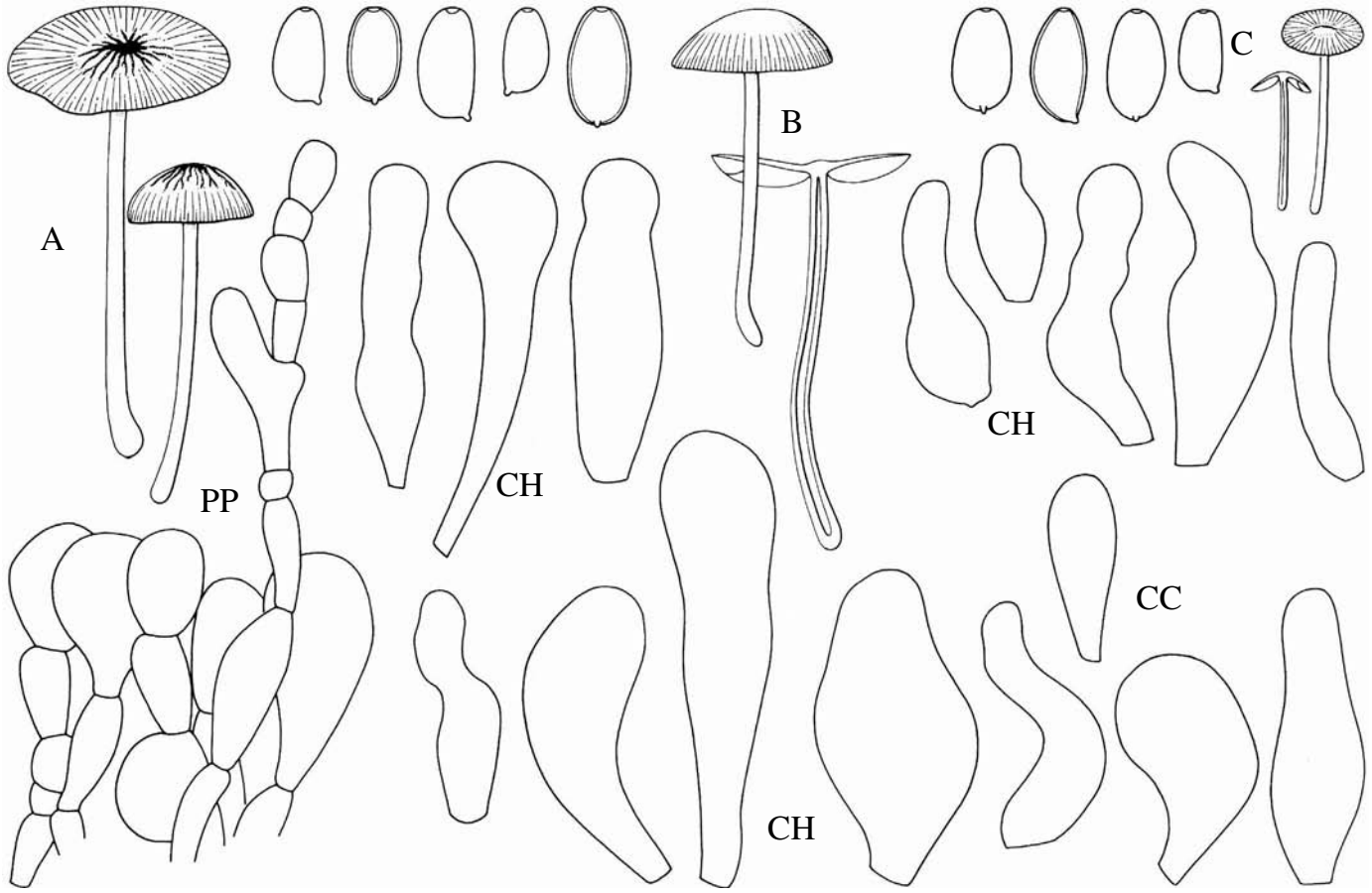


Fig. 132. *Bolbitius reticulatus*. A. f. *reticulatus*. B. f. *aleuriatus*. C. var. *pluteoides*.

1. Pileus 12–45 mm, stipe 20–55 × 1–4 mm; pileus violaceous grey, greyish brown or brown with darker centre . . . 5a. var. **reticulatus**
   2. Pileus 25–45 mm, near centre wrinkled to reticulate 5a1. f. **reticulatus**
   2. Pileus 12–30 mm, smooth . . . . . 5a2. f. **aleuriatus**

5a. var. **reticulatus** Fig. 132A and B.

SEL. ICON. — Cetto, Funghi Vero 5: pl. 1741. 1987 (as *B. aleuriatus*); Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1310 (f. *aleuriatus*), 1311 (f. *reticulatus*). 1994; Gerhardt, Gr. Pilzf.: 319 left (f. *aleuriatus*), right (f. *reticulatus*). 1997; J. Lange, Fl. agar. dan. 4: pl. 131E (f. *reticulatus*), 131G (f. *aleuriatus*). 1939; Ludwig, Micol. Veget. medit. 1: pl. 5.3A (f. *aleuriatus*), B, C (f. *reticulatus*). 2000; Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 222. 1985 (f. *reticulatus*); Phillips, Mushr. Toadst.: 120 (f. *aleuriatus*). 1981; Redeuilh in *Bull.* trimest. Soc. mycol. Fr. 110, Atlas pl. 291. 1994 (f. *reticulatus*); Ryman & Holmåsen, Svampar: 437. 1984.

SEL. DESCR. & FIGS. — W. Beyer in Libri bot. 5: 145, pl. 77, fig. 3. 1992 (f. *reticulatus*); Enderle in Ulmer Pilzfl. 4: 50–52. 1996 (f. *aleuriatus*); Krisai in Libri bot. 6: 119. 1992 (as *B. aleuriatus*); Ludwig, Pilzkompendium 1: 33–34. 2001; Redeuilh in Bull. trimest. Soc. mycol. Fr. 110, Atlas pl. 291. 1994 (f. *reticulatus*); Stangl in Z. Mykol. 44: 273–275, fig. 2. 1978 (as *B. aleuriatus*); Watling in Br. Fung. Fl. 3: 37–38, figs. 2, 6, 70. 1982.

VERN. NAME — Violetgrijs kleefhoedje.

Pileus 12–30 mm broad in f. *aleuriatus*, 25–45 mm in f. *reticulatus*, hemispherical to convex, then plano-convex to flattened, occasionally with small umbo, not hygrophanous, quite variable in colour, at centre violaceous black, brownish violet, grey-brown, olivaceous brown, dark brown, dark grey, lilac-grey (e.g., K. & W. 5E5–7, 6D5, E6, 7F6, 8E7), to the margin paler vinaceous or violaceous grey, pale grey, pale grey-brown (e.g., 5D4–5, C2–4, 6C3, D4, 7C3), minutely sulcate-striate up to halfway the radius or more, viscid when moist, smooth or slightly rugulose (f. *aleuriatus*) to strongly wrinkled at centre (f. *reticulatus*). Lamellae, L = 26–45, l = 1–3, crowded, segmentiform, thin, free, whitish to cream-coloured at first, then ochre-orange to orange-brown, with white flocculose edge. Stipe 17–55 × 1–4 mm, cylindrical or slightly thicker towards base, widely fistulose, fragile, white or greyish white, minutely pruinose-flocculose. Context fragile, in pileus submembranous, concolorous with surface. Smell and taste weak, not distinctive. Spore print rusty brown.

Spores (6.5)7.0–12.0(12.5) × (3.5)4.0–5.5(6.5) µm, av. (7.9)8.4–9.9 × (4.1)4.5–5.2 µm, Q = 1.5–2.3, Qav. = 1.7–1.95, not flattened, ellipsoid- to ovoid-oblong in frontal view, ellipsoid-oblong to subamygdaliform in side-view, sometimes a few phaseoliform, pale yellow-brown to brownish orange in ammonia (4B6/5B6, 5C7), thin-walled to slightly thick-walled (<0.5 µm), with small apical germ pore, up to 1.5 µm wide. Basidia 14–22 × 7.0–10 µm, 4-spored, sometimes a few 2-spored, often surrounded by pseudoparaphyses. Lamella edge sterile. Cheilocystidia 21–49 × 5.5–14 µm, variable, clavate, utriform, subcylindrical or lageniform with neck 4.5–6.0 µm broad. Pleurocystidia absent. Pseudoparaphyses subglobose to spheropedunculate, up to 10 µm

broad, often difficult to find and absent in older basidiocarps. Hymenophoral trama made up of long, subcylindrical elements, 4.0–20 µm broad. Pileipellis an epithelioid hymeniderm, made up of subglobose, clavate and spheropedunculate cells, 14–40 × 10–30 µm, often in chains, intermixed with erect, branched, trichodermal hyphae with short, subglobose to subcylindrical elements, 5.0–28 × 5.0–10 µm, with thin, hyaline wall, when fresh with pale greyish intracellular pigment, covered with thin gelatinous layer (invisible in exsiccata). Pileocystidia absent. Stipitipellis a cutis, made up of hyaline, thin-walled hyphae, 2.0–6.0 µm broad, with clusters of caulocystidia. Caulocystidia 22–63 × 8.0–24 µm, as variable as cheilocystidia, clavate, utriform or lageniform with neck 4.5–7.0 µm broad, intermixed with small, subglobose elements, 6.0–10 × 5.0–9.5 µm. Clamp-connections absent or rare.

HABITAT & DISTR. — Saprotrophic, solitary, sometimes in small groups, on decayed twigs, branches, wood-chips, and trunks of deciduous trees in forests and parks on moist, weakly acid to basic soils rich in nutrients, on clay as well as humus-rich sand and decayed peat (*Alno-Padion, Carpinion*). May–Nov. Uncommon in the Netherlands (f. *reticulatus* rare), mainly in Holocene areas and southern Limburg, rare along rivers and streams in Pleistocene areas. Widespread in Europe and North America.

Bolbitius reticulatus is easily recognised by the delicate basidiocarps with a viscid, greyish, violaceous or brownish pileus and free, orange-brown lamellae. However, size, colours, and structure of pileus surface are exceedingly variable and have led to the distinction of several species or intraspecific taxa. The typical, although rare, variant has relatively large basidiocarps with a dark, wrinkled-rugulose pileus and is described here as f. *reticulatus*. The most widespread variant with medium-sized basidiocarps and a smooth pileus is occasionally distinguished as *B. aleuriatus* (e.g., Courtecuisse & Duhem, Guide Champ. Fr. Eur.: pl. 1310, 1311. 1994). It is described here as f. *aleuriatus*. Variants with small basidiocarps and a pale, smooth pileus were described as *Bolbitius pluteoides* Moser (in Fung. rar. Ic. col. 7: 27. 1978). They are regarded in this Flora as a variety of *B. reticulatus*.

5b. var. **pluteoides** (Mos.) Arnolds in Persoonia 18: 210. 2003. – Fig. 132B.

Bolbitius pluteoides Mos. in Fung. rar. Ic. col. 7: 27. 1978.

MISAPPL. — *Bolbitius lacteus* sensu Watl. & Knudsen in Svampe 4: 78. 1981; sensu Watling in Nordic J. Bot. 3: 265. 1983.

SEL. ICON. — Ludwig, Pilzkompendium 1: pl. 5.3 D, E. 2000 (as *B. reticulatus*); Mos. in Fung. rar. Ic. col. 7: pl. 53b. 1978.

SEL. DESCR. & FIGS. — M. Bon in Doc. mycol. 21(84): 60. 1992; Mos. in Fung. rar. Ic. col. 7: 27, figs. 51, 52. 1978; Watling in Nordic J. Bot. 3: 265. 1983 (as *B. lacteus*); Watl. & Knudsen in *Svampe* 4: 75, pl. fig. 1. 1981 (as *B. lacteus*).

VERN. NAME — Teer kleefhoedje.

CHARACTERISTICS — Differing from var. *reticulatus* in smaller basidiocarps (pileus 5–17 mm broad when expanded, stipe 15–45 × 0.5–1(1.5) mm) with paler colours of the pileus ranging from ivory white with cream-coloured centre to pale beige, pale grey, pale pinkish or pale violaceous grey, with slightly darker centre (e.g., Mu. 7.5YR 6/4, 10YR6/4, 10YR7/2, 7/3; K. & W. 7C3, D4), at margin often turning brownish in maturity. Pileus surface smooth, viscid.

Spores 7.0–11.0(11.5) × 4.0–5.5(6.5) µm, av. 8.3–9.5 × 4.5–5.2 µm, Q = 1.5–2.1, Qav. = 1.75–1.9, not flattened, ellipsoid-oblong to subamygdaliform in side-view.

HABITAT & DISTR. — Saprotrophic, usually solitary, occasionally in small groups, usually on small wood remains such as twigs and wood-chips of deciduous trees, occasionally on humus-rich soil (possibly attached to buried wood), in deciduous forests and parks on moist, often calcareous soils rich in nutrients (*Alno-Padion, Carpinion*). June–Oct. Rather rare in the Netherlands but fairly common in Flevoland, elsewhere mainly in Holocene areas, southern Limburg, and in the river area; very rare in Pleistocene areas, mainly along streams. Widespread in Central Europe but distribution pattern not well-known.

Bolbitius reticulatus var. *pluteoides* differs from *B. reticulatus* in slightly smaller basidiocarps with paler pileus. It is often claimed that the spores are smaller as well, but in fact no significant difference exists (see Arnolds in Persoonia 18: 210–211. 2003). Therefore, *B. pluteoides* is regarded as a variety of *B. reticulatus*. Mating experiments may reveal whether it is only a phenotypic variant of that species (see also Enderle et al. in Mittbl. Arbeitsgem. Pilzk. Niederrhein 3: 14–17. 1985).

Several collections, identified as *B. lacteus*, appeared to belong to *B. reticulatus* var. *pluteoides*. See also notes on *B. lacteus*.

2. **Conocybe** Fay.

Eef Arnolds

Conocybe Fay. in Annls Sci. nat., Sér. VII, 9: 357. 1889.

Selected Literature — M. Bon in Doc. mycol. 21 (84): 63–75. 1992; Enderle in Z. Mykol. 57: 55–74. 1991; A. Hauskn. in Österr. Z. Pilzk. 5: 161–201. 1996; Kühner, Genre Galera. 1935; M. Meusers in Österr. Z. Pilzk. 5: 251–272. 1996; Watling in Br. Fung. Fl. 3: 39–83. 1982; Watl. & Gregory in Biblthеca mycol. 82: 88–148. 1981.

Basidiocarp mycenoid, rarely tricholomatoid; pileus hygrophanous, dry or slightly greasy, glabrous, pubescent or pruinose; lamellae narrowly adnate or adnexed, rarely free, yellow-brown to rusty brown when mature; stipe central, slender, often subbulbous to bulbous; partial veil usually absent, very rarely present and fugacious, leaving small flocks adhering to margin of pileus and volva-like veil remains at base of stipe; spore print orange-brown to rusty brown.

Spores glabrous or minutely verrucose, thin- to thick-walled, yellow-brown to orange-brown, sometimes pale yellow, usually with germ pore but pore lacking in some species; basidia clavate, 4- or 2-spored; cheilocystidia present, lecythiform with thin, short neck and globose capitulum; pleurocystidia absent; hymenophoral trama made up of a narrow central strand of cylindrical hyphae surrounded by inflated elements; pileipellis an epithelioid hymeniderm, made up of pyriform to spheropedunculate elements, often mixed with pileocystidia; stipitipellis a thin cutis, with clusters of lecythiform caulocystidia and/or cylindrical hairs; clamp-connections present in most species. Development in most species paravelangiocarpic. — Lectotype species (conserved): *Conocybe tenera* (Schaeff. :Fr.) Fay.

Habitat & distr. — Saprotrophic on soil, litter, humus, dung and small pieces of wood, solitary or gregarious, rarely subcaespitose; usually on subneutral to basic substrates rich in nutrients. Widespread, with world-wide distribution.

Conocybe is taken here in a narrow concept, excluding *Pholiotina* Fay. See remarks on *Pholiotina.*

Many closely related species of *Conocybe* are very similar in general appearance and macroscopic characters. Relatively few species can be recognised with certainty in the field. Some macroscopic characters can only be established on fresh and moist basidiocarps. Colour and degree of striation of the pileus may be important for identification. These features do not return to their original conditions after rehydration of dried-out basidiocarps.

Identification often depends on differences in size and/or shape of spores, cheilocystidia, and caulocystidia. The differences are in general rather subtle and often demand careful examination of tissues under an oil-immersion lens of good quality, as well as measuring of a representative sample of at least 10 spores to determine average spore size. The size of the capitula of the cheilocystidia and caulocystidia is an equally critical character. Cystidia in many species are fragile and collapse easily. They are often difficult to revive in exsiccata that are dried at too high temperatures.

Clamp-connections are best visible on the hyphae of the stipitipellis. They are often difficult to find at the base of basidia. Clamp-connections are present in most species. However, they seem to be absent in some species but the data are still incomplete and the taxonomic significance of this character is not yet clear.

Kühner (Genre Galera. 1935) introduced a remarkable chemical character for delimitation of species within sect. *Conocybe*, viz. the formation of numerous needle-like crystals in fragments of lamellae in ammonia (fig. 127C), in the descriptions below indicated as “ammonia reaction.” Occasionally other crystals are formed, viz. small rectangular or polygonal crystals. The latter types of crystals are without taxonomic significance. The formation of needle-like crystals was critically evaluated by Herregods (in Bull. trimest. Soc. mycol. Fr. 67: 159–162. 1951). He concluded that the intensity of the reaction is quite variable and that the results are often not reproducible. Nevertheless, this reaction is at present still used in all identification keys for this group. Hausknecht (in Österr. Z. Pilzk. 8: 36–37. 1999) described a standard procedure to investigate the formation of needle-like crystals and recommended the use of an

aquous 25% ammonia solution. He distinguished three degrees of crystal formation: a strong reaction when crystals are numerous within two hours, a moderate reaction when crystals are formed in between two and ten hours (often only few and scattered in a preparation), and a weak reaction when few crystals are found after ten hours or longer. This terminology is also used in this paper. However, the results of this reaction remain not completely reliable and vary within most species (see survey by Hausknecht in Österr. Z. Pilzk. 11:36. 2002). As a consequence, when the ammonia reaction is strong or moderate, it is a useful additional character, but when it is weak or absent, the significance is doubtful. Therefore, the use of this character is avoided as much as possible in the key to the species.

Species concepts in *Conocybe* are still not well established and may become clearer by investigation of culture characters, mating experiments, and molecular analyses.

Acknowledgments

A. Hausknecht (Maissau, Austria) is acknowledged for intensive correspondence over taxonomical and nomenclatural matters and for exchange of collections and partially unpublished data. R. Chrispijn and Ms. C. den Held provided me with interesting collections and descriptions, and Ms. Y. Dijkman is thanked for assistance in preparing and editing this manuscript.

KEYS TO THE SPECIES

1. Stipe pruinose as seen with a hand-lens; pileus glabrous; caulocystidia lecythiform, intermixed with globose to ovoid elements, lageniform caulocystidia and cylindrical hairs absent or very scarce . . . . . KEY ONE
1. Stipe, and often also pileus, pubescent as seen with a hand-lens; at least part of the caulocystidia lageniform and/or filiform (cylindrical hairs), intermixed with lecythiform cystidia or not
   2. Caulocystidia filiform and/or lageniform, intermixed with a large proportion of lecythiform cystidia, at least at apex . . . . . KEY TWO
   2. Caulocystidia predominantly or exclusively filiform and/or lageniform; lecythiform cystidia on stipe lacking or very scarce at apex only . . . . . KEY THREE

KEY ONE

Veil absent; stipe pruinose, entirely covered by lecythiform caulocystidia, intermixed with small globose and ellipsoid elements; lageniform and filiform caulocystidia absent or very rare (sect. *Conocybe*, *Gigantae*)

1. Basidiocarp stout, tricholomatoid, reminiscent of *Hebeloma* species; pileus 20–60(80 mm) wide, already plano-convex when young, then applanate to slightly depressed, with adhering soil; stipe 25–70 × (3)5–13 mm; lamellae, L = 60–100; spores 5.0–7.5(8.0) × 3.5–5.5 µm, thick-walled without pore . . . . . **21. C. intrusa**
1. Basisiocarps slender, mycenoid; pileus up to 40(60) mm wide, conico-campulate to convex at least when young, without adhering soil; stipe up to 5 mm thick, sometimes with thicker basal bulb; lamellae, L = 8–40; spores often larger, not thick-walled and without pore at the same time
   2. Cheilocystidia with capitulum 4.0–8.0(9.0) µm broad, on the average over 5.0 µm.
      3. Spores on the average over 10.0 µm long, moderately to rather thick-walled, orange-brown to rusty brown in ammonia
         4. Basidiocarps relatively large: pileus (10)15–42 mm, stipe 40–125(160) × 2–4 mm with basal bulb up to 7 mm thick; lamellae, L = 18–32; pileus often with olivaceous tinge; ammonia reaction usually positive and fast, occasionally only after several hours, rarely negative . . . . . **8. C. subovalis**
         4. Basidiocarps small to medium: pileus 5–18(25) mm, stipe 25–60(80) × 0.7–2 mm, base up to 3.5 mm thick; lamellae L =12–18; pileus without olivaceous tinge; ammonia reaction negative . . . . . **9. C. juniana**
      3. Spores on the average less than 10.0 µm long, thick-walled or thin-walled
         5. Spores (4.5)5.0–7.5(8.5) × (3.0)3.5–4.0(4.5) µm, usually at least in part papillate, often slightly rugulose under oil-immersion lens, always verruculose as observed with scanning electron microscope **20. C. dumetorum**

5. Spores over 7.0 µm long, without apical papilla, glabrous as observed with light microscope and scanning electron microscope
   6. Spores very thin-walled, nearly hyaline to pale yellowish in ammonia, without germ pore **12. C. spiculoides**
   6. Spores yellow-brown to rusty brown in ammonia, with germ pore
      7. Caulocystidia with capitulum 4.0–9.5 µm broad; spores thin-walled, pale brownish orange in ammonia; ammonia reaction usually positive and strong . . . . . **7. C. macrocephala**
      7. Caulocystidia with capitulum 5.0–14 µm broad; spores thin-walled or thick-walled; ammonia reaction negative
         8. Spores on the average (8.6)9.0–11.7 × 5.0–6.8 µm, moderately thick-walled (double wall in optical section), orange-brown in ammonia . . . . . **9. C. juniana**
         8. Spores on the average 7.5–9.5 × 4.2–5.2 µm, thin-walled (single wall in optical section), ochre-yellow to yellow-brown or brownish orange in ammonia
            9. Pileus bright coloured, orange-brown to rusty brown; exsiccata usually yellow- to orange-brown without brown-grey tone . . . . . **11. C. rickeniana**
            9. Pileus dull coloured, greyish brown, vinaceous brown, ochraceous brown; exsiccata at centre of pileus usually grey-brown . . . . . **10. C. echinata**

2. Cheilocystidia with capitulum 3.0–5.5(6.0) µm broad, on the average less than 5.0 µm
   10. Spores on the average less than 7.5 µm long
      11. Spores without germ pore
         12. Spores almost hyaline in ammonia, very thin-walled; pileus strikingly bicoloured, honey yellow with dark brown centre . . . . . **C. haglundii** (see notes on 12. *C. spiculoides*)
         12. Spores yellow-brown to rusty brown in ammonia, with thicker wall; pileus not bicoloured
            13. Spores av. 5.2–6.8 × 3.4–3.9 µm, verruculose at least under scanning electron microscope, occasionally appearing smooth under light microscope, often papillate; basidiocarps small: pileus 3–10 mm, stipe 7–20 × 0.5–1 mm; ammonia reaction negative . . . . . **20. C. dumetorum**
            13. Spores av. 5.9–7.2 × 3.9–4.5 µm, smooth also as observed with scanning electron microscope, not papillate; basidiocarps medium-sized: pileus 6–25 mm broad, stipe 16–60 × 1–3 mm; ammonia reaction usually positive, often weak . . . . . **17a. C. enderlei** var. **enderlei**
      11. Spores with germ pore
         14. Veil present in young basidiocarps as small, fugacious flocks along margin of pileus; cheilocystidia up to 45 µm long, lageniform to sublecythiform with slender, clavate basal part gradually passing into a tapering neck, up to 10 µm long; spores usually in part phaseoliform. . . . . **Pholiotina brunnea**
         14. Veil absent; cheilocystidia up to 20(25) µm long, truly lecythiform with globose to elliptic basal part and short neck; spores rarely phaseoliform
            15. Spores av. 5.2–6.8 × 3.4–3.9 µm, verruculose at least as observed with scanning electron microscope, occasionally appearing smooth under light microscope, often papillate, germ pore indistinct; basidiocarps small: pileus 3–10 mm broad, stipe 7–20 × 0.5–1 mm . . . . . **20. C. dumetorum**
            15. Spores av. 6.0–8.4 × 3.5–5.0 µm, smooth also as observed with scanning electron microscope, never papillate, with distinct germ pore; basidiocarps often larger
               16. Spores 5.0–8.0 × 3.5–5.0 µm, av. 5.2–7.0 × 3.5–4.5 µm, orange-brown to rusty brown in ammonia; ammonia reaction always negative; basidiocarps small, pileus up to 18 mm broad
                  17. Basidiocarps very small: pileus 2–5 mm, stipe 12–17 × 0.7–1 mm; lamellae, L = 8–10, distant; spores 5.5–7.5 × 4.0–5.0 µm, Q = 1.3–1.5. . . . . **16. C. robertii**
                  17. Basidiocarps larger: pileus 8–18 mm broad, stipe 20–45 × 0.8–1.5 mm; lamellae, L = 15–29, moderately crowded to crowded; spores (5.0)5.5–7.5 × 3.0–4.5 µm, Q = 1.5–2.1 **15. C. microspora**
               16. Spores 7.0–9.5 × 4.0–5.5 µm, av. (7.0)7.3–8.4(8.8) × 4.3–5.2 µm, pale brownish orange, pale yellow-brown to orange-brown in ammonia; ammonia reaction positive or negative

18. Ammonia reaction negative; caulocystidia predominantly lecythiform but often intermixed with some clavate to subcylindrical cystidia; pileus very pale, beige to whitish, only in young basidiocarps pale brownish orange or yellowish, not translucently striate when moist . . . . . **C. ochroalbida** (see notes on 3. *C. subpallida*)
18. Ammonia reaction usually positive, weak or strong; caulocystidia, exclusively lecythiform; pileus when moist ochre-brown, dull brown to greyish brown, translucently striate at least at margin when moist . . . . . **14. C. brachypodii**

10. Spores on the average longer than 7.5 µm
19. Spores on the average longer than 10.0 µm
20. Basidia 2–(1) spored; spores on the average over 13.0 µm long; stipe tapering into a long pseudorhiza **19. C. alboradicans**
20. Basidia predominantly 4-spored; spores on the average less than 13.0 µm long; stipe not rooting
21. Pileus bright yellow to apricot-yellow in young basidiocarps, gradually turning rusty brown in age but bright yellow in dry condition, also in exsiccata; ammonia reaction positive . . . **2. C. aurea**
21. Pileus without bright yellow colours; ammonia reaction positive or negative
22. Lower part of stipe thickened and buried in sand; habitat usually in coastal dunes; pileus with dark colours when moist: rusty brown, dark red-brown to blackish brown
23. Spores 11.0–14.5 × 6.0–8.5 µm, average length > 11.3 µm; caulocystidia exclusively lecythiform; ammonia reaction negative . . . . . **6. C. dunensis**
23. Spores 9.0–11.0 × 5.5–6.5 µm, average length < 10.5 µm long; lecythiform cystidia at stipe apex intermixed with clavate and filiform elements; ammonia reaction positive after some hours . . . . . **C. sabulicola** (see notes on 6. *C. dunensis*)
22. Stipe not buried in soil, cylindrical or bulbous; habitat in forests or grasslands (including dune grasslands); pileus paler: ochraceous to greyish brown or orange-brown
24. Stipe entirely white to cream-coloured, also in mature basidiocarps; pileus not translucently striate when moist; cheilocystidia with long neck, 3.0–8.0 µm long; ammonia reaction negative. . . . . **C. leucopus** (see notes on 4. *C. semiglobata*)
24. Stipe yellow-brown to dark brown, at least in lower part in mature basidiocarps; pileus often translucently striate when moist; cheilocystidia with shorter neck, 1.0–4.0 µm long; ammonia reaction often positive
25. Spores thin-walled (< 0.5 µm), pale yellow-brown to brownish orange in ammonia; ammonia reaction positive; lecythiform cystidia at stipe apex often intermixed with hairs and clavate elements. . . . . **3. C. subpallida**
25. Spores moderately thick-walled to thick-walled (0.5–1.0 µm), orange-brown to rusty brown or reddish brown in ammonia; ammonia reaction positive or negative; stipe usually without hairs or clavate elements
26. Pileus vividly orange-brown to reddish brown and strongly translucent-striate when moist; ammonia reaction usually strong and quick, occasionally weak and only after several hours. . . . . **1. C. tenera**
26. Pileus not or weakly striate when moist, usually dull-coloured; ammonia reaction negative or weak
27. Spores 9.5–12.5(13.0) × 6.0–7.5 × 5.5–6.5(7.0) µm, on the average 10.4–11.2 × 6.6–7.0 × 6.0–6.3 µm, clearly flattened; basidiocarps rather small: pileus 7–12 mm broad, stipe 15–40(65) × 0.5–2 mm; pileus at centre vividly reddish brown to orange-brown when moist. . . . . **5. C. subxerophytica**
27. Spores (10.5)11.0–14.0(15.0) × 6.0–7.5(8.5) µm long, on the average 11.5–12.7(13.4) × 6.4–6.9(7.2) µm, not or weakly flattened; basidiocarps medium-sized: pileus (7)10–25(35) mm broad, stipe 25–75(90) × 1–3 mm; pileus dull coloured: ochre-brown, dull brown . . . . . **4. C. semiglobata**

19. Spores on the average less than 10.0 µm long
28. Spores without germ pore

29. Basidia 2- (1-) spored; spores not flattened, 7.0–10.5(11.0) × 4.5–6.0 µm; basidiocarps medium-sized: pileus 9–20 mm . . . . . **17b. C. enderlei** var. **variispora**
29. Basidia 4-spored; spores flattened, 6.0–9.5 × 5.5–6.5 × 4.5–5.5 µm; basidiocarps very small: pileus 2–6 mm . . . . . **C. minima** (see notes on 16. *C. robertii*)

28. Spores with germ pore
30. Stipe tapering into a root; spores often flattened
31. Spores flattened, in frontal view a variable proportion (weakly) hexagonal to rhomboid; habitat on dung, compost, or manured soil . . . . . **18. C. antipus**
31. Spores not flattened, ellipsoid or ovoid in frontal view; habitat in dry, poor grasslands
32. Pileus yellow-brown to orange-brown when moist; lamellae distant; spores on the average 8.0–9.3 × (5.5)5.8–6.2 µm, Q = 1.3–1.6, ellipsoid, moderately thick-walled, rusty brown in ammonia . . . . . **C. herbarum** (see notes on 18. *C. antipus*)
32. Pileus dark rusty brown to dark brown when moist; lamellae crowded; spores on the average 8.0–9.4 × (4.5)4.9–5.8 µm, Q = 1.4–1.8(2.0), ellipsoid to ellipsoid-oblong, thin-walled, brownish orange in ammonia . . . . . **C. graminis** (see notes on 18. *C. antipus*)
30. Stipe not rooting, with rounded or bulbous base, not connected with grass roots; spores not flattened
33. Caulocystidia lecythiform with large capitulum, 4.0–9.5 µm broad; cheilocystidia with medium-sized capitulum, (3.5)4.0–7.5 µm broad; ammonia reaction positive, often strong 7. **C. macrocephala**
33. Caulocystidia and cheilocysidia with small capitulum, 2.5–5.5 µm broad; ammonia reaction positive or negative 34
34. Spores on the average 9.6–11.4 × 5.4–6.0 µm; caulocystidia predominantly lecythiform, often intermixed with some clavate to subcylindrical elements; ammonia reaction positive **3. C. subpallida**
34. Spores on the average (7.0)7.3–9.8 × 4.3–5.4 µm; caulocystidia exclusively lecythiform; ammonia reaction often negative 35
35. Pileus vividly coloured when moist, brownish orange to orange-brown with darker rusty brown to red-brown centre, fading to pale orange or yellowish when dry; ammonia reaction negative . . . . . **13. C. mesospora**
35. Pileus dull coloured, when moist ochre-brown to greyish brown with dark (greyish-) brown to blackish centre, fading to beige or greyish with grey-brown centre; ammonia reaction variable
36. Pileus at centre almost black to blackish brown, dark greyish brown towards margin . . . . . **C. nigrodisca** (see notes on 14. *C. brachypodii*)
36. Pileus at centre dull ochre-brown to rather dark grey-brown, paler towards margin **14. C. brachypodii**

KEY TWO

Veil absent; stipe pubescent with cylindrical hairs, in addition with more or less numerous lecythiform caulocystidia (sect. *Mixtae*)

Several species, belonging to sect. *Conocybe* and *Pilosellae*, are also included in this key since some collections may show intermixed lecythiform caulocystidia and cylindrical hairs to some degree.

1. Basidia 2-spored
2. Spores 7.0–10.0(14.0) × (4.0)4.5–6.7(8.0) µm; germ pore indistinct or absent **C. lobauensis** (see notes on 17b. *C. enderlei* var. *variispora*)
2. Spores (10.0)11.5–19.0 × 6.0–9.0 µm; germ pore large
3. Pileus whitish to pale greyish ochre or pale brownish, not translucently striate when moist

4. Pileus cream-coloured to whitish; context and lamellae very thin and soft; hymenium made up of basidia, surrounded by large, 7.0–15 µm broad pseudoparaphyses (pavement cells); spores av. 11.9–13.5 × 7.5–8.5 µm **31. C. pseudocrispa**
4. Pileus pale greyish ochre or pale brownish; context and lamellae of normal texture; pseudoparaphyses absent or small and obscure; spores av. 13.4–16.0 × 7.8–9.0 µm . . . . . **48. C. siliginea**

3. Pileus darker and more vividly coloured, brownish orange to reddish brown, translucently striate at least at margin when moist
5. Stipe rooting, with pseudorhiza; spores (10.5)11.5–14.5 × (6.5)7.5–9.5 µm, ellipsoid, Q = 1.4–1.6 **C. fiorii** (see notes on 26. *C. cettoiana*)
5. Stipe not rooting; spores ellipsoid-oblong or subamygdliform, Q = 1.5–2.0
6. Spores 13.0–18.0(21.0) × 7.5–10.5(11.0) µm, av. 15.0–17.0 × 8.2–9.5 µm, in side-view ellipsoid-oblong **28. C. rubiginosa**
6. Spores 11.0–15.5(16.5) × 5.5–9.5 µm, av. 12.5–14.1 × 6.3–8.4 µm, often in side-view subamygdaliform
7. Spores (11.0)12.0–15.0 × (6.5)7.5–9.5 µm, av. 13.7–14.1 × 8.1–8.4 µm, Qav. = 1.6–1.75, ellipsoid-oblong or ovoid-oblong in all views; habitat on dung . . . . . **25. C. merdaria**
7. Spores 10.5–15.5 × 5.5–7.5 µm, av. 12.5–14.0 × 6.3–7.0 µm, Qav. = 1.85–2.0; in side-view at least a large proportion subamygdaliform; habitat on soil . . . . . **27. C. ambigua**

1. Basidia 4-spored
8. Spores (12.5)14.0–18.5(20.0) × (7.0)7.5–10.0 µm, av. 14.6–17.0 × 8.2–9.0 µm; usually growing on dung **24. C. pubescens**
8. Spores less than 15.5 µm long, av. up to 14.2 × 8.0 µm; mostly on soil but sometimes on dung
9. Stipe rooting; spores 8.5–11.5 × 5.5–6.5 µm . . . . . **26. C. cettoiana**
9. Stipe not rooting
10. Spores 5.5–9.5 × 3.5–5.5 µm, on the average less than 9.0 µm long
11. Spores (4.5)5.5–7.5 × 3.5–4.5 µm, av. 5.8–6.6 × 3.6–4.0 µm, without germ pore, distinctly coloured **29. C. tuxlaensis**
11. Spores 6.5–9.5 × 3.5–5.5(6.0) µm, av. 6.8–8.4 × 4.3–5.4 µm, with distinct germ pore or without germ pore, but then spores almost hyaline
12. Spores very pale, almost hyaline or yellowish in water and ammonia, thin-walled with indistinct germ pore . . . . . **34. C. pallidospora**
12. Spores pale yellow-brown to rusty brown, with distinct germ pore
13. Pileus 9–25 mm broad, pale yellowish to pale brownish orange when moist, not translucently striate; stipe whitish to pale orange; spores thin-walled, pale yellow-brown to brownish orange in ammonia . . . . . **C. ochroalbida** (see notes on 3. *C. subpallida*)
13. Pileus 3–6(8) mm, dark brown when young and moist; stipe 15–28(40) × 1 mm, pink when young; spores moderately thick-walled, orange-brown in ammonia **C. roseipes** (see notes on 34. *C. pallidospora*)
10. Spores 9.0–15.5 × 5.0–9.0 µm, on the average over 9.5 µm long
14. Pileus very pale, ivory white to pale ochre when moist, often subcylindrical or slenderly conico-campanulate and higher than broad; lamellae very thin and fragile, more or less deliquescent; hymenium with numerous large pseudoparaphyses (pavement cells); spores (9.0)10.0–15.0(16.5) × 7.0–9.0(9.5) × 6.0–8.0 µm, weakly to strongly flattened . . . . . **30. C. apala**
14. Pileus darker, at least when moist and fresh, obtusely conical, campanulate, convex, not higher than broad; lamellae of normal texture, not deliquescent; pseudoparaphyses absent or small and obscure; spores not flattened
15. Pileus bright yellow to apricot yellow when young, gradually turning rusty brown in age but bright yellow in dry conditions; ammonia reaction positive. . . . . **2. C. aurea**
15. Pileus without bright yellow colours; ammonia reaction positive or negative
16. Caulocystidia predominantly lecythiform, intermixed with scattered hairs; spores (8.5)9.0–13.0 × (4.5)5.0–6.5 µm, av. 9.6–11.4 × 5.3–6.0 µm µm, thin-walled, pale yellow-brown to brownish orange in ammonia; ammonia reaction usually positive, often strong . . . . . **3. C. subpallida**

16. Stipe surface with numerous cylindrical hairs; spores 10.0–15.5 × 6.0–9.0 µm, av. 10.7–14.2 × 6.4–8.2 µm, slightly to clearly thick-walled, orange-brown to rusty brown in ammonia; ammonia reaction negative
    17. Smell and taste strongly farinaceous; growing on dung; spores 12.0–15.0 (17.0) × 7.0–9.5(–10.5) µm . . . . . **42. C. farinacea**
    17. Smell and taste weak, not distinctive; growing on soil.
        18. Basidiocarps medium-sized: pileus 12–32 mm broad, stipe 30–110 × 1.5–3 mm; lamellae, L = 19–36; spores 10.0–13.5(14.0) × (5.5)6.0–7.5 µm, av. 10.7–11.5 × 6.4–6.8 µm . . . . . **22. C. digitalina**
        18. Basidiocarps more slender: pileus 6–20 mm broad, stipe 40–80 × 0.5–2 mm; lamellae, L = 12–20; spores (11.0)11.5–16.5 × 6.5–9.0 µm, av. 13.0–14.2 × 7.3–8.0 µm **23. C. pulchella**

KEY THREE

Veil usually absent, rarely present as fugacious flocks along margin of pileus and thin, volva-like patches at base of stipe; stipe pubescent, covered with thin cylindrical hairs and lageniform to clavate cystidia, intermixed with small globose and ellipsoid elements; lecythiform caulocystidia absent or very rare near apex of stipe (sect. *Pilosellae*, *Candidae,* and *Singerella*).

1. Basidia predominantly 2-spored
   2. Spores (10.0)10.5–22.5 × (6.0)6.5–12.5 µm, on the average longer than 12.0 µm
      3. Spores (13.0)16.5–22.5(26.0) × (8.0)10.0–12.5(15.5) µm, av. 19.4–20.1 × 10.4–11.1 µm, with eccentric germ pore 2.3–3.5 µm broad; pileus at first brown with dark brown to blackish centre, then rusty brown to brownish orange . . . . . **C. gigasperma** (see notes on 49. *C. inocybeoides)*
      3. Spores 11.0–18.0(19.0) × (6.0)6.5–11.0 µm, on the average less than 16.5 × 9.0 µm, with up to 2.5 µm broad, central germ pore; pileus paler, beige, ochraceous or pale greyish brown
         4. Lamellae very thin and soft, in age more or less deliquescent; pileus and stipe almost white; basidia intermixed with large pseudoparaphyses (pavement cells); spores on the average 11.9–13.5 µm long **31. C. pseudocrispa**
         4. Lamellae of normal texture, not deliquescent in age; pileus pale greyish or brownish, stipe becoming brownish in lower half with age; pseudoparaphyses lacking or small and obscure; spores on the average 13.0–16.0 µm long
            5. Stipe 0.5–4 mm thick, cylindrical or slightly thickened at base; pileus remaining paraboloid to conico-convex; lamellae moderately distant, L = 13–26; spores ellipsoid, rusty brown in ammonia, with 1.8–3.0 µm wide germ pore. . . . . **48. C. siliginea**
            5. Stipe 2–6 mm thick with distinct basal bulb, 5–10(12) mm broad; pileus gradually expanding to convex or plano-convex, with or without umbo; lamellae crowded, L = 24–40; spores often in part subamygdaliform, brownish orange in ammonia, with 1.2–1.5 µm wide germ pore . . . . . **49. C. inocybeoides**
   2. Spores 9.0–13.0 × 5.5–7.5 µm, on the average less than 12.0 µm long
      6. Pileus at centre dark greyish brown when moist and fresh; stipe not rooting, in exsiccata turning wine pink to red-brown; spores distinctly flattened, in frontal view on the average at least 0.5 µm broader than in side-view **51. C. bisporigera**
      6. Pileus paler or brown to orange-brown; stipe without red tones in exsiccata; spores not distinctly flattened, rarely weakly flattened and then stipe rooting
         7. Stipe rooting; pileus brown to orange-brown when moist and fresh
            8. Spores 9.0–12.0(15.0) × 5.0–6.5 µm, not flattened, amygdaliform or with apical papilla (limoniform) in side-view; also 3- and 4-spored basidia present . . . . . **C. leporina** (see notes on 46. *C. microrrhiza*)
            8. Spores 10.5–12.0 × 7.5–8.0 × 7.0–7.5 µm, weakly flattened, ellipsoid to ovoid in side-view; basidia exclusively 2-spored. . . . . **46a. C. microrrhiza** var. **microrrhiza**
         7. Stipe not rooting; pileus pale greyish brown to ochraceous when moist; spores not flattened, amygdaliform in side-view, often papillate, 5.0–7.5 µm broad. . . . . **50. C. bispora**

1. Basidia predominantly 4-spored
   9. Pileus grey, grey-brown to dark brown when moist
      10. Basidiocarps relatively robust: pileus 20–35 mm broad, stipe 35–60 × 1.5–4 mm; pileus red-brown to dark brown at centre, strongly translucently striate when moist and fresh; spores (9.0)9.5–12.5(13.5) × (5.5)6.0–7.5(8.5) µm, av. 10.5–11.2 × 6.4–7.2 µm . . . . . **40. C. anthracophila**
      10. Basidiocarps smaller, pileus 5–20 mm broad, stipe 20–75 × 0.7–2 mm; pileus grey-brown to dark brown, occasionally mouse-grey to violaceous black at first or with olivaceous tone, not or very weakly striate when moist and fresh; spores 8.0–12.5 × (4.5)5.0–7.0(7.5) µm, av. 9.1–11.4 × 5.4–6.8 µm. . . . . **39. C. moseri**
   9. Pileus paler or vividly coloured, without grey tone: whitish, beige, ochraceous, orange-brown, rusty brown, wine-red, pink
      11. Spores on the average less than 10.0 µm long
         12. Spores without germ pore or very pale with indistinct germ pore
            13. Spores very pale yellow to pale orange in ammonia, with large but inconspicuous germ pore, on the average 7.4–8.4 × 4.3–5.3 µm; pileus conico-campanulate to hemispherical, remaining convex **34. C. pallidospora**
            13. Spores distinctly coloured, yellow-brown to brownish orange, without pore, on the average 5.8–7.3 × 3.6–4.5 µm; pileus rapidly expanding, becoming plano-convex to almost flattened. . **33. C. pilosella**
         12. Spores with germ pore, always strongly pigmented
            14. Pileus and stipe pink, flesh-coloured to wine-red when moist, at least in young basidiocarps **38. C. incarnata**
            14. Basidiocarps without pink or red colours
               15. Spores flattened, 8.0–9.5 × 6.0–7.0 × 5.0–6.0 µm, in part hexagonal in frontal view **C. hexagonospora** (see notes on 41. *C. lenticulospora)*
               15. Spores not or weakly flattened, ellipsoid or ovoid in frontal view
                  16. Stipe tapering into a 5–10(35) mm long pseudorhiza; pileus glabrous, reddish brown to orange-brown when moist . . . . . **46. C. microrrhiza**
                  16. Stipe with rounded or subbulbous base, not rooting; pileus pubescens, at least when young, ochre-yellow to brownish orange when moist
                     17. Spores 6.5–9.5(10.5) × 4.0–6.0(6.5) µm, av. 7.6–9.1(9.4) × 4.3–5.5 µm, not flattened, thin-walled, yellow-brown to brownish orange in ammonia. . . . . **35. C. rostellata**
                     17. Spores 9.0–11.5 × 5.5–7.5 × 5.0–7.0 µm, av. 9.7–10.8 × 6.0–6.8 × 5.6–6.5 µm, weakly to distinctly flattened, slightly to moderately thick-walled, orange-brown to rusty brown in ammonia. . . . . **36. C. sienophylla**
      11. Spores on the average longer than 10.0 µm
         18. Pileus pale, whitish, cream-coloured, beige, very pale greyish brown or pale yellowish brown
            19. Pileus milky white, often elongate-campanulate or subcylindrical, higher than broad; lamellae very thin and soft, more or less deliquescent with age; stipe remaining white to cream-coloured; spores on the average 11.2–13.5(14.5) µm long, weakly to strongly flattened; basidia intermixed with numerous large pseudoparaphyses, at least in young basidiocarps . . . . . **30. C. apala**
            19. Pileus yellowish, pale yellow-brown, beige, pale greyish brown, often with darker brown margin, conico-campulate to convex and umbonate, always broader than high; lamellae with normal texture, not deliquescent; stipe whitish at first, becoming ochre to brown in lower half with age; spores on the average 10.0–11.3 µm long, not flattened; pseudoparaphyses absent . . . . . **47. C. fuscimarginata**
         18. Pileus darker, ochre-brown, orange-brown or reddish brown
            20. Spores 12.0–18.5 × 7.0–10.0(10.5) µm, on the average longer than 13.0 µm; usually growing on dung
               21. Basidiocarps with farinaceous taste and smell, at least when damaged; spores 12.0–15.0(17.0) × 7.0–9.5 µm, av. 13.0–14.1 × 7.7–8.4 µm . . . . . **42. C. farinacea**
               21. Smell and taste not distinctive; spores (12.0)13.0–20.5 × (7.0)7.5–11.0 µm, av. 14.0–17.0 × 8.2–9.7 µm
                  22. Stipe 2–4 mm thick, at the base with prominent, often marginate 5–12 mm broad bulb; lecythiform cystidia on stipe lacking . . . . . **44. C. singeriana**

22. Stipe 0.5–3 mm thick, at base rounded to slightly thickened or rooting; stipe often with scattered lecythiform cystidia
    23. Basidiocarps small: pileus 5–12 mm, stipe 18–30 × 0.8–1.5 mm, not rooting, without lecythiform cystidia . . . . . **43. C. magnispora**
    23. Basidiocarps larger: pileus (7)9–40 mm, stipe 40–100(130) × 1.3 mm, rooting or not, usually with some lecythiform cystidia, at least near apex
        24. Stipe rooting; pseudorhiza up to 40 mm long; lecythiform cystidia on stipe scattered and rare . . . . . **C. watlingii** (see notes on 44. *C. singeriana*)
        24. Stipe not rooting; base rounded or subbulbous; lecythiform cystidia on stipe usually more numerous . . . . . **24. C. pubescens**

20. Spores (8.5)9.0–14.5(16.0) × 5.0–8.5(9.0) µm, on the average less than 13.2 µm long; on dung or soil
    25. Stipe relatively robust, 2–6(10) mm thick, gradually enlarged to the bulbous base or with marked, often marginate bulb, base 7–15(25) mm thick; fugacious veil may be present
        26. Stipe clavate, gradually enlarged to the bulbous base; veil absent; spores not flattened **C. elegans** (see notes on 44. *C. singeriana*)
        26. Stipe cylindrical, at base suddenly enlarged to often marginate bulb; in young basidiocarps fugacious veil remains present on margin of pileus and small belts in lower part of stipe or at bulb; spores flattened . . . . . **52. C. hornana**
    25. Stipe 1–5 mm thick, cylindrical or subbulbous, sometimes rooting, base up to 5(8) mm thick; veil absent.
        27. Context very soft, as in *C. apala*; pileus at centre vividly orange-red to brownish orange with broad pale marginal zone; stipe white, remaining so; spores 10.5–14.5 × 7.5–9.0 × 6.5–8.0 µm, slightly flattened . . . . . **32. C. zeylanica**
        27. Context of normal texture; pileus without vividly orange colour; stipe in mature basidiocarps distinctly coloured, at least in lower half; spores flattened or not
            28. Pileus weakly hygrophanous, when moist at centre pale greyish brown to pale yellow-brown, often with darker brown marginal zone, not translucently striate; spores (8.5)9.0–12.0(13.0) × 5.5–7.5(8.0) µm, not flattened . . . . . **47. C. fuscimarginata**
            28. Pileus distinctly hygrophanous, when moist at centre ochre-yellow, orange-brown or reddish brown, without darker marginal zone, translucently striate at margin; spores mostly more or less flattened
                29. Stipe at base tapering into a short or long pseudorhiza; growing on dung or heavily manured soil; spores not angular in frontal view . . . . . **45. C. fimetaria**
                29. Stipe not rooting, with rounded or subbulbous base; on soil or dung, when on dung spores in part (weakly) angular in frontal view
                    30. Basidiocarps relatively robust: stipe 35–60(80) × 1.5–4 mm; pileus 20–35(45) mm, red-brown to dark brown at centre when fresh; spores (9.0)9.5–12.5(13.5) × (5.5)6.0–7.5(8.5) µm, not flattened, slightly thick-walled; usually in old bonfire places . . . . . **40. C. anthracophila**
                    30. Basidiocarps less robust: stipe 25–85 × 0.5–2.5 mm; pileus 6–25 mm, paler, ochre-yellow to rusty brown at centre; spores weakly to distinctly flattened, often clearly thick-walled; usually on soil or dung
                        31. Spores in frontal view at least in part weakly angular; usually growing on dung, occasionally on soil . . . . . **41. C. lenticulospora**
                        31. Spores ovoid in frontal view, not angular; growing on soil
                            32. Spores 9.0–11.5 × 5.5–7.5 × 5.0–7.0 µm, av. 9.7–10.8 × 6.0–6.8 × 5.6–6.5 µm, slightly thick-walled (up to 1.0 µm) . . . . . **36. C. sienophylla**
                            32. Spores (10.0)10.5–13.5(14.0) × 6.5–8.5 × 6.0–7.5 µm, av. 11.0–12.5 × 7.2–7.8 × 6.4–7.0 µm, thick-walled (1.0–1.5 µm) . . . . . **37. C. velutipes**

Sect. **Conocybe**

SELECTED LITERATURE — A. Hauskn. in Österr. Z. Pilzk. 8: 35–61. 1999; 9: 73–109. 2000, 11:35–77. 2002; Sing. & Hauskn. in Pl. Syst. Evol. 180: 77–104. 1992

Basidiocarps mycenoid, pileus not deliquescent. Stipe slender, up to 5(7) mm thick. Stipe pruinose, not pubescent, rarely with some cylindrical hairs near apex; caulocystidia lecythiform, intermixed with small subglobose elements, rarely with scattered filiform cystidia. Pileocystidia absent or lecythiform, hardly projecting outside spheropedunculate elements of pileipellis. In part of species needle-like crystals formed on fragments of lamellae in ammonia (see notes). Pseudoparaphyses (pavement cells) in between basidia absent or scarce and difficult to find.

Conocybe dumetorum is included in this section although it is different from other species in the minutely ornamented spores and therefore usually assigned to subg. *Ochromarasmius* Watling (in Rev. Mycol. 40: 31–37. 1976). However, the ornamentation in this species is variable and in part of the collections invisible under a light microscope and then only detectable with scanning electron microscopy (Haushnecht. in Österr. Z. Pilzk. 4: 107–117. 1995). The taxonomic significance of verrucose spores needs further critical evaluation, in particular in tropical species (A. Hauskn. in Österr. Z. Pilzk. 7: 1–12. 1998).

1. Conocybe tenera (Schaeff. :Fr.) Fay. in Annls Sci. nat., Sér. VII, 9: 357. 1889. – Fig. 133.

Agaricus tener Schaeff., Fung. Bavariae 4: 31: pl. 70. 1774; *Agaricus tener* Schaeff. :Fr., Syst. mycol. 1: 265. 1821; *Galera tenera* (Schaeff. :Fr.) Kumm. Führ. Pilzk.: 75. 1871. – *Conocybe tenera* f. *tenella* J. Lange in Dansk bot. Ark. 9(6): 37. 1938 (invalid, no Latin diagn.).

EXCL. — *Conocybe tenera* sensu Dähncke, 1200 Pilze: 580. 1993 (= *C. subovalis*); sensu J. Lange, Fl. agar. dan. 4: 34. 1939 (= *C. subovalis*); sensu Breitenb. & Kränzl., Pilze Schweiz 4: 312. 1995 (= *C. semiglobata*); *Galera tenera* sensu Rick., Blätterpilze: 225. 1915 (= *C. digitalina*).

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987; Enderle & Hübner in Z. Mykol. 65: pl. 7. 1999; A. Hauskn. in Boll. Gruppo micol. G. Bres. 34:142. 1991; J. Lange, Fl. agar. dan. 4: pl. 128D. 1939 (as *C. tenera* f. *tenella*).

SEL. DESCR. & FIGS. — Enderle & Hübner in Z. Mykol. 65: 11–15, fig. 8. 1999; A. Hauskn. in Österr. Z. Pilzk. 9: 79–80, 104–107, fig. 9. 2000; Kühner, Genre Galera: 76–79, fig. 19. 1935; Watling in Br. Fung. Fl. 3: 57–58, figs 71–73, 83, 105, 108, 122. 1982.

VERN. NAME — Kaneelkleurig breeksteeltje.

Pileus (6)10–35(45) mm broad, up to 20 mm high, obtusely conical to campulate at first, then conico-convex to plano-convex, hygrophanous, when moist and fresh rather dark brown to reddish or greyish brown at centre (e.g., K. & W. 6D6, 6E7-8, 7E7, 7E8), to the margin slightly paler, gradually pallescent to ochre-brown, pale greyish brown or yellowish (e.g., 5B3, 4, 5C4, 5), translucently striate up to three-fourths of the radius, soon not striate, on drying pale ochraceous, surface glabrous, often appearing slightly greasy when moist. Lamellae, L = 16–28, l = 3(7), moderately distant to crowded, adnexed, ventricose, ochraceous when young, then orange-brown to rusty brown. Stipe (30)35–85(115) × (1)1.5–3.5 mm, subcylindrical with slightly thickened to subbulbous base up to 6 mm broad, at first cream-coloured or honey-yellow, soon becoming ochre-brown to orange-brown from base upwards, finally at base dark red-brown to blackish brown, entirely pruinose-striate, rarely with some scattered hairs near apex. Context thin, concolorous with surface, rather fragile. Smell weak, not distinctive. Taste mild. Spore print rusty brown.

Spores (8.5)9.5–13.0(14) × (4.5)5.5–7.0(7.5) µm, av. 9.8–11.8 × 5.7–6.8 µm, Q = 1.6–2.1, Qav. = 1.7–1.85, not or very slightly flattened, in side-view a variable proportion subamygdaliform, also ellipsoid-oblong, in frontal view ellipsoid-oblong to ovoid-oblong, orange-brown to rusty brown in ammonia, rather thick-walled (0.5–1.0 µm thick), with apical germ pore 1.0–2.0 µm wide. Basidia 17–30(34) × 8.0–12(13) µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 13–25 × 6.0–13(18) µm, lecythiform with subglobose to clavate basal part, short to moderately long neck (1.5–4.0 × 1.0–1.5 µm) and small capitulum, 3.0–5.5 µm broad, on the average below 4.8 µm broad. Hymenophoral trama made up of cylindrical and strongly inflated elements, 4.0–28 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate to spheropedunculate elements, 25–65 × 15–30 µm, often with brown pedicels. Pileocystidia scattered to rare, lecythiform like cheilocystidia but often smaller and with more irregular shape. Stipitipellis a cutis made up of hyaline hyphae, 2.0–7.0 µm broad. Caulocystidia 15–35 × 7.0–12 µm, lecythiform, usually with slender, long neck (3.0–10 × 1.5–1.8 µm) and small capitulum, 3.5–5.5 µm broad; in addition numerous globose and ellipsoid elements, 7.0–12 × 5.0–9.0 µm, exceptionally with some cylindrical hairs up to 80 × 5.0 µm. Clamp-connections present. Chemical reactions: Ammonia reaction usually quick and strong, rarely weak after several hours, exceptionally negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, mostly in grasslands and roadside verges on poor to fertilised, weakly acid to basic, sandy and loamy soils; also in ruderal sites

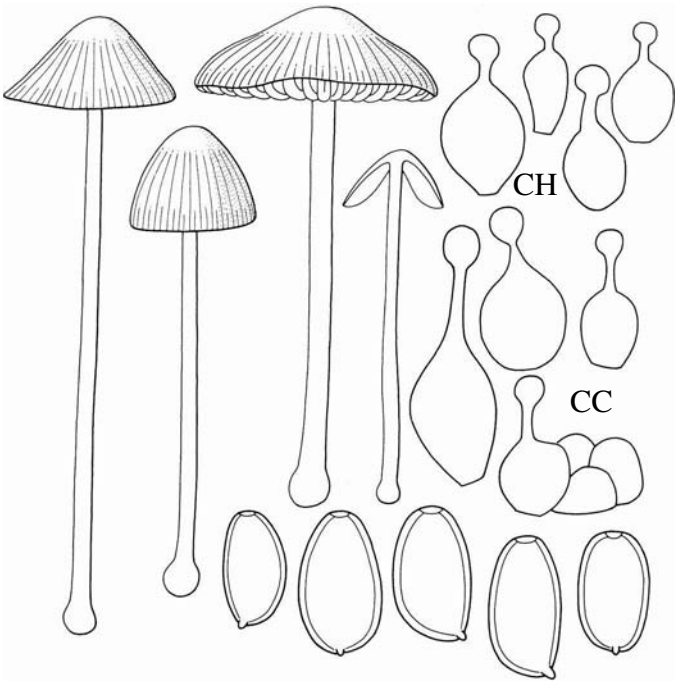


Fig. 133. *Conocybe tenera*

and deciduous forests. Uncommon in the Netherlands, but distribution insufficiently known (see notes). (April) June–Nov. Widespread in Europe, also recorded from North Africa, probably also in North and Central America and in Asia.

In the field *Conocybe tenera* is one out of many anonymous *Conocybe* species with a reddish brown, striate pileus and pruinose stipe. Diagnostic characters of *C. tenera* are the fairly large, rather thick-walled and strongly coloured spores, the cheilo- and caulocystidia with small capitula and the usually strong and quick formation of crystals in ammonia. However, this reaction is not entirely reliable since it is weak or even absent in some collections. The limits to *C. semiglobata* are not always clear and deserve more intensive study (see notes on that species).

Conocybe tenera has been often confused in the past and the name has been in use for many species of sect. *Conocybe* until 1935. Kühner (Genre Galera: 76. 1935) introduced a much more restricted concept that has been accepted by most authors and is still valid nowadays. Horak (Syn. Gen. Agar.: 176. 1968) contributed to the stability of this concept by selection of a neotype (see also A. Hauskn. in Österr. Z. Pilzk. 9: 79. 2000). Nevertheless, *C. tenera* remains one of the species that is often misidentified nowadays (see also Enderle & Hübner in Z. Mykol. 65: 11–15. 1999). Over three quarters of the collections from the Netherlands under this name appeared to belong to several other species of *Conocybe*. Although *C. tenera* is not really rare, it certainly does not belong to the most common species of *Conocybe*.

2. Conocybe aurea (J. Schaeff.) Hongo in J. jap. Bot. 38: 236. 1963. – Fig. 134.

Galera aurea J. Schaeff. in Z. Pilzk. 9: 167. 1930; *Conocybe tenera* var. *aurea* (J. Schaeff.) Kühner, Genre Galera: 72. 1935; *Conocybe tenera* f. *aurea* (J. Schaeff.) Enderle in Z. Mykol. 65: 15. 1999. – *Conocybe aurea* var. *hololeuca* A. Hauskn. in Österr. Z. Pilzk. 9: 86. 2000.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 376. 1995; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1321. 1994; Imaz. & Hongo, Col. Ill. Mushr. Japan 1: pl. 47, fig. 330. 1987; Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 202. 1985; Mos. & Jül., Atl. Basidiomyc. III Conocybe 2 (upper fig.). 1994.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 300, figs A–E. 1995; A. Hauskn. in Österr. Z. Pilzk. 9: 81–86, figs 3a–g. 2000; Kühner, Genre Galera: 72–73, fig. 17. 1935; Svrček in Česká Mykol. 19: 43–44, fig. 1. 1965; Watling in Br. Fung. Fl. 3: 53. 1982.

VERN. NAME — Gouden breeksteeltje.

Pileus 12–50(70) mm broad, up to 25(30) mm high, hemispherical to conico-campanulate at first, then plano-convex with broad umbo, hygrophanous, when moist golden-yellow, apricot-yellow to rather pale orange (K. & W. 4A7-5A7, 5B5, 5B6) at first, gradually becoming yellow-brown to cinnamon-brown at centre (6D6, 6D7, 6E7), paler towards margin, translucently striate up to halfway the centre, soon not striate, on drying turning pale yellow or golden-yellow, glabrous. Lamellae, L = 28–34, l = 3–7, crowded, adnexed, slightly ventricose, cream-coloured at first, then orange-brown to rusty brown with whitish fimbriate edge. Stipe 30–65(85) × 1.5–3(4) mm, cylindrical or with subbulbous base, up to 5 mm thick, cream-coloured at first, then pale yellow-brown to pale flesh-coloured (4A2,3, 5A3-B4), entirely pruinose-striate, without erect hairs. Context concolorous with surface. Smell and taste not distinctive. Spore print rusty brown.

Spores (9.5)10.0–13.0(14.0) × (5.5)6.0–7.5(8.0) µm, av. 10.8–12.2 × 6.1–7.0 µm, Q = 1.5–2.0, Qav. = 1.7–1.85, not or very weakly flattened, ellipsoid-oblong to slightly amygdaliform in side-view, sometimes in frontal view slightly broader, rather thick-walled (c. 1.0 µm), orange-brown in ammonia, with distinct central germ pore, 1.7–2.0 µm wide. Basidia 18–25(33) × 8.0–12 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 17–24 × 6.0–11 µm, lecythiform with ellipsoid basal part, moderately long neck (3.0–5.5 × 1.0–1.5 µm) and small capitulum, 3.5–4.5 µm wide. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 8.0–30 µm wide, with hyaline walls. Pileipellis an epithelioid hymeniderm made up of clavate to spheropedunculate elements, 12–42 × 9.0–25 µm, in part of the collections mixed with pileocystidia. Pileocystidia 20–32 × 5.0–8.0 µm, lecythiform with small capitulum 2.5–4.5 µm broad. Stipitipellis a cutis made up of cylindrical hyphae, 2.5–6.0 µm broad, with clusters of caulocystidia. Caulocystidia 14–29 × 6.0–11 µm, lecythiform with long, tapering neck (3.0–10 × 1.0–2.0 µm) and small to medium-sized capitulum, 3.5–5.5(7.0) µm broad; in additon numerous globose to ellipsoid elements up to 12 × 11 µm, occasionally also with scattered to rather numerous cylindrical hairs up to 120 µm long, 2.0–3.0 µm broad. Clamp-connections present. Chemical reactions: Ammonia reaction usually positive and strong, rarely weak or absent.

HABITAT & DISTR. — Saprotrophic, solitary or usually in groups on soil and compost, usually in disturbed habitats rich in nutrients, e.g., in gardens, parks, lawns, on compost piles and in ruderal places, mainly on heavy soils, also in unheated glasshouses, e.g., cucumber cultures and there occasionally in large numbers. In the Netherlands rare, mainly in Holocene areas. July–Oct., in glasshouses the entire year. Widespread in Europe but nowhere common; also in Asia.

Conocybe aurea is close to *C. tenera* and differs mainly in the vividly yellow colour of the pileus in young basidiocarps. The colour in *C. aurea* is brighter than in any other European species of *Conocybe*. In addition, *C. aurea* differs in paler, uniform colour of the stipe, the shape of the spores, which is slightly more amygdaliform in *C. tenera*, and a preference for compost and other nutrient-rich habitats.

A taxon with whitish sporocarps but normal, brown spores (hence no albinistic variant) has been described as *C. aurea* var. *hololeuca* A. Hauskn. (in Österr. Z. Pilzk. 9: 86–88, pl. VII, fig. 3. 2000). It was

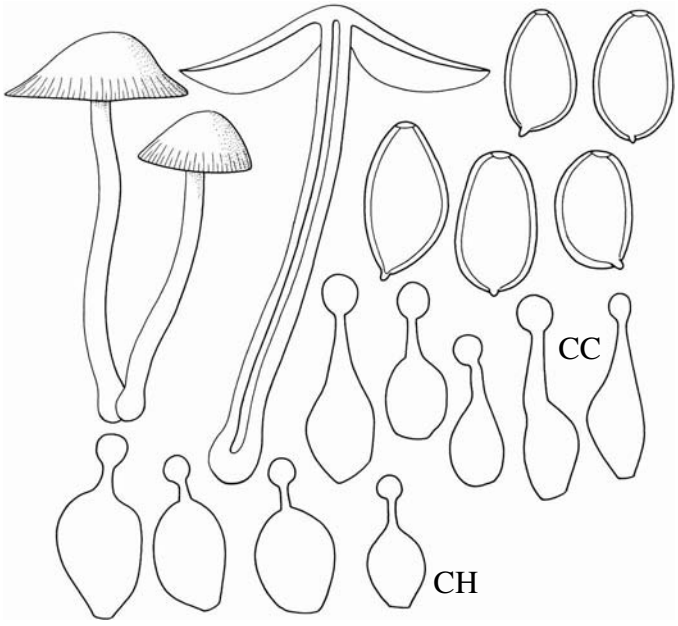


Fig. 134. *Conocybe aurea*

described as a variety of this species in view of the strong ammonia reaction and size and colour of the spores. However, it is unclear how this taxon should be distinguished from white variants of *C. tenera*.

3. Conocybe subpallida Enderle in Z. Mykol. 57: 92. 1991.

KEY TO THE VARIETIES

1. Caulocystidia lecythiform, intermixed with scattered to numerous slenderly clavate and subcylindrical elements, at least at apex of stipe. Pileus usually pale greyish to ochre-brown, not or weakly translucent-striate when moist and fresh . . . . . 3a. var. **subpallida**
1. Caulocystidia (almost) exclusively lecythiform. Pileus usually darker ochre- to orange-brown, translucently striate when moist and fresh . . . . . 3b. var. **subalpina**

3a. var. **subpallida** – Fig. 135B.

SEL. ICON. — Cetto, Funghi Vero 7: pl. 2654. 1993; Enderle in Z. Mykol. 57: 96a. 1991; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 17. 1992.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 57: 91–93, figs. 1991; A. Hauskn. in Österr. Z. Pilzk. 9: 102–104, fig. 8. 2000; Krisai et al. in Österr. Z. Pilzk. 6: 168–169. 1997.

VERN. NAME — Bleekbruin breeksteeltje.

Pileus 8–35 mm broad, 7–22 mm high, obtusely conical, conico-campanulate or hemispherical at first, then conico-convex or plano-convex, occasionally with reflexed margin in age, hygrophanous, when moist and fresh usually at centre ochre-brown, pale greyish brown to pale orangey brown (e.g., K. & W. 6D4-8, 7D6, 6D8-7D8), gradually paler towards margin, pale orange to ochraceous (e.g., 5B4, 5C4,5), occasionally considerably darker, at centre brown to reddish brown (6E6,7, 8E6), towards the margin yellowish brown (6D6), mostly weakly translucently striate but sometimes striate up to centre, on drying soon not striate, pallescent to very pale ochre or greyish orange (5A3, B3); surface smooth or weakly rugulose, glabrous, not pubescent. Lamellae, L = 25–35, l = 3(7), moderately distant to crowded, adnexed, slightly ventricose, pale greyish orange at first, then pale ochre-brown to orange-brown (5B6, 5D7, 6D8) with concolorous edge. Stipe 40–85(100) × 1–3 mm, cylindrical, usually with subbulbous base up to 6 mm broad, fistulose, whitish to straw-yellow at first, then honey-yellow to brownish orange, in lower half becoming orange-brown to reddish brown from base upwards, entirely pruinose-striate, at apex in addition with scattered hairs under hand-lens. Context concolorous with surface. Smell and taste not distinctive. Spore print not recorded.

Spores (8.5)9.0–13.0 × (4.5)5.0–6.5 µm, av. 9.6–11.4 × 5.5–6.0 µm, Q = (1.5)1.6–2.0, Qav. = 1.65–1.85, not flattened, ellipsoid-oblong in all views, pale yellow-brown to pale brownish orange in ammonia (e.g., 5B6, 5C6, 6C6, 6C7), thin-walled with distinct apical germ pore, 0.8–1.7 µm wide. Basidia 18–25 × 8.0–11.5 µm, 4-spored. Lamella edge sterile. Cheilocystidia 15–23 × 6.0–12 µm, lecythiform with globose, ellipsoid or clavate basal part, short to moderately long neck (2.0–5.0 × 1.0–1.7 µm) and small capitulum, 3.0–5.0(5.8) µm, hyaline. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 4.0–25 µm broad, with hyaline wall. Pileipellis an epithelioid hymeniderm made up of clavate and spheropedunculate elements, 15–54 × 9.0–35 µm, often with yellowish pedicel. Pileocystidia scattered to numerous, lecythiform, 24–39 × 6.5–9.5 µm, with long tapering neck, 4.5–11 × 1.5–2 µm and capitulum 4.5–5.5 µm broad, often with yellowish to brown content. Stipitipellis a cutis of repent hyphae, 2.0–6.0 µm broad, with hyaline or pale yellow wall.

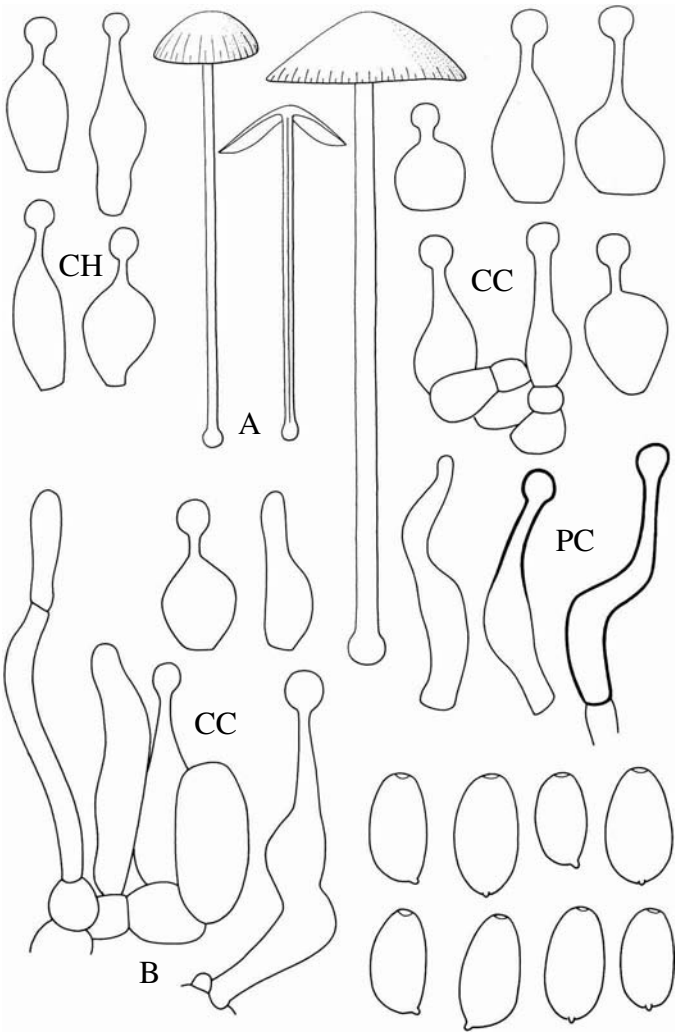


Fig. 135. *Conocybe subpallida.* A. var. *subalpina*. B. var. *subpallida*.

Caulocystidia at lower half of stipe predominantly lecythiform, 17–38(47) × 8.0–13 µm, similar to cheilocystidia but often with longer neck (2.0–11 × 1.5–2.5) µm, capitulum 2.5–5.5 µm broad; at apex a mixture of lecythiform cystidia and lageniform, clavate to subcylindrical cystidia, 16–80 × 4.5–10 µm, in various proportions; often lecythiform cystidia scarce but in other collections abundant; in addition numerous subglobose elements up to 17 × 12 µm and occasionally slender, cylindrical hairs up to 75 × 1.0–3.5 µm. Clamp-connections present. Chemical reactions: Ammonia reaction usually positive, often strong, rarely completely absent after 12 hours.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, on moist to dry, subneutral to basic, sandy, loamy and clayey soil and on compost rich in nutrients, in deciduous forests, dune scrub, roadside verges, parks and gardens, often in ruderal communities with e.g., *Urtica dioica*. In the Netherlands not uncommon, mainly in Holocene areas, but distribution incompletely known (see notes). Aug.–Nov. Also recorded from Austria, Germany and Sweden; European distribution not well known.

Conocybe subpallida resembles *C. tenera* in, e.g., spore size, shape of cheilocystidia, and positive ammonia reaction. The most striking difference is the remarkably pale colour and thin wall of the spores in *C. subpallida*. In addition, the lecythiform caulocystidia are intermixed

with more or less numerous clavate to cylindrical elements, at least at the apex of the stipe. Such elements are usually absent in *C. tenera*, although sometimes a few cylindrical hairs occur at the stipe apex. The presence of non-lecythiform cystidia at the stipe makes *C. subpallida* more or less intermediate between sect. *Conocybe* and sect. *Mixtae*. The species is maintained in sect. *Conocybe* because of the positive ammonia reaction (absent in all studied species of sect. *Mixtae*) and the different structure of the hairs that are mostly broader and more regular than in the *Mixtae*. As the name suggests, the pileus colour is usually remarkably pale for a *Conocybe*, an additional field character. However, some collections were also made with orange-brown to red-brown colours, not distinguishable from *C. tenera* in the field.

C. subpallida was only recently recognised in the Netherlands (Chrispijn, Champ. Jordaan: 229. 1999), but appears to be widespread in ruderal places on base-rich soils rich in nutrients. In the past it has been confused with *C. tenera*, *C. macrocephala,* and various other species.

Conocybe ochroalbida A. Hauskn., described from xerophytic grasslands in Austria and Italy, resembles *C. subpallida* in the pale colours of the basidiocarps (pileus pale brownish orange or yellowish when young, soon becoming whitish) and the covering of the stipe, made up of predominantly lecythiform cystidia, intermixed with some scattered cylindrical elements. It differs mainly from *C. subpallida* in considerably smaller spores, measuring 6.5–9.0 × 4.5–5.5 µm, av. 6.8–7.2(7.8) × 4.5–5.0 µm (Hausknecht in Doc. mycol. 25(98–100): 214–216. 1995).

3b. var. **subalpina** (Sing.) Arnolds in Persoonia 18: 228. 2003. – Fig. 135A.

Conocybe mesospora var. *subalpina* Sing. in Fieldiana, Bot., n.S. 21: 104. 1989; *Conocybe subalpina* (Sing.) Sing. & Hauskn. in Pl. Syst. Evol. 180: 89. 1992. — *Conocybe macrocephala* var. *macrospora* A. Hauskn. in Österr. Z. Pilzk. 9: 92. 2000.

SEL. ICON. — A. Hauskn. in Österr. Z. Pilzk. 9: pl. VIII. 2000 (as *C. macrocephala* var. *macrospora*); Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 6. 1994 (as *C. pilosella*); Sing. & Hauskn. in Pl. Syst. Evol. 180: 89–90, fig. 2d. 1992.

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 9: 92–94, figs. 6f–l. 2000 (as *C. macrocephala* var. *macrospora*); A. Hauskn. in Österr. Z. Pilzk. 11: 46, 69–72. 2002; Sing. & Hauskn. in Pl. Syst. Evol. 180: 89–90, fig. 5a–f. 1992.

CHARACTERISTICS — Differing from var. *subpallida* in darker, striate pileus and lack of subcylindrical to clavate caulocystidia on the stipe. Pileus, when young and fresh, at centre dark brown to reddish brown (K. & W. 6F7, 7F7,8, 8E8), to the margin paler orange-brown to ochraceous brown or greyish brown (6D4, 6E5, 6D6, 7C5, 7D7,8), translucently striate up to one third of radius or more; spores (8.5)9.0–12.0 × (4.5)5.0–6.5 µm, av. 9.9–10.8 × 5.4–6.0 µm, Q = 1.6–2.0, Qav. = 1.75–1.85, not flattened, ellipsoid-oblong to slightly subamygdaliform, yellow-brown to brownish orange (5C6, 6C7) in ammonia; cheilocystidia 16–27 × 6.0–13 µm, lecythiform with neck 1.0–4.5 × 1.5–2.0 µm and capitulum 3.0–5.0 µm broad, av. 4.0–4.5 µm; caulocystidia mainly lecythiform 17–28 × 6.0–13 µm with neck 2.5–6.5 × 1.5–2.0 µm, capitulum 3.0–5.5(6.5) µm, occasionally at apex a few lageniform cystidia and some cylindrical hairs up to 80 × 1.5–2.5 µm. Ammonia reaction usually positive, often strong, sometimes absent even after 12 hours.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups in the same habitats as var. *subpallida*. In the Netherlands probably less common than the typical variety. Distribution poorly known because of recent recognition and problematic taxonomic status of this taxon (see notes). July–Nov. Also recorded with certainty from Austria, Germany, Italy, and Sweden.

Conocybe subpallida var. *subalpina* is difficult to classify. It combines characteristics of various taxa, such as *C. subpallida, C. tenera,* and *C. macrocephala*. Originally it was described as a variety of *C. mesospora*, but that species differs considerably in spore size and negative ammonia reaction. It has also been described as *C. macrocephala* var. *macrospora* (Hausknecht in Österr. Z. Pilzk. 9: 92. 2000). However, it differs from *C. macrocephala* not only in spore size, but also in the smaller capitulum of cheilo- and caulocystidia, darker pileus, and habitat. Spore size, cheilocystidia, and ammonia reaction are more similar to *C. tenera*. However, the spores in *C. subpallida* var. *subalpina* are much paler and thin-walled, an important taxonomic character in this group. The spore characters and other features are more in agreement with *C. subpallida,* and therefore it is regarded in this Flora as a variety of that species. Var. *subpallida* mainly differs in paler colour of the pileus and the occurrence of non-lecythiform, cylindrical elements at the stipe apex. However, some collections of otherwise typical *C. subpallida* show a dark brown to reddish brown pileus, and the ratio between lecythiform caulocystidia and other elements is quite variable. On the other hand, also in var. *subalpina* occasionally some cylindrical elements have been observed at the stipe apex (Hausknecht in Österr. Z. Pilzk. 9: 92, fig. 6g. 2000).

4. Conocybe semiglobata Kühn. & Watl. in Notes R. bot. Gdn Edinb. 38: 337. 1980. – Fig. 136.

Conocybe tenera f. *semiglobata* Kühner, Genre Galera: 79. 1935 (invalid); *Conocybe semiglobata* (Kühner) Kühn. & Romagn., Fl. anal. Champ. sup.: 347. 1953 (invalid). *Galera tenera* f. *convexa* J. Lange in Dansk. bot. Ark. 9: 37. 1938 (invalid, no Latin diagn.).

MISAPPL. — *Conocybe affinis* sensu Sing. & Hauskn. in Pl. Syst. Evol. 180: 87. 1992; sensu A. Hauskn. in Boll. Gruppo micol. G. Bres. 36: 38. 1993; sensu Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 16. 1994.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 390, 394 (as *C. tenera*). 1995; Cetto, Funghi Vero 6: pl. 2216. 1989; Consiglio in Boll. Gruppo micol. G. Bres. 42: 73. 1999; A. Hauskn. in Boll. Gruppo micol. G. Bres. 36: 38, pl. 2. 1993 (as *C. affinis*); J. Lange, Fl. agar. dan. 4: pl. 129J. 1939 (as *Galera tenera* f. *convexa*); Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 3 (lower fig.), 16 (as *C. affinis*). 1994; Sing. & Hauskn. in Pl. Syst. Evol. 180: 87–89, fig. 2c. 1992 (as *C. affinis*).

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 308 (‘1982’) 1983; Breitenb. & Kränzl., Pilze Schweiz 4: 308, figs A–E; 312, figs A–E (as *C. tenera*). 1995; Consiglio in Boll. Gruppo micol. G. Bres. 42: 72. 1999; Enderle in Z. Mykol. 57: 84–86. 1991; A. Hauskn. in Boll. Gruppo micol. G. Bres. 36: 37–38. 1993 (as *C. affinis*); A. Hauskn. in Österr. Z. Pilzk. 11: 44, 64–69. 2002; Kühner, Genre Galera: 79–81, fig. 20. 1935; Sing. & Hauskn. in Pl. Syst. Evol. 180: 87–89, figs 1, 4g–l. 1992 (as *C. affinis*); Watling in Br. Fung. Fl. 3: 55–56, fig. 142. 1982.

VERN. NAME — Gewelfd breeksteeltje.

Pileus (7)10–25(35) mm broad, up to 15 mm high, hemispherical to obtusely conico-convex, hygrophanous, orangey ochre, ochre-brown, pale dull brown, orangey brown (e.g., K. & W. 5B4, 5C5, 5C6, 5D7, 6E6, 6E7), at centre occasionally darker reddish brown (6E-F7), only weakly translucent-striate when young and fresh, very soon not striate, on drying greyish ochre to cream-coloured (e.g., 5C3,4, 4B3), dull and

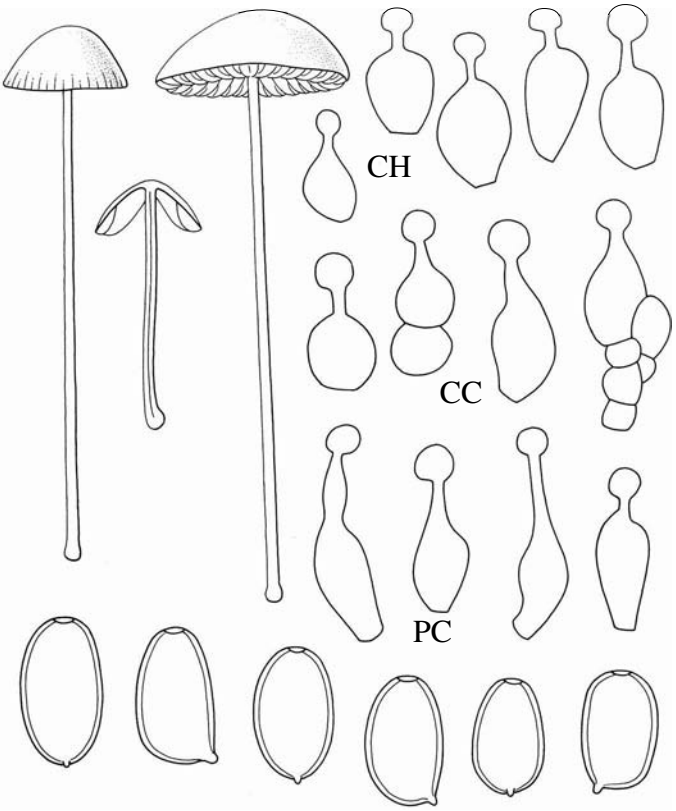


Fig. 136. *Conocybe semiglobata*

glabrous. Lamellae, L = (12)16–24, l = (1)3–5(7), rather crowded, adnexed, often ventricose, pale ochraceous at first, then rusty brown (7D8 or darker) with whitish flocculose, occasionally weeping edge. Stipe 25–75(90) × 1–2 mm, cylindrical, often with up to 5 mm broad bulbous base, fistulose, at first cream-coloured, ochraceous, pale flesh-coloured to pale brown, usually becoming darker orange-brown to rusty brown from base upwards, entirely pruinose, not pubescent, rarely with some scattered hairs at apex only. Context thin, fragile, concolorous with surface. Smell weak, not distinctive. Taste mild. Spore print rusty brown to reddish brown.

Spores (10.5)11.0–14.0(15.0) × 6.0–7.5(8.5) µm, av. 11.5–12.7(13.4) × 6.4–6.9(7.2) µm, Q = 1.6–2.0, Qav. = 1.75–1.9, not or weakly flattened (in frontal view up to 0.5 µm broader than in side-view), ellipsoid-oblong in side-view, not or only very few weakly subamygdaliform, ellipsoid- to ovoid-oblong in frontal view, rather thick-walled (± 1 µm), with large central germ pore, 1.5–2.0 µm broad, warm orange-brown to rusty brown in ammonia (7D8, 7D8/8D8). Basidia 16–27 × 8.0–11 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 15–23 × 6.0–11 µm, lecythiform with globose to clavate basal part, short neck (1.5–3.5 × 1.0–1.5 µm) and small capitulum, 3.0–5.0(5.5) µm broad. Hymenophoral trama made up of cylindrical to strongly inflated elements, 4.0–20 µm broad. Pileipellis an epithelioid hymeniderm, made up of spheropedunculate and clavate elements, 15–50 × 9.0–27 µm, often with pale brown pedicel. Pileocystidia scarce to numerous, 16–28 × 4.5–7.5 µm, lecythiform like chilocystidia but narrower with longer neck (2.0–11 × 1.4–1.8 µm) and capitulum 2.5–5.0 µm broad, often with brown wall. Stipitipellis a cutis, made up of hyphae 2.0–5.0 µm broad, with hyaline to pale yellow wall. Caulocystidia 14–26 × 6.0–11 µm, usually in clusters, lecythiform, similar to cheilocystidia but neck often longer (2.0–5.0 × 1.0–2.0 µm), with capitulum 3.0–5.0(5.5) µm broad. Clamp-connections present. Chemical reactions: Ammonia reaction negative or weak and slow, some needles formed after a few hours.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, most often in grasslands, both on nutrient-poor and on fertilised soils; also along forest edges and roadsides, in ruderal places and gardens, on weakly acid to basic, sandy and clayey soils, often on calcareous soils and in disturbed places. In the Netherlands common in Holocene areas, coastal dunes, and southern Limburg, uncommon elsewhere; detailed distribution unknown because of many misidentifications in the past. June–October, most often in summer. Widespread in Europe, also recorded from North Africa.

Conocybe semiglobata is closely related to *C. tenera*: Both species have cheilo- and caulocystidia with a small capitulum and rather large, dark coloured, rather thick-walled spores. The spores in *C. tenera* are often slightly smaller and paler and usually in part more or less amygdaliform in side-view. Moreover, the ammonia reaction in that species is usually quick and strong. Macroscopically, *C. tenera* differs in the darker, more vividly coloured pileus that is strongly striate under moist circumstances. The shape of the pileus is often more pronounced conical to campanulate in *C. tenera,* but this is by no means a reliable character. Dried-out basidiocarps of *C. semiglobata* and *C. tenera* cannot be distinguished in the field with certainty.

Conocybe subpallida may strongly resemble *C. semiglobata* in the field, but is readily distinguished by much paler, thin-walled spores, the presence of non-lecythiform elements at stipe apex, and the usually strong ammonia reaction.

A related species, originally described from Algeria, is *C. leucopus* Kühn. & Watl. (in Notes R. bot. Gdn Edinb. 40: 539. 1983). It was also described from Great Britain (Watling, Br. Fung. Fl. 4: 64. 1982). *Conocybe leucopus* is mainly characterised by the white stipe, remaining very pale in old basidiocarps, and by very slender cheilocystidia, up to 5.0 µm broad, with a long, thin neck. The spores measure 11.5–13.0(14.5) × 6.5–8.0 µm and are relatively broader (Q = 1.5–1.7) and more thick-walled than the spores of *C. semiglobata*. The ammonia reaction of *C. leucopus* is also negative. *C. leucopus* has been recorded from several localities in the Netherlands (Arnolds in Arnolds et al., Overz. Paddest. Nederland: 107. 1995), but no authentic material has been seen that corresponds with the original description.

Conocybe affinis Sing. (in Beih. Nova Hedwigia 29: 207. 1969), originally described from Argentina, has been synonymized by several European authors with *C. semiglobata*. According to Hausknecht (in Österr. Z. Pilzk. 11: 37. 2002), who studied the holotype of *C. affinis*, it is a separate species, synonymous with *C. tenerrima* Sing. (in Singer & Digilio in Lilloa 25: 292. 1953), also described from South America. That species differs from *C. semiglobata* in tiny, dark coloured basidiocarps, broader and slightly smaller spores (10–12.5 × 6.5–8.0 µm), and habitat on dung.

5. Conocybe subxerophytica Sing. & Hauskn. in Pl. Syst. Evol. 180: 80. 1992.

KEY TO THE VARIETIES

1. Lamellae rather crowded, soon orange-brown; stipe whitish, turning brown in age . . . . . 5a. var. **subxerophytica**
1. Lamellae subdistant, remaining pale ochraceous for a long time; stipe whitish or yellowish, not becoming brown . . . . . 5b. var. **brunnea**

5a. var. **subxerophytica**

MISAPPL. — *Conocybe affinis* Sing. in Nova Hedwigia 29: 207. 1953.

SEL. ICON. — Sing. & Hauskn. in Pl. Syst. Evol. 180: 81, fig. 2a. 1992.

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 11: 72–74, fig. 5a, b. 2002; Sing. & Hauskn. in Pl. Syst. Evol. 180: 80, 86–87, fig. 4a–f. 1992.

CHARACTERISTICS — Differing from var. *brunnea* by remarkably distant and pale brown (K. & W. 6D5) lamellae, slightly paler, orange-brown pileus and yellowish stipe, not darkening with age; spores (8.0)9.5–12.0(13.0) × (5.5)6.3–7.8(9.0) × (4.0)5.5–7.0(7.5) µm, av. 10.4–12.1 × 6.8–7.2 × 6.2–6.6 µm.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, in poor, xerophytic grasslands on sandy or loamy soil. Not found in the Netherlands. Not uncommon in Austria; also recorded from Greece and Argentina. May–Sept., often early in the year.

Conocybe subxerophytica is closely related to *C. semiglobata*. It differs mainly from the latter species in the slightly smaller, flattened spores and also in the smaller basidiocarps with darker pileus and in the total absence of ammonia reaction. The distinction between var. *subxerophytica* and var. *brunnea* is made on macroscopic characters only and may appear to be artificial after study of more material.

5b. var. **brunnea** A. Hauskn. in Österr. Z. Pilzk. 11: 74. 2002. – Fig. 137.

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 11: 74–76, fig. 5 c–h. 2002.

VERN. NAME — Platsporig breeksteeltje.

Pileus 7–12 mm broad, up to 8 mm high, campanulate to conico-convex, hygrophanous, when fresh and moist at centre reddish brown to orange-brown at first, slightly paler towards margin, becoming paler orangey brown or ochre-brown in age, not or weakly translucent-striate, on drying turning orange-ochre or pale ochaceous, smooth to rugulose, glabrous. Lamellae, L = 16–20, l= 1–3, fairly crowded to crowded, adnexed, slightly ventricose, pale yellow-brown at first, then orange-brown to rusty brown with slightly paler, fimbriate edge. Stipe 15–40 × 0.5–2 mm, cylindrical or subbulbous, not rooting, fistulose, whitish to cream-coloured at first, then ochraceous, finally with brown tones, entirely pruinose. Context concolorous with surface. Smell and taste weak, not distinctive. Spore print not recorded.

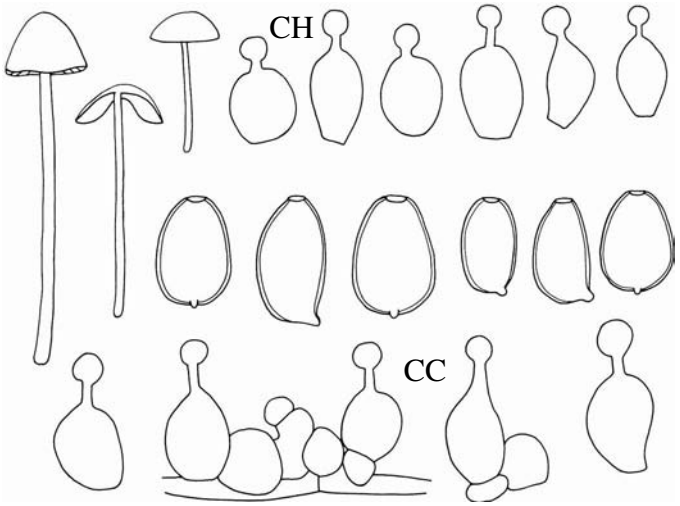


Fig. 137. *Conocybe subxerophytica* var. *brunnea*

Spores 9.5–12.5(13.0) × 6.0–7.5 × 5.5–6.5(7.0) µm, av. 10.4–11.2 × 6.6–7.0 × 6.0–6.3 µm, slightly to distinctly flattened, in frontal view ovoid to ovoid-oblong, Q = 1.4–1.7(1.8), Qav. = 1.5–1.65(1.7), in side-view ellipsoid-oblong to subamygdaliform, Q = 1.6–2.0, Qav. = 1.7–1.8, orange-brown in ammonia, slightly to fairly thick-walled (0.5–1.0 µm), with large, central germ pore, 1.5–1.8 µm wide. Basidia 15–20 × 8.5–11 µm, 4-spored. Lamella edge sterile. Cheilocystidia 14–20 × 6.0–10 µm, lecythiform with subglobose or ellipsoid basal part, short neck (1.5–2.5 × 1.0–1.5 µm) and small capitulum, 3.0–5.0 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 5.0–20 µm broad, with hyaline or pale brown wall. Pileipellis an epithelioid hymeniderm, made up of pyriform to spheropedunculate cells, 25–40 × 14–20 µm; pedicel often with slightly thickened, yellowish wall. Stipitipellis a dry cutis, made up of repent hyphae, 2.0–5.0 µm broad, with hyaline to pale yellow wall, with numerous clusters of cystidia. Caulocystidia 15–22 × 7.0–11 µm, lecythiform with fairly short neck (1.5–4.0 × 1.5–2.0 µm), intermixed with subglobose elements, 7.0–10 × 6.5–9.0 µm. Clamp-connections present. Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, in the Netherlands in a poor, unfertilised hayfield on limestone and in open, short-grazed grassland on slightly calcareous, loamy sand; also in Central Europe characteristic of poor, xerophytic grasslands. In the Netherlands very rare (Havelte, Havelterberg; Maastricht, Pietersberg), but probably confused with related species in the past and actually more widespread. Sept.–Oct. Also recorded from Germany and Italy.

Conocybe affinis Sing. (in Beih. Nova Hedwigia 29: 207. 1969), originally described from Argentina, has a similar spore size (10–12.5 × 6.5–8.0 µm), but the spores are not flattened. In addition, it differs from *C. subxerophytica* in tiny, dark coloured basidiocarps, broader spores, and habitat on dung (Hausknecht in Österr. Z. Pilzk. 11: 37. 2002).

6. Conocybe dunensis T.J. Wallace in P.D. Orton in Trans. Br. mycol. Soc. 43: 192. 1960. – Fig. 138.

SEL. ICON. — M. Bon in Doc. mycol. 21 (84): pl. 2A. 1992; Contu in Riv. Micol. 31: 124. 1988; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1323. 1994; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 2 (lower fig.). 1994.

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 5: 175–178, figs. 4g–k. 1996; T.J. Wallace in P.D. Orton in Trans. Br. mycol. Soc. 43: 192–193, figs. 3, 4, 244, 398. 1960; Watling in Br. Fung. Fl. 3: 53–54, figs. 128–130. 1982.

VERN. NAME — Duinbreeksteeltje.

Pileus (10)14–30 mm broad, up to 15 mm high, obtusely conical, then conico-convex to convex with broad umbo, strongly hygrophanous, when moist at centre rusty brown, date-brown to dark red-brown (e.g., K. & W. 7D8, 8D7, 8E7), slightly paler towards the margin, translucently striate up to centre or at margin only but soon desiccating and becoming not striate, on drying becoming ochraceous to orangey brown, dull and glabrous. Lamellae, L = 20–25, l = 1–3, rather crowded to crowded, adnexed, ventricose, up to 3 mm broad, pale yellowish at first, orange-brown to rusty brown when mature, with slightly paler, flocculose edge. Stipe 40–80(100) × (1.5)2–4 mm, cylindrical or to the basis slightly thickened, not subbulbous, not with a tapering root but usually base over 10–20 mm buried in sand, fistulose, whitish to pale ochre at first, gradually becoming yellow-brown to orangey brown from base upwards, exposed part pruinose-striate lengthwise, without patent hairs (hand-lens). Context concolorous with surface. Smell and taste weak, not distinctive. Spore print rusty brown.

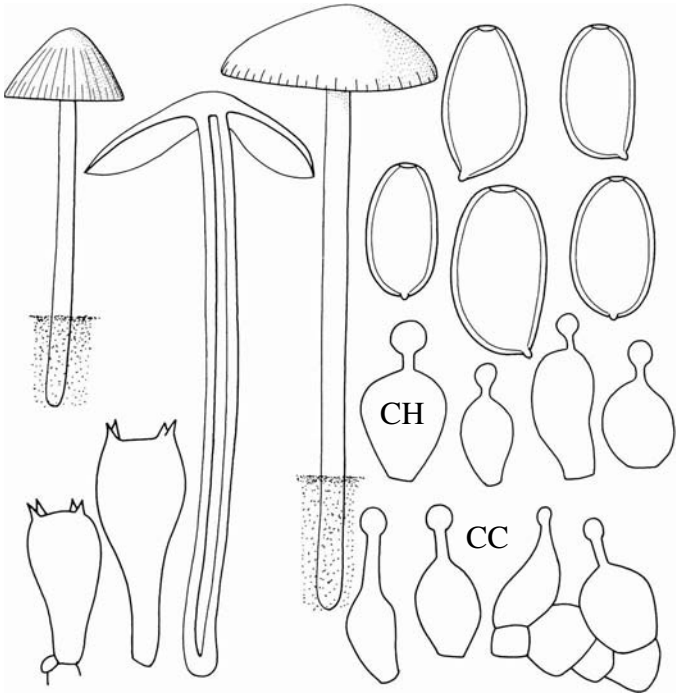


Fig. 138. *Conocybe dunensis*

Spores (10.0)11.0–14.5 × (5.5)6.0–8.5(9.0) µm, av. 11.7–13.4 × 6.5–7.8 µm, Q = 1.5–2.0, Qav. = (1.55)1.6–1.85, not or weakly flattened, ellipsoid-oblong to ovoid-oblong or slightly subamygdaliform in side-view, rather thick-walled (± 0.5–1.0 µm), orangey yellow in water, orange-brown to rusty brown in ammonia, with central germ pore, 1.2–2.0 µm wide. Basidia 16–35 × 8.0–14 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 13–23 × 6.0–11 µm, lecythiform with short neck (1.5–3.0(5.0) × 1.0–2.5 µm) and small, globose capitulum, 3.0–4.5 µm broad, occasionally with brown wall. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 3.0–30 µm broad, hyaline or with yellow-brown parietal pigment. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 18–42 × 12–28 µm, often with brown pedicel or entirely brown wall. Pileocystidia absent. Stipitipellis a cutis of repent, hyaline to pale yellow hyphae, 2.0–5.0 µm broad, with many clusters of caulocystidia. Caulocystidia 13–24 × 6.0–12(15) µm, lecythiform, similar to cheilocystidia but often with longer neck, 1.0–6.0 × 1.0–2.0 µm and slightly larger capitulum, 3.0–6.5 µm broad, often with brown wall. Clamp-connections present. Chemical reactions: Ammonia reaction usually negative, occasionally weak after several hours.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on dry, calcareous sand poor in humus in coastal sand dunes close to the shore, often among *Ammophila arenaria*, also in bare sand, on coastal sand flats, and on supplied dune sand; once on a clayey dike inland. In the Netherlands uncommon. May–Nov. Widespread in Europe along the coasts of the North Sea and Atlantic Ocean, also locally along the Mediterranean Sea.

Typical collections of *Conocybe dunensis* can be recognised by the combination of the habitat, rather large and stout basidiocarps with a dark, reddish brown pileus, and the stipe buried in sand. In habit and microscopical characters it comes close to *C. tenera*, but the spores in *C. dunensis* are usually larger, in particular broader, and the ammonia reaction is negative. *Conocybe semiglobata* is also close and is widespread in dune meadows. It differs in paler and duller colours of the pileus when moist, the stipe not being buried in the substrate and in darker spores. Hausknecht (in Österr. Z. Pilzk. 5: 176. 1996) reported a collection of *C. dunensis* with mixed 4- and 2-spored basidia.

7. Conocybe macrocephala Kühn. & Watl. in Notes R. bot. Gdn Edinb. 38: 335. 1980. – Fig. 139.

Conocybe tenera f. *macrocephala* Kühner, Genre Galera: 73. 1935 (invalid); *Conocybe macrocephala* (Kühner) Kühn. & Romagn., Fl. anal. Champ. sup.: 346. 1953 (invalid). *Conocybe abruptibulbosa* Watling in Notes R. bot. Gdn Edinb. 38: 345. 1980. *Conocybe herinkii* Svrček in Czech Mycol. 48: 295. 1996.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 374. 1995 (as *C. abruptibulbosa*); Cetto, Funghi Vero 6: pl. 2217. 1989; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 3 (upper fig.). 1994.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 298, figs. A–E. 1995 (as *C. abruptibulbosa*); Esteve-Raventos in Bol. Soc. micol. Madrid 12: 58. 1988; A. Hauskn. in Österr. Z. Pilzk. 9: 76–78, 88–92, figs. 4, 5. 2000; Kühner, Genre Galera: 73–76, fig. 18. 1935; Svrček in Czech Mycol. 48: 295. 1996 (as *C. herinkii*); Watling in Br. Fung. Fl. 3: 54–55, fig. 139. 60–61, figs. 126, 127, 133. 1982 (as *C. abruptibulbosa*).

VERN. NAME — Parkbreeksteeltje.

Pileus 10–40(50) mm broad, 8–35 mm high, campanulate to obtusely conical at first, soon expanding to conico-convex or plano-convex, often with broad umbo, margin occasionally reflexed, hygrophanous, when moist and fresh at centre rather pale to dark brown, greyish brown,

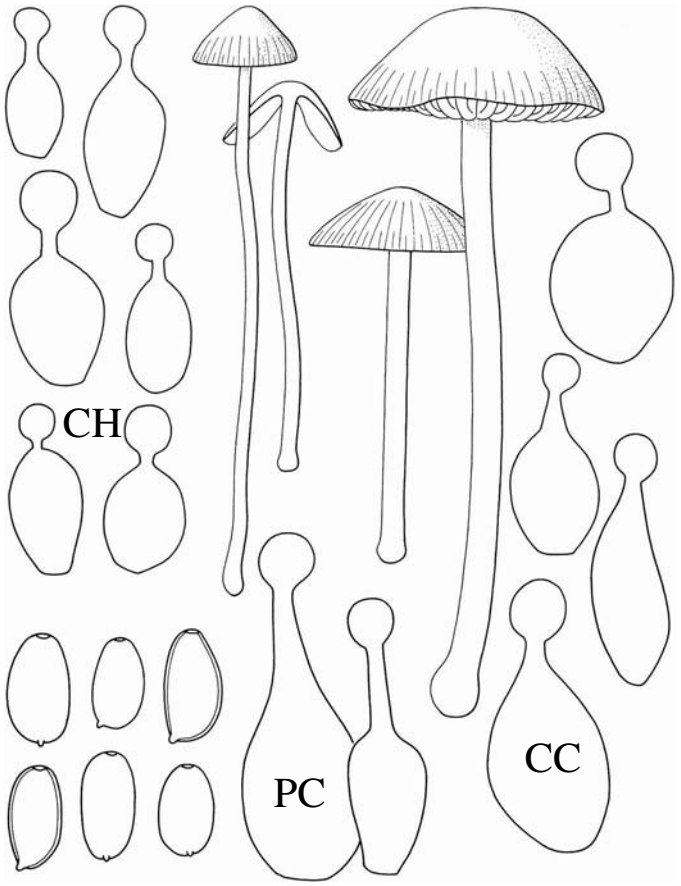


Fig. 139. *Conocybe macrocephala*

yellow-brown or orangey brown to rusty brown (e.g., K. & W. 6D5-7, 6E5-7, 7E7-F7, 7E8-F8), to the margin gradually paler brown, pale flesh-coloured or ochraceous (e.g., 5C6, 6B3, C3, D4, E4), in general rather dull coloured, translucently striate up to halfway the radius or more, on drying soon not striate, pallescent to pale greyish orange, ochraceous to cream-coloured, smooth or slightly rugulose, glabrous. Lamellae, L = 16–28, l = 3–7, adnexed, moderately crowded to crowded, often slightly ventricose, ochraceous at first, then yellow-brown to rusty brown, with slightly paler, fimbriate edge. Stipe (15)20–80 × 1–4 mm, cylindrical, base slightly thicker to bulbous, up to 7 mm broad, at first ivory white to cream-coloured, gradually darkening to honey-yellow, brownish orange or rusty brown from base upwards, entirely pruinose-striate lengthwise, usually without hairs, sometimes with some cylindrical hairs near apex. Context concolorous with surface, thin and fragile. Smell and taste weak, not distinctive. Spore print rusty brown.

Spores (7.5)8.0–11 × (4.5)5.0–6.5 µm, av. 8.6–10.0 × 4.8–5.8 µm, Q = 1.5–2.0, Qav. = 1.6–1.8, not flattened, ellipsoid-oblong, sometimes in part subamygdaliform in side-view, pale yellow-brown to brownish orange in ammonia (5B6-C7, C7, 6C7), thin-walled or slightly thick-walled, with apical germ pore 1.2–1.8 µm wide. Basidia 18–28 × 7.0–10(11) µm, clavate, 4-spored, sometimes a few 2-spored. Lamella edge sterile. Cheilocystidia 17–27 × 7.0–12(14) µm, lecythiform with globose, ellipsoid or clavate basal part, short neck (1.0–3.0 × 1.0–2.0 µm) and medium-sized capitulum, (3.5)4.0–7.5 µm broad, av. 4.6–6.9 µm. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and inflated elements, 4.0–26 µm broad, with hyaline or yellowish wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 18–55 × 9.0–30 µm, often with yellow-brown pedicel, often intermixed with cystidia. Pileocystidia absent, scattered, or numerous, 21–35(47) × 6.5–12(16) µm, lecythiform as cheilocystidia but larger, with long tapering neck (5.0–13 × 1.5–3.0 µm) and capitulum 4.0–8.5 µm broad, often with brown-yellow content. Stipitipellis a cutis, made up of hyphae 2.0–7.5 µm broad, with hyaline or yellowish wall. Caulocystidia 17–36 × 8.0–18 µm, lecythiform as cheilocystidia but often with longer and thicker neck (3.0–6.0 × 1.5–3.0 µm) and larger capitulum, 4.0–9.5 µm wide; in addition with small subglobose elements up to 12 × 9.0 µm, sometimes at apex intermixed with few lageniform cystidia and cylindrical hairs up to 70 × 2.0–5.0 µm. Clamp-connections present. Chemical reactions: Ammonia reaction positive, in most collections strong and fast, in others weak and only after several hours.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, usually on black, humus-rich or peaty, moderately acidic to basic soil in deciduous forests on moist and wet soils, e.g., in alder forests (*Alnion glutinosae*), *Salix* scrub (*Salicion cinereae*), and forests along streams and rivers (*Alno-Padion*), also in shady roadside verges and parks, occasionally in open grasslands, e.g., in poor hayfields on limestone. In the Netherlands fairly common but distribution poorly known because of confusion with related species. July–Nov. Widespread in Europe.

It is impossible to distinguish *Conocybe macrocephala* in the field from many other members of the species complexes around *C. tenera* and *C. juniana*. The basidiocarps of *C. macrocephala* vary much in size, colour, and general appearance. A variant with large basidiocarps and a bulbous stipe has been distinguished as a separate species, *C. abruptibulbosa*. As suggested by Hausknecht (in Österr. Z. Pilzk. 9: 84. 2000), this distinction is superfluous since all transitions towards populations with smaller basidiocarps occur.

Conocybe macrocephala is microscopically characterised by a combination of rather small to medium-sized, thin-walled spores, cheilo- and caulocystidia with fairly large capitulum and a positive ammonia reaction. *Conocybe tenera* has larger spores, always with thicker, darker wall, and cystidia with smaller capitulum. *Conocybe macrocephala* is more difficult to identify when the ammonia reaction is very weak or delayed, as is the case in some collections. *Conocybe herinkii* Svrček was based on such collections (Hausknecht in Österr. Z. Pilzk. 9: 75. 2000). In that case *C. macrocephala* may be confused mainly with *C. juniana*. The latter species has in general smaller basidiocarps, often larger spores and caulocystidia with larger capitulum. In additon, the spores of *C. juniana* have thicker walls and are clearly darker under the microscope.

Hausknecht (in Österr. Z. Pilzk. 9: 88–96. 2000) maintained a very wide species concept for *C. macrocephala*, including var. *riedheimensis* with on the average smaller spores (7.0–9.3 × 4.3–5.0 µm) and var. *macrospora* with larger spores (8.5–12.0 × 5.5–6.8 µm). Both varieties are also different from var. *macrocephala* in cystidia with smaller capitula. In this Flora *Conocybe riedheimensis* is regarded as a synonym of *C. brachypodii* (see that species) and var. *macrospora* as a synonym of *C. subpallida* var. *subalpina*.

8. Conocybe subovalis Kühn. & Watl. in Notes R. bot. Gdn Edinb. 38: 340. 1980. – Fig. 140.

Conocybe tenera var. *subovalis* Kühner, Genre Galera: 69. 1935 (invalid); *Conocybe subovalis* (Kühner) Kühn. & Romagn., Fl. anal. Champ. sup.: 347. 1953 (invalid).

MISAPPL. — *Galera tenera* sensu J. Lange, Fl. agar. dan. 4: 34. 1939; *Galera ovalis* sensu Bres., Iconogr. Mycol. 17: 808. 1931.

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 393. 1995; Bres., Iconogr. Mycol. 17: 808. 1931 (as *Galera ovalis*); Dähncke, 1200 Pilze: 580. 1993 (as *C. tenera*); J. Lange, Fl. agar. dan. 4: pl. 129H. 1939 (as *G. tenera*); Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 4 (upper fig.). 1994; R. Phillips, Paddest. Schimm.: 155. 1981.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 310, figs A–E. 1995; Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 107–108, figs. 1986; Enderle in Z. Mykol. 57: 89–90, figs. 1991; A. Hauskn. in Österr. Z. Pilzk. 9: 96–100, figs 7a–h. 2000; Kühner, Genre Galera: 69–71 fig. 16. 1935; Watling in Br. Fung. Fl. 3: 56–57, figs 120, 138. 1982.

VERN. NAME — Dikvoetbreeksteeltje.

Pileus (10)15–42 mm broad, up to 25 mm high, campanulate, hemispherical or obtusely conical, slightly expanding to conico-convex or convex, strongly hygrophanous, when moist and fresh, at centre ochraceous brown, yellow-brown, orangey brown, or dirty brown, often with olivaceous tone (K. & W. 5C5, 5D4, 5D5, 6D6, 6D7, 7D7), paler towards the margin, translucently striate up to centre or at margin only, quickly drying and usually found unstriate, when dry dirty ochre-yellow, ochre-brown to cream-coloured with darker centre, often with olivaceous tone at centre, glabrous. Lamellae, L = (18)22–32, l = 3–7, moderately distant to crowded, adnexed, ventricose, up to 5 mm broad, pale ochraceous when young, ochre-brown to orange-brown when mature, with slightly paler flocculose edge. Stipe 40–125(160) × (1.5)2–4 mm, cylindrical with slightly swollen to bulbous base, up to 7 mm broad, fistulose, cream-coloured to pale ochraceous at first, gradually darkening to yellow-brown or red-brown from base upwards, entirely pruinose-striate lengthwise, not pubescent or with few patent hairs near apex (hand-lens). Context concolorous with surface. Smell weak, not distinctive. Taste weak, mild. Spore print rusty brown.

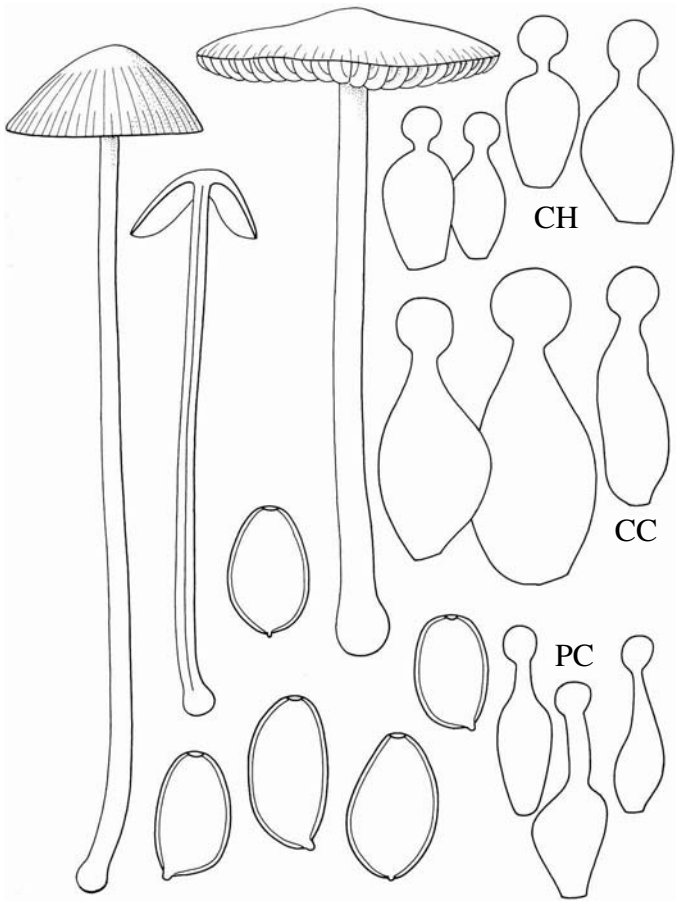


Fig. 140. *Conocybe subovalis*

Spores (9.0)9.5–13.5(14.5) × (5.0)5.5–7.5(8.5) µm, av. 10.5–12.2(13.0) × 5.8–7.0(7.8) µm, Q = (1.5)1.6–2.0, Qav. = 1.7–1.8, usually slightly flattened, ellipsoid-oblong in side-view, in frontal view ovoid-oblong, yellow-brown to rusty brown (5D8, 6D8, 7D8) in ammonia, rather thick-walled (0.5–1.0 µm), with large apical germ pore, 1.5–2.0 µm wide. Basidia 17–31 × 7.5–11 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 17–32 × 8.0–14(17) µm, lecythiform with subglobose to ovoid basal part, short neck (1.0–3.0(5.0) × 1.0–2.0 µm) and large capitulum, (3.5)4.0–7.0 µm broad, on the average over 5.0 µm broad. Hymenophoral trama made up of cylindrical to strongly inflated, globose elements, 3.0–24 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate to spheropedunculate elements, 16–30 × 7.0–20 µm, hyaline or with brownish pedicel, mixed with scattered pileocystidia. Pileocystidia 20–28 × 6.0–10 µm, lecythiform like cheilocystidia but more slender with longer neck (4.0–12 × 1.0–2.0 µm) and capitulum 4.0–6.0 µm broad, often with yellowish to orange-brown content. Stipitipellis a cutis, made up of hyaline hyphae, 2.0–6.0 µm broad, with numerous clusters of caulocystida. Caulocystidia (18)23–44(50) × (7.0)9.0–22 µm, with ovoid to clavate basal part, gradually tapering into a thick, short to rather long neck (2.0–7.0 × 2.0–4.0 µm), with large capitulum, 5.0–12 µm broad; intermixed with smaller subglobose elements, 7.0–12 × 6.0–10 µm, occasionally near apex with few cylindrical hairs up to 100 × 8.0 µm. Clamp-connections present. Chemical reactions: Ammonia reaction usually positive, most often after several hours, occasionally strong and fast, sometimes absent.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on soil in both deciduous forests and open habitats such as grasslands, ruderal sites, and roadsides, usually on humus-rich, weakly acid to basic soils, often rich in nitrogen, e.g., among *Urtica dioica*, but also known from nutrient-poor grasslands on limestone. In the Netherlands widespread and common, but distribution insufficiently known. May–Nov. Widespread in Europe.

Typical basidiocarps of *Conocybe subovalis* may be recognised in the field by their large size and the pileus colour with olivaceous tone, in particular when dry. However, smaller basidiocarps without olivaceous colours can only be identified by microscopical characters, in particular the large cheilo- and caulocystidia with broad capitulum, relatively large spores, and usually the positive ammonia reaction.

The intensity of crystal formation in *Conocybe subovalis* is quite variable and the reaction may even be absent. In that case the difference with *C. juniana* may become problematic. The latter species usually has smaller basidiocarps with a paler pileus without olivaceous tone and slightly paler spores. Most descriptions in literature (e.g., Kühner, Genre Galera: 69. 1935; Watling in Br. Fung. Fl. 3: 56. 1982) suggest that the spores in *C. subovalis* are considerably larger than in *C. juniana*, viz. 11.5–13.5 × 6.5–8.0 µm. However, most collections of *C. subovalis* from the Netherlands have spores less then 12.0 µm long. See also Hausknecht in Österr. Z. Pilzk. 9: 96. 2000.

9. Conocybe juniana (Velen.) Hauskn. & Svrček in Österr. Z. Pilzk. 8: 46. 1999. – Fig. 141.

Galera juniana Velen., Novit. mycol. nov.: 68. 1947; *Conocybe spicula* f. *macrospora* Kühner, Genre Galera: 65. 1935 (invalid). — *Galera tenera* f. *minor* J. Lange in Dansk bot. Ark. 9(6): 37. 1938 (invalid, no Latin diagn.). — *Conocybe magnicapitata* P.D. Orton in Trans. Br. mycol. Soc. 43: 193. 1960. — *Conocybe sordescens* P.D.

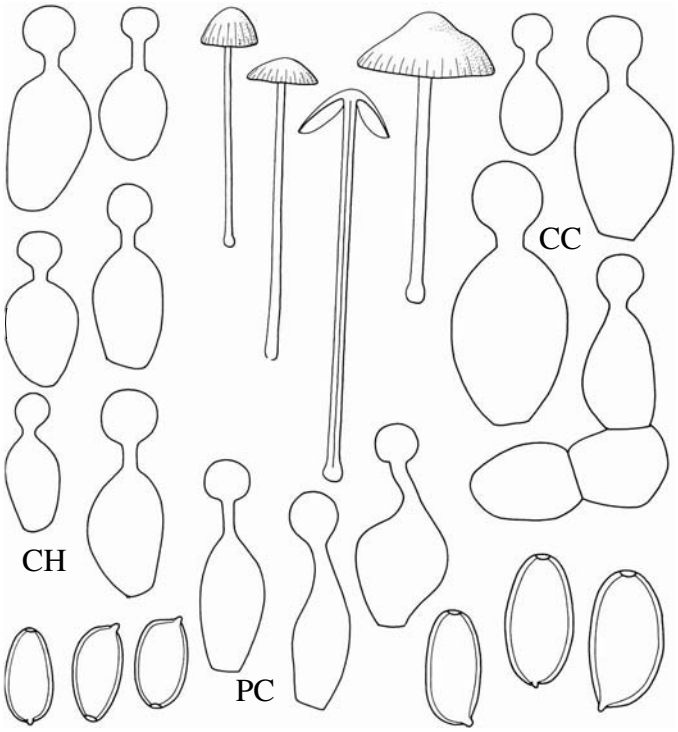


Fig. 141. *Conocybe juniana*

Orton in Trans. Br. mycol. Soc. 81: 546. 1988. — *C. juniana* var. *sordescens* (P.D. Orton) A. Hauskn. in Österr. Z. Pilzk. 8: 50. 1999. — *Conocybe juniana* var. *subsejuncta* A. Hauskn. in Österr. Z. Pilzk. 8: 52. 1999.

MISAPPL. — *Conocybe rickeniana* sensu Dähncke, 1200 Pilze: 581. 1993.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 382. 1995 (as *C. magnicapitata*); Dähncke, 1200 Pilze: 581. 1993 (as *C. rickeniana*); J. Lange, Fl. agar. dan. 4: pl. 129I. 1939 (as *G. tenera* f. *minor*); Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 5 (upper fig.). 1994 (as *C. magnicapitata*).

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 305 ('1982')1983 (as *C. magnicapitata*); M. Bon in Doc. mycol. 24 (96): 14. 1995 (as *C. magnicapitata*); Breitenb. & Kränzl., Pilze Schweiz 4: 304, figs. A–E. 1995 (as *C. magnicapitata*); Esteve-Raventos in Bol. Soc. micol. Madrid 12: 59. 1988 (as *C. magnicapitata*); A. Hauskn. in Österr. Z. Pilzk. 8: 46–54, figs 4, 5. 1999; Kühner, Genre Galera 65–68, fig. 15. 1935 (as *G. spicula* f. *macrospora*); P.D. Orton in Trans. Br. mycol. Soc. 43: 193–194, fig. 399. 1960 (as *C. magnicapitata*); P.D. Orton in Trans. Br. mycol. Soc. 91: 546–547, figs 2, 19–20. 1988 (as *C. sordescens*); Watling in Br. Fung. Fl. 3: 61–62, figs 106, 121, 134. 1982 (as *C. magnicapitata*).

VERN. NAME — Tuinbreeksteeltje.

Pileus 5–18(–25) mm broad, up to 15 mm high, obtusely conical to hemispherical, expanding to conico-convex or plano-convex, occasionally umbonate, hygrophanous, when moist and fresh at centre dark to pale brown, greyish brown or yellowish brown (e.g., K. & W. 5D5, 6D5,6, 6E5,6,7, 7E7), dull coloured, without orange tinge, to the margin slightly paler, translucently striate up to one-third of radius or not striate, on drying pallescent to beige, ochraceous grey or flesh-coloured brown with pale ochraceous to pale orange margin; surface glabrous, smooth to rugulose or wrinkled, mainly near centre. Lamellae, L = 12–18, l = 3–7, moderately distant to crowded, adnexed, often ventricose, ochraceous at first, then rusty brown with concolorous with surface or paler, slightly fimbriate edge. Stipe 25–60(–80) × 0.7–2 mm, cylindrical, slightly broader to subbulbous, up to 3.5 mm thick at base, apex whitish, downwards pale ochraceous to yellowish orange at first then entirely pale orange to brownish orange, often rusty brown to reddish brown in age, entirely pruinose to pruinose-striate, not pubescent. Context concolorous with surface. Smell and taste weak, not distinctive. Spore print rusty brown.

Spores (7.0–)8.0–12.5(–13.5) × (4.5–)5.0–7.0(–7.5) µm, av. (8.6–)9.0–11.7 × 5.0–6.8 µm, Q = (1.5–)1.6–2.0(–2.2), Qav. = 1.6–1.85, often slightly flattened, ellipsoid-oblong to ovoid-oblong in both side- and frontal view, orange-brown (7D8) in ammonia, moderately thick-walled (0.5–1.0 µm), with apical germ pore, 1.0–1.8 µm wide. Basidia 16–25 × 8.0–12 µm, 4-spored. Lamella edge sterile. Cheilocystidia 16–27 × 7.5–14 µm, lecythiform with subglobose, ovoid to clavate basal part, short to moderately long neck (1.5–4.5 × 1.3–2.0 µm) and rather large to large capitulum, (4.0)4.5–8.0(9.0) µm broad, average broader than 5.2 µm. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 4.0–50 µm broad, hyaline. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, (15–)23–45 × 9.0–23(–27) µm, hyaline or with pale yellow peduncle, often intermixed with cystidia. Pileocystidia absent, scattered, or numerous, 24–45 × 8.0–13 µm, like cheilocystidia but often with longer neck, 4.0–8.0 × 1.5–3.0 µm, and 5.0–8.0 µm broad capitulum; often with slightly thickened, yellowish wall. Stipitipellis a cutis of hyaline or pale yellow hyphae, 2.0–6.0 µm broad. Caulocystidia 17–37 × 8.0–17(–22) µm, lecythiform like cheilocystidia but often larger with thick neck (1.5–5.0 × 2.0–5.0 µm) and large capitulum, (4.0–)5.0–12(–14) µm broad; in addition numerous globose to ellipsoid elements up to 13 × 12 µm; lageniform cystidia and cylindrical hairs lacking. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in groups, on soil in poor and manured grasslands, lawns, roadside verges, ruderal communities of tall herbs, churchyards, gardens, and arable fields, less frequent in forests, then often in disturbed places, e.g., along foot-paths or roads, on moderately acidic to basic, usually rather nutrient-rich sand, clay and decayed peat. Widespread and rather common in the Netherlands. (May)July–Nov. Widespread in Europe and common in many regions; also recorded from Central Asia.

Conocybe juniana is a variable species concerning spore size and size of cheilo- and caulocystidia. Hausknecht (in Österr. Z. Pilzk. 8: 46. 1996) distinguished three varieties: var. *juniana* with spores on the average 9.7–11.5 × 5.3–6.8 µm, cheilocystidia with capitulum 4.3–7.0(–10.5) µm broad and caulocystidia with capitulum 6.0–12 µm broad; var. *sordescens* with spores av. 9.2–10.2 × 5.0–5.5 µm, cheilocystidia with capitulum 4.0–6.5 µm broad and caulocystidia with capitulum 5.0–7.0 µm; and var. *subsejuncta* with spores av. 8.9–9.4 × 5.2–5.8 µm, cheilocystidia with capitulum 5.0–9.0 µm broad and caulocystidia with capitulum 6.0–12.0 µm broad. These taxa are not distinguished here since all differentiating characters overlap in the collections from the Netherlands.

Conocybe juniana is close to *C. rickeniana* but the spores are distinctly more thick-walled, darker, and in general slightly larger. In addition, the colour of the pileus is mostly duller and darker brown, more similar to *C. echinata.* The latter species differs also in smaller and paler, thin-walled spores. Collections of *C. juniana* with large basidiocarps may be confused with *C. subovalis*. See notes on that species.

In the collections studied, *Conocybe juniana* appeared to be often confused with *C. macrocephala*. The dimensions of spores in these species show much overlap, but the spores in *C. macrocephala* are considerably paler and thin-walled. In addition the latter species differs in a positive ammonia reaction and caulocystidia with slightly smaller capitula.

10. Conocybe echinata (Velen.) Sing. in Fieldiana, Bot., n.S. 21: 103. 1989. – Fig. 142.

Galera echinata Velen., Novit. mycol. nov.: 69. 1947. – *Conocybe spicula* f. *sordida* Kühner, Genre Galera: 62. 1935 (invalid); *Conocybe sordida* Kühn. & Watl. in Notes R. bot. Gdn Edinb. 38: 339. 1980.

SEL. ICON. — Cetto, Funghi Vero 6: pl. 2225. 1989 (as *C. sordida*); Hübner in Z. Mykol. 63: pl. 1. 1997; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 18. 1995 (as *C. sordida*).

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 63: 6–9, fig. 2. 1997; A. Hauskn. in Österr. Z. Pilzk. 8: 42–46, figs. 3a–i. 1999; Kühner, Genre Galera: 62–63, fig. 13. 1935 (as *C. spicula* f. *sordida*); Watling in Br. Fung. Fl. 3: 62–63, figs. 135, 140. 1982 (as *C. sordida*).

VERN. NAME — Donker breeksteeltje.

Pileus (5–)8–30(–45) mm broad, campanulate, convex to obtusely conical, then conico-convex to plano-convex, often with obtuse umbo, strongly hygrophanous, when moist at centre dull brown, greyish brown, dark brown to vinaceous brown (e.g., K. & W. 6E6, 6F7, 7E6, 7E5, 7F7, 8E6), to the margin paler greyish brown to dirty ochre-brown, translucently striate up to centre or at margin only, on drying soon not striate and pallescent to pale greyish ochre, coffee-with-milk colour,

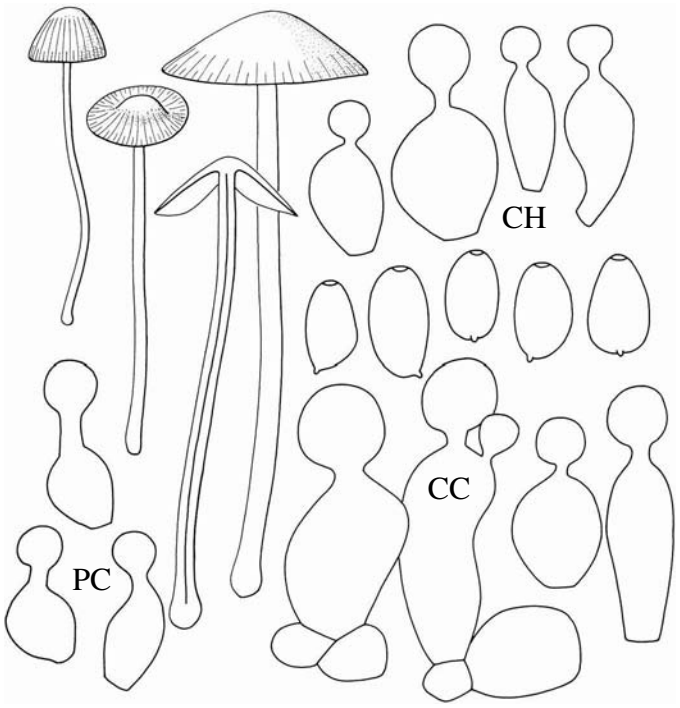


Fig. 142. *Conocybe echinata*

glabrous, in exsiccata centre of pileus usually grey-brown. Lamellae, L = 15–25, l = 3–7, moderately distant to crowded, adnexed, ventricose, up to 3.5 mm broad, pale ochraceous then ochre-brown to orangey brown with slightly paler, flocculose edge. Stipe 30–80(110) × 0.7–2(3) mm, cylindrical, often slightly bulbous at base, fistulose, at first pale ochraceous with whitish apex, from the base darkening to orangey brown or reddish brown, finally entirely dark brown, entirely pruinose, often pruinose-striate, occasionally weeping hyaline droplets when moist, without patent hairs (hand-lens). Context concolorous with surface. Smell weak, not distinctive. Taste weak, mild. Spore print rusty brown.

Spores (6.5)7.0–10.0 × 4.0–5.5(6.0) µm, av. 7.5–9.3 × 4.3–5.2 µm, Q = 1.6–2.0, Qav. = 1.7–1.85, not flattened, ellipsoid- to ovoid-oblong, in some collections a variable proportion subamygdaliform in side-view, thin-walled to slightly thick-walled (less than 0.5 µm), yellowish in water, yellow-brown to brownish orange (5C6, 6C6) in ammonia, with central germ pore 1.0–1.5 µm wide. Basidia 14–25(30) × 6.5–10 µm, 4-spored. Lamella edge sterile. Cheilocystidia 16–28(32) × 7.0–12(15) µm, lecythiform with globose to ovate basal part, short neck (1.0–3.0 × 1.0–3.0 µm) and large capitulum, (4.5)5.0–8.5 µm broad. Hymenophoral trama made up of cylindrical, inflated and globose elements, 4.0–40 µm broad, with hyaline or pale yellow wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 16–42 × 10–33 µm; pedicel often with pale brown wall. Pileocystidia scattered to numerous, lecythiform, 16–24 × 6.0–9.0 µm with moderately long, thick neck (3.0–5.0 × 2.0–3.0 µm) and capitulum 5.0–7.0 µm broad, often with brown pigment. Stipitipellis a cutis of repent, hyaline or pale yellow hyphae, 2.0–8.0 µm broad, with numerous cystidia, often in clusters. Caulocystidia 23–45 × 10–20 µm, lecythiform, similar to cheilocystidia but larger, with rather short and thick neck, 2.0–4.5 × 1.5–4.0 µm, capitulum 5.0–14 µm broad, intermixed with numerous small globose to ovate elements, 6.0–15 × 6.0–12 µm. Clamp-connections present. Chemical reactions: Ammonia reaction negative (short rectangular and triangular crystals occasionally abundant).

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on soil in forests and along forest edges, in grasslands, gardens, parks, and ruderal places on moist to dry, weakly acid to basic soils, mostly on clay or loam. In the Netherlands probably rather common but less widespread as *C. rickeniana,* mainly in Holocene areas. May–Nov. Widespread in Europe and common in Central Europe.

Conocybe echinata may be recognised in the field by the dirty brown pileus, an unusual colour within this genus, in combination with the pruinose stipe without hairs. The microscopical characters are similar to *C. rickeniana*. *Conocybe echinata* may turn out to be a form or variety of that species.

11. Conocybe rickeniana P.D. Orton in Trans. Br. mycol. Soc. 43: 195. 1960. – Fig. 143.

Galera teneroides (Peck) Sacc., Syll. Fung. 5: 861. 1887 (non *Conocybe teneroides* [J. Lange] Kits v. Wav. 1970).

MISAPPL. — *Galera spicula* sensu Rick., Blätterpilze: 226. 1915; *Conocybe spicula* f. *typica* sensu Kühner, Genre Galera: 64. 1935; sensu auct. eur.

EXCL. — *Conocybe rickeniana* sensu Dähncke, 1200 Pilze: 581. 1993 (= *C. juniana*).

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 387. 1995; Cetto, Funghi Vero 6: pl. 2218. 1989; Consiglio in Boll. Gruppo micol. G. Bres. 42: 71. 1999; Gerhardt, Gr. Pilzf.: 385 (centre). 1999; J. Lange, Fl. agar. dan. 4: pl. 128C. 1939 (as *Galera teneroides*); Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 4 (lower fig.). 1994; Ryman & Holmåsen, Svampar: 436. 1984.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 306–307 (‘1982’) 1983; Breitenb. & Kränzl., Pilze Schweiz 4: 306, figs A–E. 1995; Consiglio in Boll. Gruppo micol. G. Bres. 42: 71–72. 1999; Enderle in Z. Mykol. 57: 81–83. 1991; A. Hauskn. in Österr. Z. Pilzk. 8: 54–58, figs 6a–f. 1999; Kühner, Genre Galera: 64–65, fig. 14. 1935 (as *C. spicula* f. *typica*); P.D. Orton in Trans. Br. mycol. Soc. 43: 195. 1960; Watling in Br. Fung. Fl. 3: 59–60, fig. 123. 1982.

VERN. NAME — Roestbruin breeksteeltje.

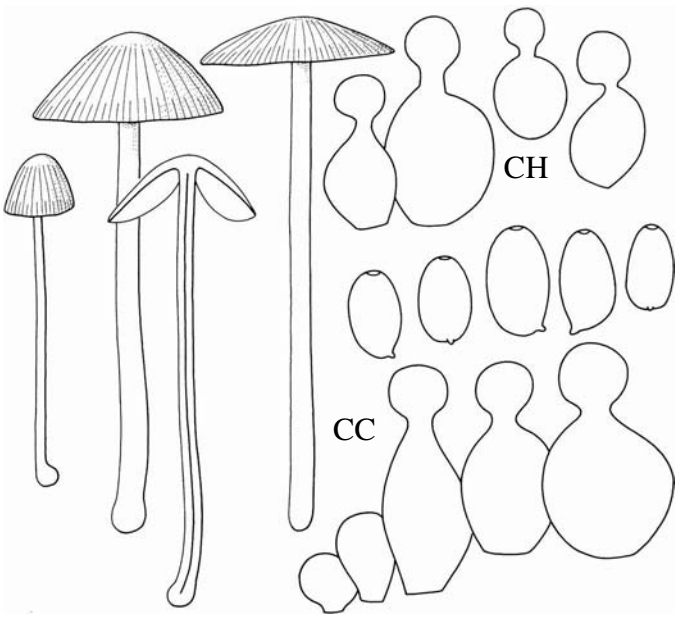


Fig. 143. *Conocybe rickeniana*

Pileus 5–25 mm broad, campanulate or obtusely conical at first, then conico-convex to plano-convex, hygrophanous, when moist vividly coloured, pale reddish brown, orange-brown, brownish orange or yellow-brown (K. & W. 5C7, 6C5-8, 7D6), often darker red-brown at centre, translucently striate up to centre, on drying ochre-yellow to greyish ochre, glabrous, dry. Lamellae, L = 17–26, l= 3–7, rather crowded, adnexed, slightly ventricose, up to 4 mm broad, pale ochraceous, then ochre-brown, finally orange-brown to rusty brown, with white flocculose edge. Stipe 25–65(90) × 0.5–2.5 mm, cylindrical or with small, up to 3.5 mm broad bulb at base, fistulose, pale yellow to pale orange, often becoming orange- to red-brown from base up, entirely pruinose to pruinose-striate, without erect hairs. Context concolorous with surface. Smell very weak, not distinctive or sweetish. Taste mild, not distinctive. Spore print rusty brown.

Spores (6.5–)7.0–10.0 × (4.0)4.5–5.5(6.0) µm, av. 7.7–9.5 × 4.6–5.2 µm, Q = 1.6–2.1, Qav. = 1.65–1.95, not flattened, ellipsoid-oblong to slightly amygdaliform in side-view, not broader in frontal view, yellow-brown in water, pale oange to brownish orange (6B6, C7, 7C7) in ammonia, thin-walled, with prominent central germ pore, 1.2–1.8 µm wide. Basidia 16–22(27) × 8.0–9.0(10) µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 16–29 × 8.5–13 µm, lecythiform with globose to ellipsoid basal part, short neck (1.5–3.0 × 1.5–2.0 µm) and large, globose capitulum, (4.5)5.0–8.0(9.0) µm broad, av. over 5.3 µm. Pleurocystidia absent. Hymenophoral trama made up of subcylindrical and inflated to subglobose elements, 5.0–23 µm broad. Pileipellis an epithelioid hymeniderm, made up of pyriform, clavate and spheropedunculate elements, 20–50 × 12–25 µm; pedicel often with pale brown wall. Pileocystidia absent or scattered to numerous, 15–27 × 5.0–10 µm, lecythiform like cheilocystidia, with moderately long, thick neck (2.5–5.0 × 2.0–3.0 µm) and capitulum 5.0–8.0 µm broad, often with brown pigment. Stipitipellis a cutis made up of cylindrical hyphae, 2.0–8.0 µm broad, with numerous clusters of cystidia. Caulocystidia 23–40(52) × 10–19(23) µm, lecythiform, with short, thick neck (2.0–4.0 × 3.0–4.5 µm) and very large, often flattened capitulum, 7.0–11(16) µm broad, in addition with many smaller, subglobose to clavate elements. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, on moderately acidic to basic, moist to dry, sandy, peaty, and loamy soils, mainly in grasslands and along roadsides, both on unfertilised and manured soils, also in parks, gardens, and forests on rather nutrient-rich, moist soils. Aug.–Nov. Widespread and common in the Netherlands, also elsewhere in Europe.

Conocybe rickeniana can be easily recognised in general by the combination of the vividly coloured pileus, large-headed cheilocystidia and relatively small, thin-walled spores. However, the affinity to *C. echinata* remains to be solved. The latter species has similar microscopical characters and differs only in darker and duller colours of the pileus. Also the colours in *C. rickeniana* are rather variable, from ochre-brown to vividly orange-brown or reddish brown. Possibly *C. echinata* is only a form or variety of *C. rickeniana*. In that case the epithet *echinata* has priority at species level.

12. Conocybe spiculoides Kühn. & Watl. in Notes R. bot. Gdn Edinb. 38: 339. 1980.

Conocybe spicula var. *spiculoides* Kühner, Genre Galera: 61. 1935 (invalid); *Conocybe spiculoides* (Kühner) Sing. in Mycologia 51: 395. 1959 (invalid).

EXCL. — *Conocybe spiculoides* sensu auct. neerl. (= *Conocybe* spp. div., see notes).

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Mykol. 8: 58–60, figs 6g–k. 1999; Kühner, Genre Galera: 61–62, fig. 12. 1935; Watling in Notes R. bot. Gdn Edinb. 38: 339, fig. 2F. 1980; Watling in Br. Fung. Fl. 3: 63, figs 110, 132. 1982.

VERN. NAME — Lichtsporig breeksteeltje.

CHARACTERISTICS — Pileus 18–20 mm broad, conico-campanulate to obtusely conical, strongly hygrophanous; colours in fresh condition unknown, pale greyish-clay colour on drying, cream-colour when completely dry, not striate; lamellae, L = 15–16, l = 3(7), adnate, ascending, slightly thickened, rather dark ochre to ochre-brown; stipe 45–65 × 1.2–1.5 mm, cylindrical, base often subbulbous, up to 2.5 mm thick, yellowish white or pale honey-yellow at apex, ochraceous to reddish brown in lower half, entirely pruinose-striate, without hairs; context thin with weak fruity smell; taste unknown; spore print not recorded.

Spores 7.0–9.5 × 4.0–5.5 µm, av. 8.0–8.6 × 4.6–5.0 µm, not flattened, ellipsoid-oblong, thin-walled, without germ pore, hyaline to pale yellowish in water and ammonia; basidia 18–26 × 7.5–10 µm, clavate, 4-spored; cheilocystidia 16–32 × 8.0–15 µm, lecythiform with short thick neck and rather large capitulum, (3.5)4.0–7.0(7.5) µm broad; pileipellis an epithelioid hymeniderm, made up of clavate to spheropedunculate elements, 30–50 × 14–32 µm, with scattered pileocystidia; pileocystidia lecythiform, similar to cheilocystidia but smaller and often with yellow wall; caulocystidia 18–39 × 9.0–15(23) µm, lecythiform like the cheilocystidia but capitulum often larger, 5.5–9.5 µm broad. Clamp-connections present although rare. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic on soil and litter amongst grass and mosses in pine forest. Not recorded from the Netherlands. So far only known with certainty from the type locality in France (Bois de Vincennes, Paris). Also reported from Great Britain. October.

The above description is based on the descriptions by Kühner (Genre Galera: 61. 1935) and Hausknecht (in Österr. Z. Mykol. 8: 58. 1999). *Conocybe spiculoides* is easily recognised by the very pale, thin-walled spores without germ pore. In other characters it comes close to *C. rickeniana*, although the colours of basidiocarps seem to be considerably paler in *C. spiculoides*.

Conocybe spiculoides was reported as rather rare in the Netherlands and even as common in the IJsselmeerpolders (Arnolds et al., Overz. Paddest. Ned.: 111, fig. 10. 1995). However, no authentic collections from the Netherlands have been seen showing the essential spore characters of *C. spiculoides*. Most collections appeared to belong either to *C. rickeniana* or to *C. echinata*. These species possess also rather pale spores, but always distinctly coloured and with a clear germ pore. Other collections under the name *C. spiculoides* appeared to be identical with the recently described *C. enderlei*. That species has also spores without a germ pore, but they are considerably smaller and darker than in *C. spiculoides*.

During his revision of sect. *Conocybe*, Hausknecht (in Österr. Z. Pilzk. 8: 58. 1999) studied only the type-collection of *Conocybe spiculoides* in spite of his extensive collecting in Central Europe. Watling (in Br. Fung. Fl. 3: 63. 1982) listed two records from Midland Britain. Consequently, this species seems to be extremely rare. Perhaps it is only an aberrant, semi-albinistic variant of *C. rickeniana*.

A second species in sect. *Conocybe* with almost hyaline, thin-walled spores without pore is *C. haglundii* A. Hauskn. (in Österr. Z. Pilzk. 10: 206. 2001). It differs from *C. spiculoides* in very small basidiocarps (pileus 4–8 mm) with bicoloured pileus; smaller, often lacrymoid spores (5.8–7.8 × 3.3–4.4 µm) and cheilocystidia with small capitulum,

2.5–4.0 µm broad. *Conocybe haglundii* has been found so far on sandy soil in one locality in Sweden.

13. Conocybe mesospora Kühn. & Watl. in Notes R. bot. Gdn Edinb. 38: 336. 1980. – Fig. 144.

Conocybe mesospora Kühner f. *typica*, Genre Galera: 54. 1935 (invalid); *Conocybe mesospora* Kühner & Sing. in Mycologia 51: 395. 1959 (invalid).

SEL. ICON. — Enderle in Z. Mykol. 57: 96a. 1991; Enderle in Micologia 2000: 167. 2001; A. Hauskn. in Pl. Syst. Evol. 180: figs 2b, e. 1992.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 57: 79–81. 1991; Enderle in Micologia 2000: 165. 2001; A. Hauskn. in Österr. Z. Pilzk. 11: 55–57. 2002; Kühner, Genre Galera: 58–60, fig. 11. 1935; Sing. & Hauskn. in Pl. Syst. Evol. 180: 77–104, figs 5g–n. 1992; Watling in Br. Fung. Fl. 3: 59, fig. 136. 1982.

VERN. NAME — Weidebreeksteeltje.

CHARACTERISTICS — Pileus 9–30(45) mm broad, up to 18 mm high, campanulate to obtusely conical, expanding to conico-convex or plano-convex with obtuse umbo, hygrophanous, when moist and fresh vividly coloured, at centre brownish orange, orange-brown to rusty brown (e.g., K. & W. 6D6-7, 6D8, D8-E8, 7D8-E8), towards the margin paler, pale yellow-brown to brownish orange (e.g., 5B6, 5C5-6, 6C5-7), translucently striate up to halfway or more, fading to flesh-coloured, pale orange or ochre-yellow on drying (e.g., 5B4-5, 5C5), with paler yellowish margin, without grey colours also in exsiccata, glabrous and dry. Lamellae, L = 17–25, l = 3–7, crowded or rather crowded, adnexed, segmentiform, ochraceous at first, then orange-brown to rusty brown with concolorous or slightly paler edge. Stipe 28–75 × 1–2.5(3) mm, cylindrical, often base slightly bulbous, up to 4 mm thick, fistulose, cream-coloured to pale ochraceous at first, then orange-yellow, occasionally becoming orange-brown in lower half with age, entirely pruinose to pruinose-striate, without patent hairs. Context concolorous with surface, thin and fragile. Smell weak, not distinctive. Taste mild. Spore print rusty brown.

Spores (6.5)7.0–10.0(11.0) × 4.0–5.5(6.5) µm, av. 7.4–9.6 × 4.3–5.4 µm, Q = 1.5–1.9, Qav. = 1.6–1.75, not flattened. ellipsoid-oblong to slightly amygdaliform in side-view, not broader in frontal view, slightly thick-walled, brownish orange to orange-brown in ammonia (K. & W. 6C6-8, 6D8), with apical germ pore 0.7–1.5 µm wide. Basidia 17–26 × 7.5–10 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 14–25 × 6.0–11 µm, lecythiform with globose, elliptic or clavate basal part, short to moderately long neck (1.0–4.5 × 1.0–2.0 µm) and small capitulum (2.8)3.2–5.5 µm broad. Hymenophoral trama made up of cylindrical and inflated elements, 3.0–22 µm broad, hyaline or with pale yellow wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 21–48 × 10–27 µm; pedicels in part with slightly thickened, brown wall. Pileocystidia not observed, but present in some collections according to other authors (Kühner, Genre Galera: 58. 1935; Sing. & Hauskn. in Pl. Syst. Evol. 180: 77. 1992), similar to cheilocystidia, occasionally with brown wall. Stipitipellis a cutis of repent hyphae, 2.0–8.0 µm broad, hyaline or with pale yellow wall. Caulocystidia frequent, often in clusters, lecythiform, 14–24 × 7.5–12 µm, similar to cheilocystidia, neck 1.0–4.5 × 1.0–20 µm, capitulum 3.0–5.5 µm broad. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, in deciduous forests and parks, along roadsides and dikes, in both unfertilised and strongly manured grasslands, on moist to dry, weakly acidic to basic loamy or clayey soils, more rarely on sand and peat. In the Netherlands widespread and rather common in Holocene areas and in Southern Limburg in limestone grasslands, rare elsewhere. Exact distribution insufficiently known. June–October, mainly in autumn. Widepread in Europe, also recorded from Central Asia.

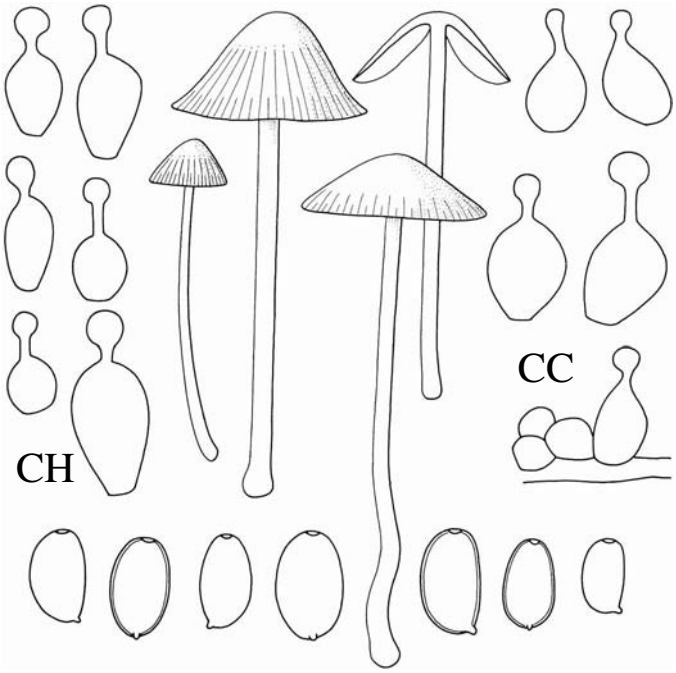


Fig. 144. *Conocybe mesospora*

Conocybe mesospora is a variable species, particularly in habitat, size of basidiocarps, and size of spores. Collections with the smallest spores (7.0–8.0 × 4.0–5.0 µm) and largest spores (9.0–10.0 × 5.0–5.5 µm) do not show any overlap in spore size (see also Singer & Hausknecht in Pl. Syst. Evol. 180: 78, fig. 1. 1992). Type studies were published by Kühner & Watling (in Notes R. bot. Gdn Edinb. 38: 336. 1980) and Hausknecht (in Österr. Z. Pilzk. 11: 42. 2002).

Conocybe mesospora can only be separated from other species after microscopical examination of lamellae and stipe surface. The species often resembles *C. rickeniana* in the field by the vividly coloured pileus. Diagnostic characters are the rather small spores with distinct germ pore, cheilo- and caulocystidia with small capitulum, and negative ammonia reactions. *Conocybe brachypodii* is very close and differs only in the dull colours of the basidiocarp in both fresh and dry condition and in the often (weakly) positive ammonia reaction. The spores in some collections of *C. brachypodii* are slightly smaller, but there is a considerable overlap with *C. mesospora* (see Singer & Haushnecht (in Pl. Syst. Evol. 180: 178. 1992).

14. Conocybe brachypodii (Velen.) Hauskn. & Svrček in Czech Mycol. 51: 43. 1999. – Fig. 145.

Galera brachypodii Velen., Novit. mycol. nov.: 67. 1947. *Galera albipes* Velen., Novit. mycol.: 128. ('1939') 1940 (non *Conocybe albipes* (Otth) A. Hauskn. 1998). — *Conocybe mesospora* var. *excedens* Kühner, Genre Galera: 56. 1935 (invalid); *Conocybe excedens* Kühn. & Watl. in Notes R. bot. Gdn Edinb. 40: 537. 1983. — *Conocybe excedens* var. *pseudomesospora* Sing. & Hauskn. in Pl. Syst. Evol. 180: 95. 1992. — *Conocybe macrocephala* var. *riedheimensis* Hauskn. & Enderle in Österr. Z. Pilzk. 9: 95. 2000.

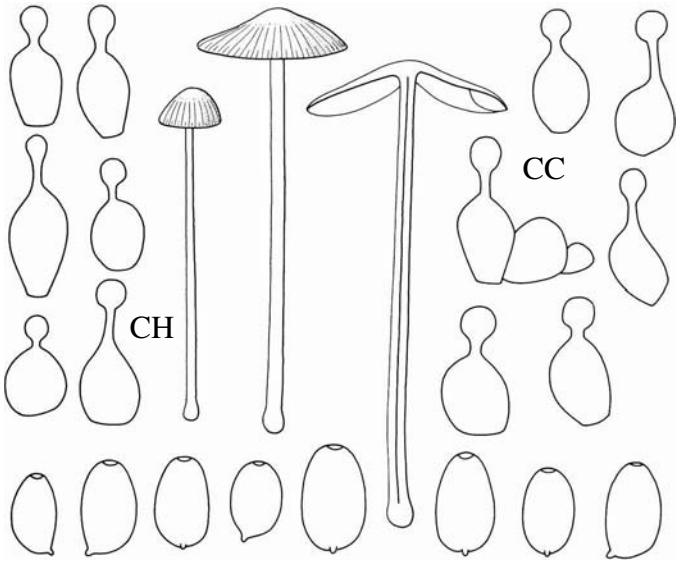


Fig. 145. *Conocybe brachypodii*

SEL. ICON. — A. Hauskn. in Pl. Syst. Evol. 180: figs 3a, b. 1992 (as *C. excedens* var. *pseudomesospora)*; Enderle in Österr. Z. Pilzk. 9: pl. 7, fig. 9. 2000 (as *C. macrocephala* var. *riedheimensis*); Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 19 (upper fig.). 1994 (as C. *excedens* var. *pseudomesospora*); Sing. & Hauskn. in Pl. Syst. Evol. 180: pl. 3a, b. 1992 (as *C. excedens* var. *pseudomesospora*)

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 9: 95–96, figs 6a–e. 2000 (as *C. macrocephala* var. *riedheimensis*); A. Hauskn. in Österr. Z. Pilzk. 11: 50–54. 2002; A. Hauskn. & Zucch. in Boll. Gruppo micol. G. Bres. 36: 38–40, pl. 3. 1993 (as *C. excedens* var. *pseudomesospora*); Kühner, Genre Galera: 56–57, fig. 10e. 1935 (as *C. mesospora* var. *excedens*); Sing. & Hauskn. in Pl. Syst. Evol. 180: 95–97 figs 6g–l. 1992 (as *C. excedens* var. *pseudomesospora*).

VERN. NAME — Kleinsporig breeksteeltje.

Pileus (6)8–26(35) mm broad, 5–15 mm high, broadly conical, conico-campanulate or hemispherical at first, then conico-convex to plano-convex, often with broad umbo, occasionally with recurved margin in age, hygrophanous, always more or less dull coloured, when moist and fresh at first dark ochraceous brown or reddish brown to dull brown at centre (K. & W. 5C6, 5D6,7, 5E7, 6D6, 7D7), then dark dull brown, umber (6F5,6, 7F5,6, 7E7), to the margin slightly paler, translucently striate up to halfway the radius or more, on drying pallescent to pale ochraceous, pale brownish grey or flesh-coloured brown at centre (e.g., 6D3, 7D4), pale pinkish grey or greyish cream-coloured at margin, glabrous. Lamellae, L = 16–30, l = 1–3, moderately crowded to crowded, adnexed, slightly ventricose, ochraceous at first, then orange-brown to rusty brown with paler, fimbriate edge. Stipe 20–65(80) × 1–2.5(3) mm, cylindrical or with subbulbous base (up to 5 mm), white to cream-coloured at first, then ochre-yellow to yellow-brown (e.g., 5C4,5), occasionally with slightly darker, orange-brown base (5D7), pruinose-striate lengthwise, without patent hairs (hand-lens). Context thin, concolorous with surface. Smell and taste not distinctive. Spore print not recorded.

Spores (6.5)7.0–9.0(10.0) × (3.5)4.0–5.5 µm, av. (7.0)7.3–8.4(8.8) × 4.3–5.2 µm, Q = 1.4–1.9, Qav. = 1.5–1.75, not flattened, ellipsoid to ellipsoid-oblong, in side-view occasionally a variable proportion sub-amygdaliform, pale brownish orange, orange-brown or rusty orange in ammonia (6C6, 6C8, 6D8, 7C8), thin-walled to slightly thick-walled (< 0.5 µm) with small, distinct germ pore, 0.7–1.2 µm wide. Basidia 14–25 × 6.5–10 µm, 4-spored. Lamella edge sterile. Cheilocystidia 16–23(26) × 6.0–11 µm, lecythiform with globose, ellipsoid or clavate basal part, short to rather long neck (1.5–5.0 × 1.0–1.5 µm) and small capitulum, 2.5–5.5(6.0) µm broad, av. 3.5–4.8 µm broad, hyaline. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 5.0–27 µm broad, with hyaline to pale brown wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 15–45 × 8.0–24 µm, often with slightly thickened, yellow-brown wall below. Pileocystidia usually present and numerous, occasionally scarce or absent, lecythiform, as cheilocystidia but more variable, 17–40 × 5.0–13 µm, with longer neck, 3.0–8.5(11) × 1.0–2.0 µm and capitulum 3.0–6.0 µm broad, often with brown intracellular pigment. Stipitipellis a cutis, made up of slender hyphae, 2.0–6.0 µm broad, hyaline or pale yellow. Caulocystidia lecythiform, 15–27 × 6.0–11.0 µm, similar to cheilocystidia but neck often longer, 1.5–7.0 × 1.5–2.5 µm) and capitulum 3.5–6.0(6.5) µm broad, often with brown walls. Clamp-connections present. Chemical reactions: Ammonia reaction variable: often positive, either strong or weak (after 12 hours some needle-like crystals at least near margin of cover-glass), or (in ± 25% of collections) negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on the ground, in the Netherlands mainly in nutrient-poor and on fertilised grasslands, lawns and grassy roadside verges on clayey or loamy, calcareous soil; in Central Europe mainly recorded from forests and unknown from open places (Singer & Hausknecht in Pl. Syst. Evol. 180: 96. 1992). In the Netherlands probably rather common, mainly in Holocene areas and South Limburg, but distribution insufficiently known. June–Nov. Common and widespread in Austria, otherwise European distribution largely unknown.

Conocybe brachypodii can be recognised by the rather small to medium-sized basidiocarps with dull brown colours, small to rather small spores, and cystidia with small capitulum. For differences with the closely related *C. mesospora*, see notes on that species. *Conocybe excedens* is regarded as a small-spored variant of *C. brachypodii* (Hausknecht in Österr. Z. Pilzk. 11: 40. 2002).

The ammonia reaction in *Conocybe brachypodii* is extremely variable. Variants with a strong reaction have been described by Hausknecht (in Österr. Z. Pilzk. 9: 95. 2000) as *C. macrocephala* var. *riedheimensis*. However, they agree in all other essential characters with *C. brachypodii,* and *C. macrocephala* var. *riedheimensis* is therefore regarded as synonym (see also Hausknecht in Österr. Z. Pilzk. 11: 54. 2002). *Conocybe macrocephala* differs from *C. brachypodii* mainly in larger spores, cystidia with larger capitulum, and constantly positive ammonia reaction.

A closely related species, described from Switzerland and Austria, is *Conocybe nigrodisca* Hauskn. & Krisai (in Persoonia 14: 655. 1992). It differs from *C. brachypodii* in the dark brown pileus with almost black centre and, correlated with this character, in coarsely encrusted dark pigment on the hyphae of the pileitrama, possibly also in the habitat on bare soil in montane and alpine areas (see also Hausknecht in Österr. Z. Pilzk. 11: 61–63. 2002). *Conocybe nigrodisca* may turn out to be a variety of *C. brachypodii*.

15. Conocybe microspora (Velen.) Dennis in Bull. trimest. Soc. mycol. Fr. 69: 189. 1953.

Galera microspora Velen., České Houby: 542. ('1920') 1921. *Conocybe mesospora* var. *brunneola* Kühner, Genre Galera 55. 1935 (invalid); *Conocybe brunneola* (Kühner) Kühn. & Romagn., Fl. anal.

Champ. sup.: 348. 1953 (invalid); *Conocybe brunneola* Kühn. & Watl. in Notes R. bot. Gdn Edinb. 38: 333. 1980.

EXCL. — *Conocybe microspora* sensu Dennis in Bull. trimest. Soc. mycol. Fr. 69: 189. 1953 (= *C. microsperma* Sing.).

KEY TO THE VARIETIES

1. Spores ellipsoid to ovoid . . . . . 15a. var. **microspora**
1. Spores, at least in part, weakly to strongly phaseoliform 15b. var. **brunneola**

VERN. NAME — Gebocheld breeksteeltje.

15a. var. **microspora** – Fig. 146A.

MISAPPL. — *Galera spartea* sensu Rick., Blätterpilze: 226. 1915; sensu Konr. & M., Ic. sel. Fung. 2: pl. 172, fig. 2. 1927; *Conocybe robertii* sensu Enderle in Z. Mykol. 59: 35.1993

EXCL. — *Conocybe microspora* sensu Enderle in Z. Mykol. 62: 22. 1996 (= *C. dumetorum*).

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987 (as *C. brunneola*); Enderle in Z. Mykol. 59: opposite 32. 1993 (as *C. robertii*); Konr. & M., Ic. sel. Fung. 2: pl. 172, fig. 2. 1927 (as *G. spartea*).

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 59: 35–37. 1993 (as *C. robertii*); A. Hauskn. in Österr. Z. Pilzk. 11: 57–59. 2002; Sing. & Hauskn. in Pl. Syst. Evol. 180: 101–102, figs 7g–l. 1992; Svrček in Czech Mycol. 37: 215–216, fig. 1. 1983.

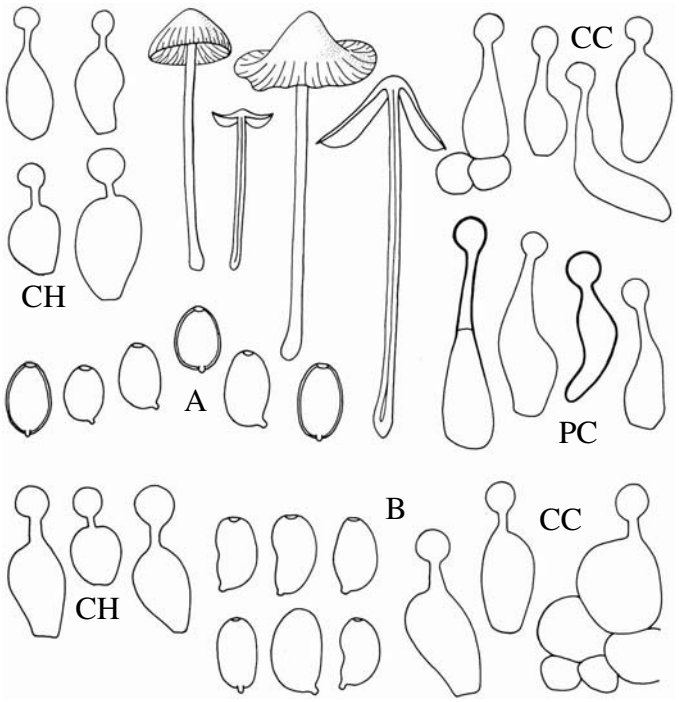


Fig. 146. *Conocybe microspora*. A. var. *microspora*. B. var. *brunneola*

Pileus 8–18 mm broad, 5–10 mm high, campanulate to broadly conico-convex at first, then plano-convex to almost applanate, often with broad umbo, hygrophanous, when moist and fresh at centre dark reddish brown, rusty brown to dark greyish brown (e.g., K. & W. 6E5-F6, 7D7-E8, 8E7, 8F8), towards margin slightly paler, translucently striate up to at least half of the radius, on drying fading to pale greyish brown, ochre-brown, brownish orange, dull and glabrous or occasionally minutely pubescent. Lamellae, L = 15–29, l = (1)3–7, moderately distant to crowded, adnexed, ventricose, yellow-brown at first, then orange-brown to rusty brown with white flocculose edge. Stipe 20–45(60) × 0.8–1.5(2) mm, cylindrical or at base subbulbous, up to 2.5 mm broad, whitish to pale yellow at first, gradually turning yellow-brown, flesh-coloured brown or brownish orange, at base often turning reddish brown to blackish brown in age, entirely pruinose, not pubescent. Context thin, concolorous with surface. Smell and tast weak, not distinctive. Spore print not recorded.

Spores (5.0)5.5–7.5(8.0) × (3.0)3.5–4.5 µm, av. 6.0–7.0 × 3.5–4.2 µm, Q = 1.5–1.9, Qav. = 1.55–1.75, not flattened, ellipsoid to ellipsoid-oblong, not (sub)amygdaliform in side-view, in frontal view often ovoid to ovoid-oblong, orange-brown, rusty brown to reddish brown (6D8, 7D8, 8D8) in ammonia, slightly thick-walled (< 0.5 µm), smooth also as observed with scanning electron microscope, with small, apical germ pore, about 1.0 µm wide. Basidia 13–20 × 6.0–8.5 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 12–22 × 6.0–10 µm, lecythiform with subglobose to clavate basal part, short neck (1.5–3.5 × 1.0–1.5 µm) and small capitulum, 2.5–5.0 µm broad, often with brown wall. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 4.0–23 µm broad, with hyaline to pale brown wall. Pileipellis an epithelioid hymeniderm made up of clavate to spheropedunculate elements, 18–42 × 9.0–25 µm, in part with pale brown wall in particular near base, sometimes encrusted. Pileocystidia scattered to numerous, mainly lecythiform like the cheilocystidia but more variable, sometimes septate, 16–28 × 4.0–7.0 µm, with longer neck (3.0–9.0 × 1.0–2.0 µm) and capitulum 3.0–5.0 µm broad, usually with brown wall; in addition often with some short, cylindrical hairs, 23–47 × 1.0–2.0 µm, base up to 3.0 µm broad. Stipitipellis a cutis, made up of cylindrical hyphae, 2.0–6.0 µm broad, with hyaline to pale brown wall. Caulocystidia lecythiform, 15–24 × 4.5–8.5 µm, with neck 1.5–8.5 × 1.0–1.5 µm and capitulum 2.5–4.5 µm broad, often with brown wall, intermixed with numerous subglobose elements, 5.0–10.0 × 4.0–10.0 µm; cylindrical hairs absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, usually solitary, sometimes in small groups, terrestrial, most often in unfertilised meadows and hay-fields on dry slopes, on loamy, basic soil above limestone (*Mesobromion*); also in grasslands in calcareous sea dunes. In the Netherlands rather common in southern Limburg, rare in calcareous dunes and in the river area. (July) Sept.–Oct. Also recorded from Germany, Austria, and Switzerland, but European distribution incompletely known.

Conocybe microspora is characterised by small, smooth spores with distinct germ pore in combination with lecythiform caulocystidia with small capitulum. It can be confused with *C. dumetorum*, which has spores of similar or slightly smaller dimensions. This species differs in the minutely verrucose spores, which in addition are often amygdaliform. The spores are always ellipsoid and smooth in *C. microspora,* sometimes with apical papilla. However, in some collections of *C. dumetorum* the spores are ellipsoid and appearing smooth under the light microscope ("var. *phaeoleiospora* A. Hauskn."). In some cases this variant and *C. microspora* can only be distinguished by study of the spore surface with a scanning electron microscope (Hausknecht in Österr. Z. Pilzk. 4: 116. 1995).

Conocybe microspora var. *microspora* had not been recorded from the Netherlands before. It appears to be more widespread than var. *brunneola* (listed by Arnolds et al., Overz. Paddest. Nederland. 1995); most collections of var. *microspora* had been identified as either *C. dumetorum* or *C. brunneola*.

15b. var. **brunneola** (Kühn. & Watl.) Sing. & Hauskn. in Pl. Syst. Evol. 180: 102. 1992. – Fig. 146B.

Conocybe mesospora var. *brunneola* Kühner, Genre Galera 55. 1935 (invalid); *Conocybe brunneola* (Kühner) Kühn. & Romagn., Fl. anal. Champ. sup.: 348. 1953 (invalid); *Conocybe brunneola* Kühn. & Watl. in Notes R. bot. Gdn Edinb. 38: 333. 1980.

EXCL. — *Conocybe brunneola* sensu Breitenb. & Kränzl., Pilze Schweiz 4: 300. 1995 (= *C. dumetorum*).

SEL. ICON. — Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1322. 1994.

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 11: 59–61. 2002; Kühner, Genre Galera: 55–56, fig. 10B. 1935; Sing. & Hauskn., in Pl. Syst. Evol. 180: 102–103, figs. 7M–O. 1992; Watling in Br. Fung. Fl. 3: 58–59, figs. 112, 131, 137. 1982.

CHARACTERISTICS — Macroscopic characters similar to var. *microspora*. Spores (5.5)6.0–7.5 × 3.0–4.5 µm, av. 6.5–7.2 × 3.3–4.0 µm, Q = 1.6–2.1(2.3), Qav. = 1.75–1.95, not flattened, ellipsoid-oblong, at least in part weakly to distinctly phaseoliform in side-view; basidia 4-spored; cheilocystidia 13–22 × 7.0–11 µm with capitulum 3.0–5.5 µm broad.

HABITAT & DISTR. — As var. *microspora*, but in the Netherlands very rare (Bemelen, Bemelerberg). Sept.–Oct. Recorded from France, England, and Austria, but apparently rare in Europe. Also recorded from South America.

This variety differs from var. *microspora* only in the slightly more elongate spores, part of them being phaseoliform. The proportion of these spores varies from about 10–80%. In some collections of var. *microspora* a small proportion of spores may also be slightly phaseoliform. Therefore, Singer & Hausknecht (in Pl. Syst. Evol. 180: 103. 1992) are followed, who distinguished these taxa at the rank of variety. See also notes on var. *microspora*.

Studies of the type of *Conocybe brunneola* were published by Kühner & Watling (in Notes R. bot. Gdn Edinb. 38: 333. 1980) and Hausknecht (in Österr. Z. Pilzk. 11: 38. 2002).

16. Conocybe robertii Sing. & Hauskn. in Pl. Syst. Evol. 180: 97. 1992. – Fig. 147.

EXCL. — *Conocybe robertii* sensu Enderle in Z. Mykol. 59: 35. 1993 (= *C. microspora* var. *microspora*).

SEL. ICON. — Sing. & Hauskn. in Pl. Syst. Evol. 180: pl. 3d. 1992.

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 11: 63–64. 2002; Sing. & Hauskn. in Pl. Syst. Evol. 180: 97–101, figs. 7a–f, 8a. 1992.

CHARACTERISTICS — Pileus 2–5 mm broad, hemispherical to plano-convex, hygrophanous, when moist at centre rather dark brown (K. & W. 6E-F6, 6E5), towards the margin paler ochre-brown (6C-D4), translucently striate up to halfway the radius, on drying pale ochraceous or ochraceous orange (5B3) with pale brown centre, glabrous, without veil remains; lamellae, L = 8–10, l = 0–2, adnexed, distant, almost whitish at first, then rusty brown with concolorous edge; stipe 12–17 × 0.7–1 mm, cylindrical or slightly broader to subbulbous base, fistulose, whitish at first, in lower half becoming yellow-brown with age, entirely pruinose; context concolorous with surface; smell weak, not distinctive; spore print not recorded.

Spores 5.5–7.5 × 4.0–5.0 µm, av. c. 6.8 × 4.5 µm, Q = 1.3–1.5, Qav. = c. 1.4, not or slightly flattened, ellipsoid to ovoid, smooth, thin-walled, pale yellow-brown in ammonia, with small germ pore, up to 1.0 µm wide; basidia 15–23 × 8.0–9.0 µm, clavate, 4-spored; lamella edge sterile; cheilocystidia 20–23 × 8.0–11 µm, lecythiform with small, globose capitulum, 3.5–5.5 µm broad; pleurocystidia absent; pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 22–45 × 13–33 µm, often with pale brown walls, intermixed with scattered pileocystidia; pileocystidia up to 40 × 8.0 µm, lecythiform, similar to cheilocystidia but more slender; caulocystidia 18–30 × 7.0–15 µm, lecythiform, similar to cheilocystidia, with capitulum 4.5–6.0 µm broad. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

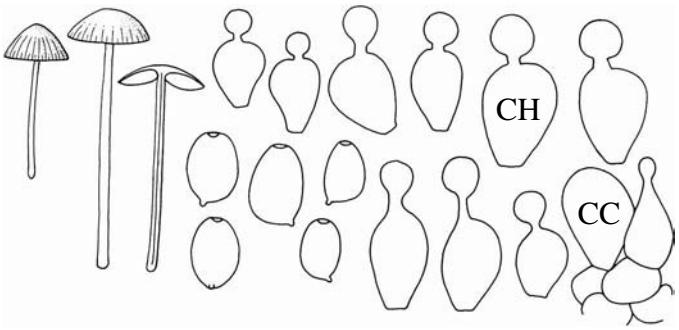


Fig. 147. *Conocybe robertii*

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on soil in dry grasslands. At present only known from Austria. Sept.

Conocybe robertii is close to *C. microspora* and differs from that species mainly in the very small basidiocarps with few, distant lamellae and in broader spores. Initially some collections from the Netherlands have been identified by Hausknecht as *C. robertii* in view of their spore size. However, at present a narrower concept of *C. robertii* is applied, comprising only the type collection (A. Hauskn. in Österr. Z. Pilzk. 11: 63. 2002).

A related species from xerophytic grasslands in Central Europe is *Conocybe minima* Sing. & Hauskn. (in Pl. Syst. Evol. 180: 93. 1992). It has also very small basidiocarps (pileus 2.5–6 mm, stipe 9–23 × 0.7–1.2 mm) and distant lamellae, but considerably larger, flattened spores, 6.5–9.5(10.5) × 5.5–6.5(7.0) × 4.5–5.5 µm, av. 7.4–8.9 × 5.8–6.2 × 5.0–5.2 µm. Both *C. minima* and *C. robertii* may occur in the Netherlands, in particular on slopes of limestone and loess in southern Limburg.

17. Conocybe enderlei A. Hauskn. in Österr. Z. Pilzk. 10: 202. 2001.

KEY TO THE VARIETIES

1. Basidia 4-spored. Spores 6.0–7.5(8.0) × (3.5)4.0–5.0 µm, av. 6.5–7.2 × 4.1–4.5 µm . . . . . 17a. var. **enderlei**
1. Basidia predominantly 2-(1-)spored. Spores 7.0–10.5(11.0) × 4.5–6.0 µm, av. 8.0–9.0 × 4.8–5.5 µm . . . . . 17b. var. **variispora**

VERN. NAME — Oranjebruin breeksteeltje.

17a. var. **enderlei** – Fig. 148A.

SEL. ICON. — A. Hauskn. in Österr. Z. Pilzk. 10, pl. 23. 2001.

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 10: 202–205, figs 1a–e, 2001.

Pileus 6–25 mm broad, up to 14 mm high, obtusely conical, campanulate or hemispherical, then conico-convex with broad umbo, hygroph-

anous, when moist at centre rather dark brown to rusty brown (e.g., K. & W. 6E7, 6E8, 6D8-E8; Mu. 5YR4/3), to the margin paler brown to ochre-brown (e.g., 10YR6/6), translucently striate up to centre or at margin only, on drying pale orange or ochraceous, glabrous and dull. Lamellae, L = 18–24, l = (1)3–5, moderately distant to crowded, adnexed, ventricose, up to 4 mm broad, ochraceous, then orange-brown to rusty brown with slightly paler, flocculose edge. Stipe 16–60 × 1–3 mm, cylindrical or with subbulbous base, fistulose, pale yellow to pale yellow-brown, entirely pruinose, without patent hairs (under hand-lens). Context concolorous with surface. Smell and taste weak, not distinctive. Spore print not recorded.

Spores 5.0–7.5(8.0) × 3.5–5.0 µm, av. 5.9–7.2 × 3.9–4.5 µm, Q = 1.4–1.9, Qav. = 1.5–1.8, not flattened, ellipsoid or ovoid to oblong, brownish orange to orange-brown in ammonia, slightly to rather thick-walled, without germ pore. Basidia 14–28 × 7.0–9.0 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 13–23 × 6.0–11 µm, lecythiform with subglobose to ellipsoid or clavate basal part, rather short, thin neck (1.5–3.0 × 1.0–2.0 µm) and small capitulum, 3.0–5.0 µm broad, often with pale brown wall. Hymenophoral trama made up of cylindrical to subglobose elements, 4.0–30 µm broad, with pale brown parietal and encrusting pigment. Pileipellis an epithelioid hymeniderm made up of clavate to spheropedunculate elements, 28–48 × 12–25 µm, often with brown pedicels. Pileocystidia absent. Stipitipellis a cutis of cylindrical hyphae, 2.0–6.0 µm broad, often with yellowish walls, with clusters of caulocystidia. Caulocystidia 13–21 × 5.0–11 µm, lecythiform like the cheilocystidia but neck often longer (2.5–5.5 × 1.5–2.0 µm), capitulum 3.0–5.0 µm broad; in addition with numerous globose to ellipsoid elements, often in chains, 5.0–15 × 5.0–13 µm. Clamp-connections present. Chemical reactions: Ammonia reaction variable, usually positive but weak, but in some collections strong; occasionally only positive in fresh basidiocarps but negative in exsiccata.

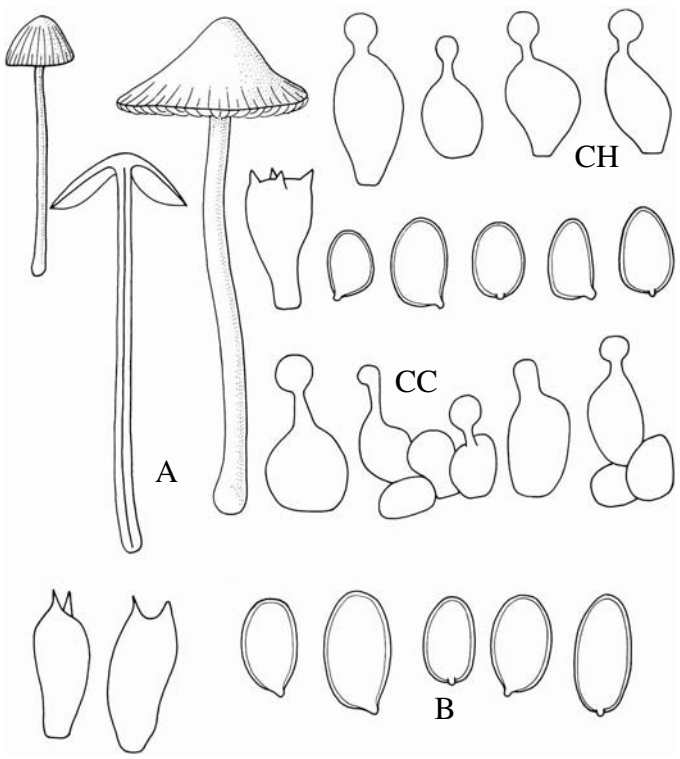


Fig. 148. *Conocybe enderlei*. A. var. *enderlei*. B. var. *variispora*.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on soil in grassy roadside verges, on dikes and in deciduous forests on fertile, clayey soils. In the Netherlands rare, but probably more widespread (overlooked or not recognised). Aug.–Oct. Also recorded from Austria, Germany, Italy, and Finland.

Although *Conocybe enderlei* has only been recently described, this species is in fact one of the more easily recognisable members of sect. *Conocybe* in view of the rather small and dark spores without germ pore. In the Netherlands some collections were initially identified as *C. spiculoides*. The latter species shows some resemblance in the spores without a germ pore, but differs markedly in larger spore size, almost hyaline spore wall, and cheilocystidia with larger capitulum.

17b. var. **variispora** A. Hauskn. in Österr. Z. Pilzk. 10: 205. 2001. – Fib. 148B.

SEL. ICON. — A. Hauskn. in Österr. Z. Pilzk. 10: pl. 24. 2001.

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 10: 205–206, figs 2a–e. 2001.

CHARACTERISTICS — Pileus 9–20 mm broad, when moist and fresh orange-brown or reddish brown, translucently striate; stipe 25–40 × 1.5–3 mm, pale orange to brownish orange, pruinose.

Spores 7.0–10.5(11.0) × 4.5–6.0 µm, av. 8.0–9.0 × 4.8–5.5 µm, Q = 1.5–2.0, Qav. = 1.55–1.75, ellipsoid(-oblong) to ovoid(-oblong), occasionally in part depressed or deformed, not flattened, brownish orange to orange-brown (5C7, 6D8) in ammonia, with slightly thickened wall, without germ pore; basidia 13–20 × 6.5–9.0 µm, 2-(1-)spored; cheilocystidia 15–22 × 6.0–11 µm, lecythiform with short to rather long neck (1.5–5.0×x 1.0–1.5 µm) and small capitulum, (2.5)3.0–4.5 µm broad; otherwise as var. *enderlei*.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, in the Netherlands only recorded from poor grasslands on calcareous loam above limestone (*Mesobromion*). Very rare in southern Limburg (Valkenburg, Grachterberg; Nijswiller), but probably more widespread. Sept.–Oct. Also recorded from Austria.

Conocybe enderlei var. *variispora* is relatively easily recognised by the combination of predominantly 2-spored basidia, rather small spores without any trace of a germ pore and lecythiform caulocystidia. It differs from var. *enderlei* only in 2-spored basidia. Var. *variispora* may be a different species in fact, but more research is required.

The collections of *Conocybe enderlei* var. *variispora* from the Netherlands were initially identified as *C.* cf. *lobauensis*. *Conocybe lobauensis* Sing. & Hauskn. (in Pl. Syst. Evol. 159: 107. 1988) was described from dry, open grasslands in Austria and shares 2-spored basidia and poreless spores of approximately the same size (7.0–10.0(12.0) × (4.0)4.5–6.5(7.5) µm). It differs from *C. enderlei* var. *variispora* in smaller basidiocarps (pileus 3–10 mm broad) and in particular in the covering of the stipe, made up of lecythiform cystidia, intermixed with numerous non-lecythiform elements and narrow hairs. Therefore, *C. lobauensis* belongs to sect. *Mixtae*.

18. Conocybe antipus (Lasch :Fr.) Fay. in Annls Sci. nat., Sér. VII, 9: 537. 1889. – Fig. 149.

Agaricus antipus Lasch in Linnaea 3: 415. 1828; *Agaricus antipus* Lasch :Fr., Syst. mycol., Index gen.: 7. 1832; *Galera antipus* (Lasch :Fr.) Quél. in Mém. Soc. Émul. Montbéliard, Sér. II, 5: 136. 1872 (Champ. Jura Vosges 1).

SEL. ICON. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: pl. 3b ('1982') 1983; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1320. 1994; Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 204. 1985.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 304–305, fig. 124 ('1982') 1983; A. Hauskn. in Österr. Z. Pilzk. 5: 172–174, figs 3g–j. 1996; Kühner, Genre Galera: 83–85, fig. 22. 1935; Watling in Br. Fung. Fl. 3: 63–64, figs 76, 113. 1982.

VERN. NAME — Boorvoetbreeksteeltje.

Pileus 10–25(30) mm broad, 6–20 mm high, obtusely conical or campanulate at first, then conico-convex to plano-convex, hygrophanous, when moist brownish orange, ochre-brown to rusty brown (K. & W. 5C6-6C6, 5D6-6D6, 6D7, 6D8-E8), gradually paler to margin, translucently striate up to 1/2 to 3/4 of the radius, soon drying to pale isabella, cream-coloured or pale ochraceous (4A2-3, 4A3-5A3) glabrous. Lamellae, L = 17–28, l = 1–5, moderately distant to crowded, adnexed to almost free, ventricose, pale ochraceous at first, then rusty brown with paler flocculose edge. Stipe 18–55 × 1.5–3 mm (without pseudorhiza), subcylindrical or with subbulbous base, up to 6 mm thick, fistulose, white to pale ochraceous, often becoming brown with age from base upwards, entirely pruinose, not pubescent, at base tapering into a white root up to 40 mm long, often curved and easily breaking. Context thin, concolorous with surface, inside root ochraceous. Smell weak, not distinctive. Taste mild. Spore print rusty brown.

Spores (7.5)8.0–11.0 × 5.5–7.5 × 4.5–6.5 µm, av. 8.6–9.7 × 5.7–7.0 × 5.1–5.6 µm, flattened, in frontal view ellipsoid to ovoid, a variable proportion (weakly) hexagonal to rhomboid, occasionally some mitriform to ellipsoid with apical papilla (limoniform), Q = 1.3–1.7(1.8), Qav. = 1.5–1.6, in side-view ellipsoid-oblong to subamygdaliform, Q = (1.5)1.6–1.9, Qav. = 1.65–1.8, brownish orange to orange-brown in ammonia, rather thick-walled (0.5–1.0 µm), with apical germ pore 1.0–1.5 µm wide, brownish orange to orange-brown in ammonia, rather thick-walled (0.5–1.0 µm), with apical germ pore 1.0–1.5 µm wide. Basidia 16–26 × 8.0–10.5 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia (13)15–30 × 5.0–10 µm, lecythiform with slender, clavate to elliptic basal part, short, thin neck (1.5–3.5 × 1.0–1.5 µm) and small globose capitulum, 3.0–4.5 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to globose elements, 4.0–24 µm broad, with hyaline or pale yellow walls. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 23–50 × 9.0–22 µm, hyaline, base occasionally with slightly thickened, pale brown wall. Pileocystidia absent. Stipitipellis a cutis of thin, hyaline, repent hyphae, 2.0–7.0 µm broad, often with scattered stipitate capitula and with clusters of caulocystidia. Caulocystidia 12–25 × 4.5–8.0 µm, predominantly lecythiform, similar to cheilocystidia but more irregular and often with slightly longer neck (2.0–4.5 µm) and capitulum 3.0–4.5 µm broad; sometimes capitulum and/or neck lacking; also with many globose to ellipsoid elements up to 8.0 × 7.0 µm. Clamp-connections present but sometimes infrequent. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in groups, mainly on dung, compost, or manured soil, occasionally on nutrient-poor soil, in grasslands and gardens, also in cold glasshouses (cucumber cultures). Aug.–Oct.; in glasshouses throughout the year. In the Netherlands rare, although abundant in some glasshouses. Widespread in Europe. Also in North America.

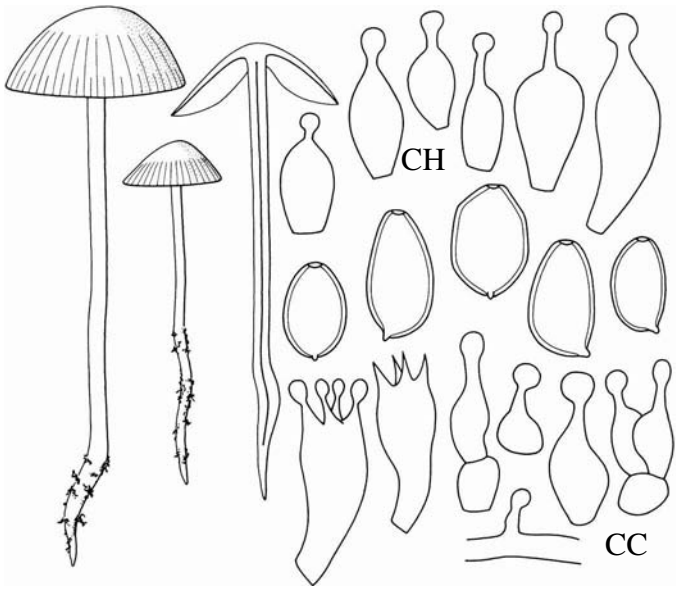


Fig. 149. *Conocybe antipus*

Conocybe antipus is well-characterised by the combination of a rooting, pruinose stipe, 4-spored basidia, and flattened spores. The spores are often described as distinctly angular, but in most collections from the Netherlands only a minor proportion of the spores was slightly hexagonal or rhomboid. The habitat on dung is also not a reliable character since *C. antipus* has also been found in unfertilised habitats, e.g., limestone grasslands.

Conocybe antipus may be confused with *C. cettoiana.* The latter species also has a rooting stipe and is similar in other macroscopic characters and spore size. It differs in the shape of spores, being hardly angular in face-view, and in particular in the presence of cylindrical hairs at the stipe, at least at the apex. Therefore, *C. cettoiana* belongs to sect. *Mixtae*.

A related species with rooting stipe is *Conocybe herbarum* A. Hauskn. It resembles *C. antipus* in the 9–30 mm broad pileus with brownish orange to yellow-brown centre and the whitish, pruinose stipe with exclusively lecythiform caulocystidia and with pseudorhiza up to 20 mm long. It differs from *C. antipus* mainly in the not flattened and not angular, relatively broad, ellipsoid spores, measuring 7.0–9.5(11.0) × (5.0)5.5–6.5(7.0) µm, av. 8.0–9.3 × (5.5)5.8–6.2 µm, Q = 1.3–1.6. The habitat of *C. herbarum* seems to be characteristic as well. It has been recorded in Austria and France from xerophytic grasslands on steep slopes, always connected with roots of grasses, in particular *Bromus inermis* (Hausknecht in Österr. Z. Pilzk. 5: 183–187, pl. 5,6, figs 6g–l. 1996).

Conocybe graminis A. Hauskn. is another species, growing on grass roots in similar habitats and recorded so far from Austria, Germany, and Italy (Hausknecht in Österr. Z. Pilzk. 5: 181–183, pl. 4, figs 6a–f. 1996). It differs from *C. herbarum* mainly in the dark brown to rusty-brown pileus, closer lamellae, and slightly more elongate, ellipsoid spores with thin wall, measuring (6.0)7.0–10.0(10.5) × (4.0)4.5–6.5(7.0) µm, av. 8.0–9.4 × (4.5)4.9–5.8 µm, Q = 1.4–1.7(2.0). The caulocystidia are not exclusively lecythiform, but at stipe apex intermixed with some clavate elements and cylindrical hairs (see also *C. cettoiana*). Both *C. herbarum* and *C. graminis* may occur in the Netherlands, in particular on calcareous slopes in southern Limburg.

19. Conocybe alboradicans Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 302. ('1982') 1983. – Fig. 150.

Conocybe pragensis A. Hauskn. in Czech Mycol. 51: 47. 1999. — *Conocybe neoantipus* var. *carinthiaca* Sing. & Hauskn. in Pl. Syst. Evol. 159: 117. 1988; *C. alboradicans* var. *carinthiaca* (Sing. & Hauskn.) A. Hauskn. in Österr. Z. Pilzk. 5: 170. 1996.

SEL. ICON. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: pl. 3a ('1982') 1983; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 392. 1995 (as *Conocybe* spec.); A. Hauskn. in Österr. Z. Pilzk.: pl. 1. 1996; Sing. & Hauskn. in Pl. Syst. Evol. 159: fig. 1c. 1988; Hauskn. & Zucch. in Boll. Gruppo micol. G. Bres. 41: 97. 1998.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands: 302–304, fig. 123 ('1982') 1983; Breitenb. & Kränzl., Pilze Schweiz 4: 310. 1995 (as *Conocybe* spec.); A. Hauskn. in Österr. Z. Pilzk. 5: 168–172, figs 2, 3a–f. 1996; A. Hauskn. in Czech Mycol. 51: 45–49, fig. 3a–e. 1999 (as *Conocybe pragensis*); Hauskn. & Zucch. in Boll. Gruppo micol. G. Bres. 41: 96–97, figs 1d–f. 1998; Sing. & Hauskn. in Pl. Syst. Evol. 159: 117–119, fig. 5. 1988.

VERN. NAME — Wortelend breeksteeltje.

Pileus (7)10–28 mm broad, 6–15 mm high, obtusely conical or campanulate at first, soon expanding to conico-convex or hemispherical, hygrophanous, when moist ochre-brown, brownish orange to orange-brown (K.& W. 5C7-6C7, 5D6, 6D7, 6E7, 6D8), weakly to strongly translucently striate from 1/3 to 9/10 of the radius, on drying greyish ochre to ochre-yellow (4A3-5A3, 5B3, B4); surface glabrous or slightly wrinkled, greasy-shiny. Lamellae, L = 24–30, l = 1–5, fairly crowded, adnexed, ventricose, up to 4 mm broad, pale ochre then rusty brown with paler, flocculose edge. Stipe (15)25–65 × 1.5–4 mm (without pseudorhiza), cylindrical or slightly thicker downwards, fistulose, entirely white at first, becoming pale ochre at base in age, entirely pruinose, occasionally in addition with some cylindrical hairs at apex, downwards passing into an easily breaking, tapering, white root up to 30 mm long. Context concolorous with surface, in pileus up to 2 mm thick, rather firm, in particular in stipe. Smell weak, not distinctive. Taste mild, not distinctive. Spore print rusty brown.

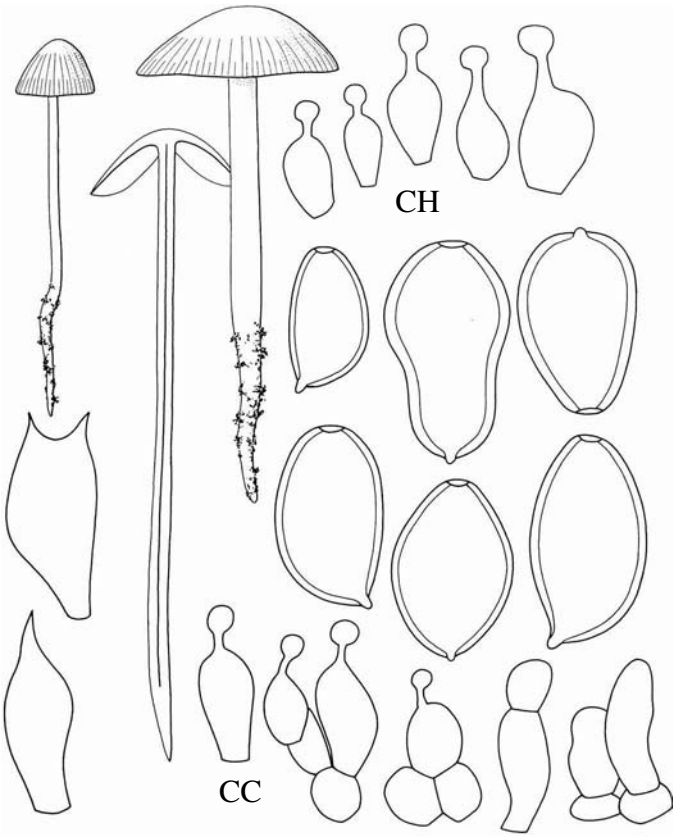


Fig. 150. *Conocybe alboradicans*

Spores (11.0)12.0–19.0(23.0) × 7.5–10.5(11.0) µm × 6.5–9.5(10.5) µm, av. 13.3–16.5 × 8.5–10.1 × 7.5–8.8 µm, weakly to distinctly flattened, Q = 1.3–1.8(1.9), Qav. = 1.5–1.65, ellipsoid to ovoid in frontal view; Q = 1.5–1.9(2.2), Qav. = 1.6–1.85, ellipsoid-oblong to slightly amygdaliform in side-view, largest spores often irregular, orange-brown to rusty brown in ammonia, rather thick-walled (0.8–1.5 µm), with large apical germ pore, 1.5–2.0 µm wide. Basidia 19–25(30) × 9.0–13 µm, 2-spored or 2- and 1-spored intermixed. Lamella edge sterile. Cheilocystidia 14–26 × 6.0–10(11) µm, lecythiform with ellipsoid to clavate basal part, tapering into a rather short neck (1.5–4.0 × 1.0–2.0 µm), with small, globose capitulum, 3.0–5.0 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and inflated elements, 3.0–28 µm broad. Pileipellis an epithelioid hymeniderm, made up of pyriform, clavate and spheropedunculate elements, 13–37 × 8.0–28 µm, often with yellow-brown pedicel. Pileocystidia absent. Stipitipellis a cutis of slender, repent hyphae, 2.0–7.0 µm broad, with clusters of cystidioid elements. Caulocystidia 13–22 × 5.0–8.0 µm, predominantly lecythiform, similar to cheilocystidia, with neck 2.0–3.0 × 1.0–1.5 µm and capitulum 2.8–4.0 µm broad; also with globose, ellipsoid, and utriform elements, 4.0–18 × 4.0–9.0 µm. Clamp-connections present, often scarce. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, most often in rather poor grasslands on dry, moderately acid to basic, sandy and loamy soils, also in manured pastures, ruderal places, and arable fields. Aug.–Oct. Widespread but uncommon in the Netherlands, also recorded from Denmark (fairly common), Austria, Italy, and Switzerland.

Conocybe alboradicans is a characteristic species because of the rather robust basidiocarps with rooting, white stipe, large spores and 2-spored basidia. Hausknecht (in Österr. Z. Pilzk. 5: 170. 1996) distinguished var. *carinthiaca* on the basis of a non-striate, clearly rugulose pileus, less distinctly flattened spores, and a habitat on richer substrates. In view of the observed variability, this variety is regarded as a variant of *C. alboradicans* without taxonomic importance. The "macrospores," described by Hausknecht (in Österr. Z. Pilzk. 5: 170. 1996), are produced by scattered 1-spored basidia and fall within the normal range of spore size.

Conocybe pragensis was recently described by Hausknecht (in Czech Mycol. 51: 45. 1999) as a species close to *C. alboradicans*. It was said to be different in more robust basidiocarps, firmer context, spores with thicker wall, and caulocystidia with longer neck. However, these characters fall completely within the variation of the investigated collections of *C. alboradicans*.

20. Conocybe dumetorum (Velen.) Svrček in Česká Mykol. 10: 175. 1956. – Fig. 151.

Galera dumetorum Velen., České Houby: 541. ('1920') 1921. – *Galera laricina* Kühner in *Botaniste* 17: 170. 1926; *Conocybe laricina* (Kühner) Kühner, Genre Galera: 51. 1935; *Conocybe dumetorum* var. *laricina* (Kühner) A. Hauskn. in Czech Mycol. 51: 51. 1999. — *Conocybe dumetorum* var. *austriaca* A. Hauskn. in Österr. Z. Pilzk. 4: 112. 1995. — *Conocybe dumetorum* var. *phaeoleiospora* A. Hauskn. in Österr. Z. Pilzk. 4: 114. 1995.

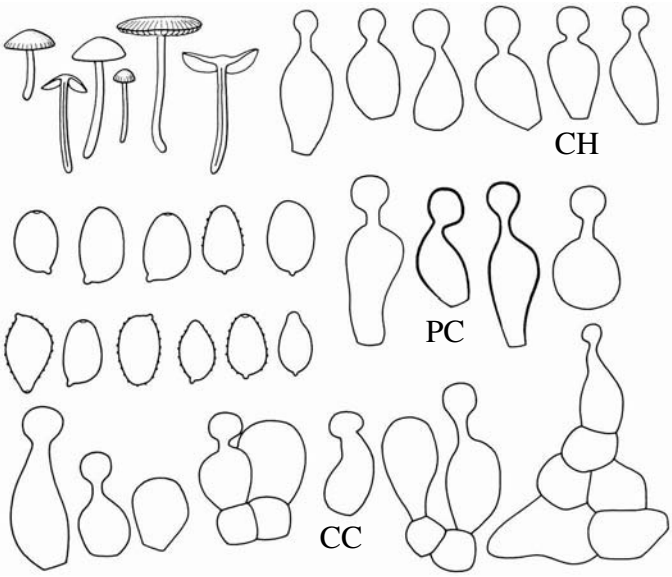


Fig. 151. *Conocybe dumetorum*

MISAPPL. — *Conocybe brunneola* sensu Breitenb. & Kränzl., Pilze Schweiz 4: pl. 377. 1995; *Conocybe microspora* sensu Enderle in Z. Mykol. 62: 22. 1996.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 377. 1995 (as *C. brunneola*); Cetto, Funghi Vero 6: pl. 2223. 1989; Hauskn. & Zucch. in Boll. Gruppo micol. G. Bres. 41: 99. 1998.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 300. 1995 (as *C. brunneola*); Enderle in Z. Mykol. 62: 19–24, figs. 1&2. 1996 (as *C. dumetorum* and *C. microspora* resp.); Enderle in Z. Mykol. 63: 15–16, fig. 7. 1997; A. Hauskn. in Rheinl. Pfalz. Pilzj. 5: 45, figs 4–7. 1995; A. Hauskn. in Österr. Z. Pilzk. 4: 107–117, figs 1–11. 1995; A. Hauskn. in Czech Mycol. 51: 51, figs 3f–h. 1999; Hauskn. & Zucch. in Boll. Gruppo micol. G. Bres. 41: 99–100, figs 1g–i, 1998; Kühner in Botaniste 17: 170–171. 1926 (as *Galera laricina*); Kühner, Genre Galera: 51–54, fig. 9. 1935 (as *C. laricina*); Watling in Br. Fung. Fl. 3: 83, figs 101–104. 1982.

VERN. NAME — Dwergbreeksteeltje

Pileus 3–10 mm broad, up to 6 mm high, conico-convex to hemispherical at first, then plano-convex to applanate, hygrophanous, when moist at centre dark brown to red-brown (e.g., K. & W. 7E6, 7F6, 8F8, 6E5), to the margin gradually paler orange-brown to yellow-brown (e.g., 6E7, 6D6), translucently striate up to halfway the radius or at margin only, on drying ochre-brown to flesh-coloured brown (e.g., 6C5) with reddish brown centre, dry, glabrous, smooth or slightly rugulose near centre. Lamellae, L = 12–18, l = 1–3(7), rather crowded to crowded, adnexed, often ventricose, yellow-brown to orangey brown with concolorous edge. Stipe 7–20(25) × 0.5–1 mm, cylindrical or with subbulbous base, fistulose, at first yellowish in upper part, at base yellow- to orange-brown, gradually darkening to red-brown from base upwards, entirely pruinose to pruinose-striate. Context concolorous with surface, thin. Smell and taste weak, not distinctive. Spore print rusty brown.

Spores (4.5)5.0–7.5(8.5) × (3.0)3.5–4.0(4.5) µm, av. 5.2–6.8 × 3.4–3.9 µm, Q = 1.3–1.9, Qav. = 1.45–1.75, not flattened, usually a variable proportion amygdaliform to papillate, also ellipsoid- or ovoid-oblong, sometimes exclusively ellipsoid-oblong, slightly thick-walled, usually a variable proportion minutely verruculose under oil-immersion lens, occasionally appearing completely smooth (but then verruculose as observed with scanning electron microscope), with callus or very small, often indistinct germ pore up to 1.0 µm wide, yellow-brown to brownish orange in ammonia. Basidia 15–23 × 5.5–8.0 µm, clavate, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia 15–24 × 5.0–9.0(12) µm, lecythiform with subglobose to narrowly clavate basal part, short to rather long neck (1.4–3.7 × 1.2–1.8 µm) and small to rather large capitulum, 3.0–6.5 µm broad, often with pale brown wall. Hymenophoral trama made up of cylindrical and strongly inflated elements, 4.0–26 µm broad, with hyaline to pale yellow-brown walls. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 18–40 × 9.0–18 µm, often with brown pedicel, intermixed with scattered to numerous pileocystidia. Pileocystidia 14–23 × 5.0–8.0 µm, lecythiform like cheilocystidia, with neck 1.8–3.0 × 1.2–1.8 µm and capitulum 4.0–6.0 µm broad; often with slightly thickened, brown wall. Stipitipellis a cutis made up of hyaline and pale yellow hyphae, 2.0–7.0 µm wide, with clusters of caulocystidia. Caulocystidia 13–25 × 5.0–12 µm, lecythiform with short neck (1.4–2.3 × 1.2–1.8 µm) and rather small capitulum, 4.0–6.5 µm broad; in addition stipe with subglobose elements up to 9.5 µm broad; lageniform or filiform cystidia lacking. Clamp-connections present. Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, often solitary, on soil in both deciduous forests and open grasslands, usually on heavy, calcareous soils, e.g., in limestone grasslands (*Mesobromion*), on river dikes (*Arrhenatheretum*), and in hornbeam-oak forests (*Stellario-Carpinetum*). In the Netherlands rarely recorded but easily overlooked and distribution insufficiently known due to misidentifications. Aug.–Nov. Widespread in Europe.

Typical collections of *Conocybe dumetorum* are well-characterised by the presence of small, slightly verrucose spores with a papilla. However, the ornamentation is only visible under an oil-immersion lens of good quality and in some collections not detectable at all with a light microscope (but always roughened as observed with scanning electron microscopy, see Hausknecht in Österr. Z. Pilzk. 4: figs. 11a–c. 1995). Moreover, in some collections all spores are ellipsoid without a papilla at apex. In view of the variation in the spore characters, Hausknecht (in Österr. Z. Pilzk. 4: 107–117. 1995) distinguished three varieties: var. *dumetorum* with verruculose spores with an apical papilla, and cheilocystidia with capitulum mostly over 5 µm broad; var. *austriaca* A. Hauskn. with ellipsoid, verruculose spores and cheilocystidia with capitulum 3.5–6.0 µm broad; and var. *phaeoleiospora* A. Hauskn. with ellipsoid to ovoid, smooth spores (as seen with light microscope), and cheilocystidia with capitulum 3.2–4.0(5.5) µm broad. Later on, Hausknecht (in Czech Mycol. 51: 51. 1999) found out that the type-collection of *C. dumetorum* belonged to var. *austriaca*, which is consequently a synonym of var. *dumetorum*. The variety with verruculose spores with an apical papilla should be named now *C. dumetorum* var. *laricina* (Kühner) A. Hauskn. The collections from the Netherlands combine characteristics of several varieties, e.g., a mixture of smooth and verruculose and/or ellipsoid spores with or without a papilla. Also a collection with smooth smooth, papillate spores was found that does not fit into the proposed varieties. Therefore, smooth these varieties are not distinguished in this Flora.

Variants of *Conocybe dumetorum* with smooth, ellipsoid spores may be confused with *C. microspora* or *C. roberti*. The spores in the latter two species have always a distinct germ pore, which is absent or less distinct in *C. dumetorum*. However, some collections may be only distinguished by SEM⁻ study (Hausknecht in Österr. Z. Pilzk. 4: 116. 1995). *Conocybe enderlei* is somewhat similar to *C. dumetorum* in

having ellipsoid spores without pore, but the spores are much darker and *C. enderlei* has much larger basidiocarps.

Sect. **Giganteae** Sing.

Basidiocarps tricholomatoid; pileus fleshy, stipe stout, 8–13 mm thick. Stipe pruinose, not pubescent, rarely with some cylindrical hairs near apex; caulocystidia lecythiform, intermixed with small subglobose elements, rarely with scattered filiform cystidia. Pileocystidia absent. No needle-like crystals formed on fragments of lamellae in ammoniacal solutions.

21. Conocybe intrusa (Peck) Sing. in Sydowia 4: 133. 1950. – Fig. 152.

Cortinarius intrusus Peck in Bull. Torrey bot. Club 23: 416. 1896. — *Conocybe hebelomatoides* Middelhoek & Reijnders in Reijnders in Meded. Ned. mycol. Vereen. 30: 116. 1952; *Conocybe intrusa* f. *hebelomatoides* (Middelhoek & Reijnders) Watling in Notes R. bot. Gdn Edinb. 35: 289. 1977.

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 380. 1995; D. Reid in Fung. rar. Ic. col. 3: pl. 23a. 1968.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 302, figs A–E. 1995; Middelhoek & Reijnders in Meded. Ned. mycol. Vereen. 30: I–V. 1952 (as *C. hebelomatoides*); D. Reid in Fung. rar. Ic. col. 3: 23–26, figs 12a–g. 1968; Watling in Br. Fung. Fl. 3: 81–82, figs. 85–90. 1982; Watling in Notes R. bot. Gdn Edinb. 35: 281–293, figs 1–2. 1977.

VERN. NAME — Reuzenbreeksteel.

Pileus 20–60(80) mm broad, 5–15 mm high, convex to plano-convex when young, soon applanate to slightly depressed, not hygrophanous, ivory white, cream-coloured, beige to ochre-yellow or pale pink, often centre slightly darker isabella, flesh-coloured to yellow-brown, slightly viscid when moist and fresh, soon dry, subtomentose, glabrous, smooth or radially wrinkled; margin often slightly sulcate; surface usually partially covered with adhering soil and litter. Lamellae, L = 60–100, l = 3–7, crowded, adnexed to free, segmentiform or slightly ventricose, up to 5 mm broad, ivory white to cream-coloured at first, soon ochraceous, finally orange-brown to rusty brown, occasionally with olivaceous tone, with white fimbriate edge. Stipe 25–70 × (3)5–13 mm, subcylindrical to clavate, at base thickened to bulbous, up to 20 mm thick, solid to fistulose, whitish to cream-coloured, becoming only slightly darker in lower half with age, pruinose at least at apex, downwards also slightly fibrillose-striate. Context concolorous with surface, in pileus up to 8 mm thick, firm. Smell weak, earth-like to slightly raphanaceous. Taste similar. Spore print rusty brown.

Spores 5.0–7.5(8.0) × 3.5–5.5 µm, av. 5.8–7.3 × 4.1–4.7 µm, Q = 1.3–1.65, Qav. = 1.35–1.55, not to moderately flattened, ellipsoid to ovoid in side-view and frontal view, rusty brown in ammonia, thick-walled (0.5–1.5 µm), without pore but often wall slightly thinner near apex. Basidia 14–21 × 7.0–8.5 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 16–28 × 6.0–13 µm, lecythiform with subglobose to clavate basal part, short to rather long neck (1.0–5.0 × 1.0–1.5 µm) and small capitulum, 3.0–4.5(5.0) µm broad, hyaline. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated, subglobose elements, 3.0–24 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate to spheropedunculate elements, 23–72 × 12–31 µm, with thin, hyaline walls, sometimes covered with few cylindrical hyphae, 1.5–4.0 µm broad. Pileocystidia absent or scattered, ± 20–24 × 7.0–14 µm, lecythiform as the cheilocystidia, with neck 1.5–2.5 × 1.0–2.0 µm, capitulum 3.5–5.5 µm broad; also occasionally with some short cylindrical hairs, 20–30 × 1.5–2.5 µm. Stipitipellis a cutis, made up of 1.5–6.0 µm broad, hyaline hyphae, with scattered clusters of caulocystidia. Caulocystidia 13–22 × 6.0–13 µm, lecythiform, with neck 1.5–3.0 × 1.0–1.5 µm and capitulum 3.0–4.5 µm broad, intermixed with numerous globose and ellipsoid elements, 5.0–10.0 × 4.0–9.0 µm; cylindrical hairs absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

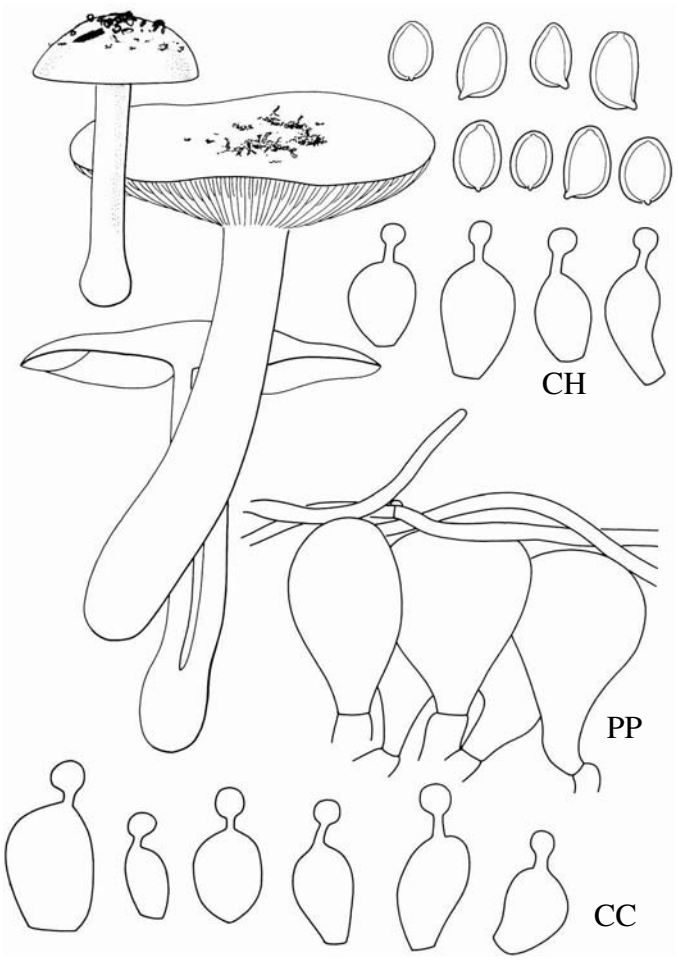


Fig. 152. *Conocybe intrusa*

HABITAT & DISTR. — Saprotrophic, solitary to subgregarious, terrestrial, on humus-rich and peaty soils and compost, on substrates rich in nutrients, in particular nitrogen. In the Netherlands mainly in heated and unheated glasshouses with, e.g., cucumber and flowers and there occasionally abundant, rarely outside buildings in gardens and along paths in parks. Distribution in buildings incompletely known (Hengelo; Kortenhoef; 's-Graveland), outside buildings very rare (Roermond; Rijswijk, Huys te Werve; Helmond). In glasshouses usually in spring and summer (March–July), in the open air July–Dec. Also recorded from other countries in West and Central Europe, usually in glasshouses. Probably introduced, possibly from North America where the species is more widespread.

Within the genus *Conocybe*, *C. intrusa* is unique in its habit with a fleshy, soon expanded pileus and thick, sturdy stipe. The small, thick-walled spores without distinct pore are also very characteristic. The basidiocarps develop to a large extent below the soil surface and the

already expanded pileus pushes up the soil when the stipe stretches, resembling the appearance of some species of *Agaricus*, e.g., *A. bitorquis*. The soil and litter adhering to the pileus surface are also characteristic of *C. intrusa*.

It is more difficult to recognise this fungus at first glance as a representative of *Conocybe*. Its habit is more similar to *Hebeloma* or *Cortinarius* (both genera with a pileipellis of thin hyphae, different spores and mycorrhizal associations) or *Agrocybe*. *Conocyte intrusa* differs from the latter genus in colour of spore print and presence of small lecythiform cystidia.

Sect. **Mixtae** Sing.

Basidiocarps mycenoid, pileus not deliquescent, often pubescent, at least when young; stipe slender, up to 5(7) mm thick, pruinose and pubescent, at least when young; caulocystidia intermixed, lecythiform and lageniform to filiform in approximately similar proportions; pileocystidia filiform; ammonia reaction usually negative, occasionally weak; pseudoparaphyses (pavement cells) in between basidia absent or scarce and difficult to find.

22. Conocybe digitalina (Velen.) Sing. in Fieldiana Bot., n.S. 21: 103. 1989. – Fig. 153.

Galera digitalina Velen., Novit. mycol. nov.: 70. 1947. — *Conocybe subpubescens* Kühner in Botaniste 34: 275. 1949 (invalid); *Conocybe subpubescens* P.D. Orton in Trans. Br. mycol. Soc. 43: 195. 1960.

MISAPPL. — *Conocybe pubescens* sensu J. Lange, Fl. agar. dan. 4: 34. 1939; sensu Kühner, Genre Galera: 86. 1935 (f. typica); *Conocybe cryptocystis* sensu Mos., Röhrlinge Blätterpilze, 4. Aufl.: 281. 1978; sensu auct. eur.; *Conocybe tenera* sensu Rick., Blätterpilze: 225. 1915.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 378. 1995; Cetto, Funghi Vero 6: pl. 2222. 1989 (as *C. cryptocystis*); Dähncke, 1200 Pilze: 582. 1993 (as *C. cryptocystis*); Gerhardt, Gr. Pilzf.: 387 (top). 1999; J. Lange, Fl. agar. dan. 4: pl. 128H. 1939 (as *C. pubescens*).

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 300, figs A–E. 1995; Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 109–110. 1986 (as *C. subpubescens*); A. Hauskn. in Czech. Mycol. 51: 49, figs 4a–d. 1999; Krieglst. et al. in Z. Mykol. 50: 55. 1984 (as *C. subpubescens*); Kühner, Genre Galera: 86–89, fig. 23. 1935 (as *C. pubescens* f. typica); P.D. Orton in Trans. Br. mycol. Soc. 43: 195. 1960 (as *C. subpubescens*); Watling in Br. Fung. Fl. 3: 68–69. 1982 (as *C. subpubescens*).

VERN. NAME — Moerasbreeksteeltje.

Pileus 12–32 mm broad, campanulate or obtusely conical, then weakly expanding to conico-convex or convex, hygrophanous, when moist vividly coloured, brownish orange, orange-brown to date brown (K. & W. 5C7, 8, 5D7, 6C7, C8-D8), translucently striate up to centre, on drying pale ochraceous to buff (5B4, 4B4), minutely pubescent under a hand-lens when young, gradually becoming almost glabrous. Lamellae, L = 19–36, l = 3–7, moderately distant to fairly crowded, adnexed, up to 3.5 mm broad, segmentiform to slightly ventricose, pale ochraceous, then brownish orange to orange-brown or rusty brown with minutely flocculose, paler edge. Stipe 30–110 × 1.5–3(4) mm, cylindrical or slightly thickened at base to subbulbous (up to 5 mm), fistulose, pale yellow to ochraceous at first, becoming pale orange-brown to reddish brown (6C7, 7C6) from base upwards, minutely pruinose-striate, in addition densely pubescent (hand-lens). Context concolorous with surface with surface. Smell weak, not distinctive. Taste mild, not distinctive.

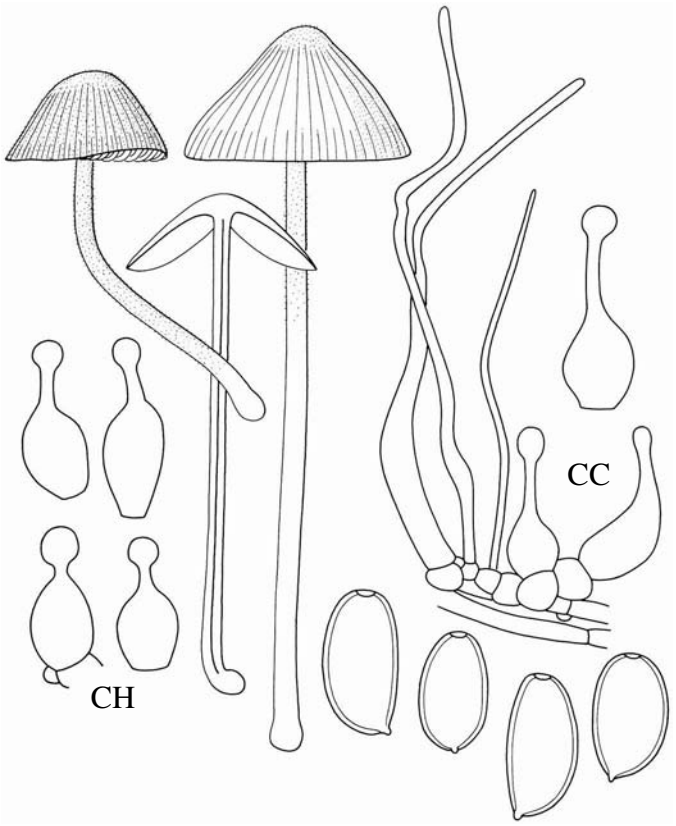


Fig. 153. *Conocybe digitalina*

Spores 10.0–13.5(14.0) × (5.5)6.0–7.5 µm, av. 10.7–11.5 × 6.4–6.8 µm, Q = 1.6–2.0, Qav. = 1.65–1.8, not flattened, ellipsoid-oblong to slightly amygdaliform in side-view, orange-brown in water and ammonia, slightly thick-walled (± 0.5 µm) with large, central germ pore, 1.3–2.0 µm wide. Basidia 17–27 × 8.5–11 µm, clavate, 4-spored. Lamella edge sterile or almost sterile, made up of densely packed cystidia. Cheilocystidia 13–25 × 6.5–11.5 µm, lecythiform with ellipsoid to broadly fusiform basal part, tapering into a short to moderately long neck (2.0–5.0 × 1.5–2.0 µm), with a small capitulum, 3.5–5.0(5.5) µm broad. Hymenophoral trama made up of cylindrical and strongly inflated elements, 3.0–28 µm broad, often with yellow-brown parietal pigment. Pileipellis an epithelioid hymeniderm, made up of pyriform, spheropedunculate and subglobose elements, 15–40 × 8.0–19 µm, hyaline or with pale brown walls, intermixed with scattered to numerous hairs. Pileocystidia 40–130 × 1.0–3.0 µm, filiform, often slightly enlarged to the base, up to 5.0 µm broad, hyaline. Stipitipellis a cutis made up of repent hyphae, 2.0–5.0 µm broad, with clusters of cystidia. Caulocystidia a mixture of (1) lecythiform cystidia, 15–27 × 6.0–10 µm, similar to cheilocystidia but often with longer neck (2.0–9.5 × 1.5–2.5 µm) and capitulum 3.5–5.0(5.5) µm broad; (2) globose, clavate, ovate and utriform elements, 7.0–16 × 4.0–10 µm; (3) slender, often tortuous, cylindrical hairs up to 120 × 1.0–2.5 µm, often up to 5.0 µm broad at base. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in groups, terrestrial, mostly in shady, wet to moist, often in winter inundated habitats, on moderately acidic to basic, peaty, sandy and loamy soils, such as *Salix* scrub, *Alnus* forests and along ditches; occasionally in drier places or in moist grasslands. Aug.–Oct. (Nov.). Widespread and fairly common

in the Netherlands but distribution insufficiently known because of confusion with related species. Probably widespread in most of Europe.

Conocybe digitalina is closely related to *C. pulchella* and by some authors regarded as doubtfully distinct (Enderle in Z. Mykol. 60: 45. 1994). However, *C. digitalina* differs not only in generally larger basidiocarps with thicker stipe and more lamellae, but also in the consistently smaller spores and narrower basidia. These characters were already noticed by Kühner (Genre Galera: 88. 1935), but not used in his key. Moreover, the habitat preferences are different. *C. digitalina* is usually found in damp places in forests, whereas *C. pulchella* mainly grows in dry grasslands. However, *Conocybe digitalina* is occasionally found in grasslands and *C. pulchella* sometimes in forest communities.

23. Conocybe pulchella (Velen.) Hauskn. & Svrček in Czech Mycol. 51: 58. 1999. – Fig. 154.

Galera pulchella Velen., České Houby: 543. (1920) 1921. – *Conocybe pubescens* var. *pseudopilosella* Kühner, Genre Galera: 89. 1935 (invalid); *Conocybe pseudopilosella* (Kühner) Kühn. & Romagn., Fl. anal. Champ. sup.: 346. 1953 (invalid); *Conocybe pseudopilosella* Kühn. & Watl. in Notes R. bot. Gdn. Edinb. 38: 336. 1980.

EXCL. — *Conocybe pseudopilosella* sensu Breitenb. & Kränzl., Pilze Schweiz 4: 306. 1995 (= *C.* spec.).

SEL. ICON. — M. Bon, Mushr. Toadst.: 261. 1987; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 5 (lower fig.). 1994; R. Phillips, Paddest. Schimm.: 155. 1981 (all as *C. pseudopilosella*).

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 305–306, fig. 125. ('1982')1983; Enderle in Z. Mykol. 60: 43–45. 1994; Kühner, Genre Galera: 89–91, fig. 24. 1935; Watling in Br. Fung. Fl. 3: 66, figs 146, 147. 1982. (all as *C. pseudopilosella*).

VERN. NAME — Harig breeksteeltje.

Pileus 5–20 mm broad, campanulate to obtusely conical at first, then conico-convex, only slightly expanding, hygrophanous, when moist vividly coloured, brownish orange, orange-brown to rusty brown (K. & W. 6C7, 6D8, 7D8), translucently striate up to centre, minutely pubescent (hand-lens) when young, often appearing glabrous in age, on drying fading to pale ochre-brown or ochraceous buff. Lamellae, L = 12–20, l = 1–3(7), moderately crowded, adnexed, slightly ventricose, up to 3.5 mm broad, pale ochraceous then orange-brown to rusty brown with minutely flocculose, slightly paler edge. Stipe (25)40–80 × 0.5–2 mm, usually very slender, cylindrical or subbulbous at base, up to 3 mm broad, fistulose, pale yellow to ochraceous at first, becoming orange-brown to rusty brown from base upwards, minutely pruinose-striate, in addition pubescent at least at apex (hand-lens). Context thin, concolorous with surface. Smell weak, not distinctive. Taste mild or slightly raphanaceous. Spore print rusty brown.

Spores (11.0)11.5–16.5 × 6.5–9.0 µm, av. 13.0–14.2 × 7.3–8.0 µm, Q = (1.6)1.7–2.1, Qav. = 1.75–1.95, not flattened, ellipsoid-oblong in frontal view, ellipsoid-oblong to subamygdaliform in side-view, orange-brown to rusty brown in water and ammonia, slightly to rather thick-walled (0.5–1.0 µm), with large, central germ pore, 1.5–2.5 µm wide. Basidia 18–25(34) × 10–14(16) µm, broadly clavate, 4-spored. Lamella edge sterile, made up of densely packed cystidia. Cheilocystidia (13)15–21 × 6.0–10.5 µm, lecythiform with clavate, fusiform or ellipsoid basal part, rather short cylindrical or tapering neck (1.5–3.0 × 1.0–2.0 µm) and small capitulum, 2.5–4.5 µm broad; sometimes part of cystidia with pale brown wall. Hymenophoral trama made up of cylindrical to subglobose elements, 4.0–30 µm broad, often with brownish yellow parietal pigment. Pileipellis an epithelioid hymeniderm,

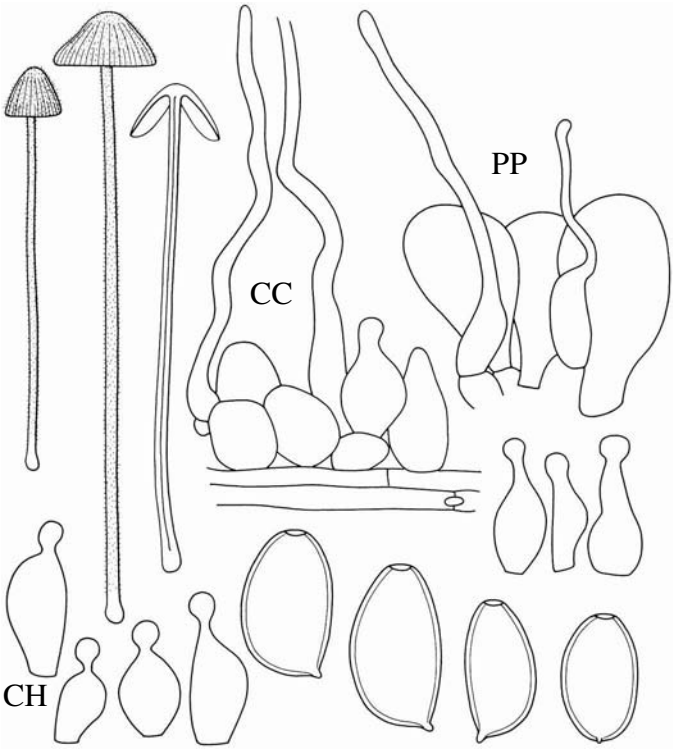


Fig. 154. *Conocybe pulchella*

made up of pyriform, spheropedunculate and subglobose elements, 22–40 × 12–25 µm, often with brown pedicel, intermixed with scattered to numerous hairs. Pileocystidia filiform, up to 70 × 1.0–2.0 µm, often tortuous and with swollen base, 3.5–5.5 µm broad. Stipitipellis a cutis, made up of repent hyphae, 2.0–5.0 µm broad, with clusters of cystidia. Caulocystidia a mixture of (1) lecythiform cystidia, 14–21 × 6.0–10 µm, similar to cheilocystidia but often with longer, tapering neck (2.0–6.5 × 1.5–2.5 µm) and capitulum 3.0–4.5 µm broad; (2) globose, clavate and ovate elements without capitulum, 8.0–15 × 5.0–9.0 µm; (3) thin, cylindrical, often tortuous hairs up to 90 × 1.0–2.0 µm, sometimes slightly broader towards base, up to 3.5 µm broad. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, usually on dry, weakly acidic to basic, often fertilised, sandy and loamy soils in grasslands and grassy roadside verges; occasionally found in herb-rich forest and scrub, also on moist, peaty soils. Aug.–Nov. Widespread and not uncommon in the Netherlands but distribution insufficiently known because of confusion with related species. Probably widespread in most of Europe.

Within sect. *Mixtae*, *C. pulchella* is recognised by its small, hardly expanding, vividly coloured pileus, slender stipe and fairly large spores borne on 4-spored basidia. *Conocybe pubescens* differs in larger spores, and it usually grows on dung. For differences with *C. digitalina* see notes on that species.

24. Conocybe pubescens (Gillet) Kühner, Genre Galera: 85. 1935. – Fig. 155.

Galera pubescens Gillet, Hyménomycètes: 553. 1876. — *Galera megalospora* J. Schaeff. in Z. Pilzk. 9: 170. 1930. — *Conocybe pinetorum* Watling et al. in Bol. Soc. micol. Madrid 11: 85. 1986.

MISAPPL. — *Galera pilosella* sensu Rea, Brit. Basidiomyc.: 407. 1922.

EXCL. — *Conocybe pubescens* sensu Kühner, Genre Galera: 85. 1935; J. Lange, Fl. agar. dan. 4: 34. 1939 (= *C. digitalina*).

SEL. ICON. — Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 203. 1985; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 1 (upper fig.). 1992.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 59: 33–35, figs. 1993; Watling in Br. Fung. Fl. 3: 66–67, figs 77, 116. 1982; Watling et al. in Bol. Soc. micol. Madrid 11: 85–89, figs 8A–E, G–J. 1986 (as *C. pinetorum*).

VERN. NAME — Donzig breeksteeltje.

Pileus (7)9–20(30) mm broad, 7–13 mm high, obtusely conical to campanulate at first, hardly expanding in age, hygrophanous, when moist brownish orange to warm orange-brown (K. & W. 6D7, 7D7), slightly paler towards margin, translucently striate from 1/4 to 3/4 of the radius, on drying soon non-striate, pale brownish orange to ochraceous (5B4, 5C6, 5C7), minutely pubescent at first (hand-lens), often appearing glabrous in age. Lamellae, L = 16–20, l = (1)3, rather crowded, adnexed to adnate, ascending, pale ochraceous at first, then orange-brown to rusty brown with slightly paler flocculose edge. Stipe 40–100(130) × 1–3 mm, cylindrical or slightly thickened downwards, with or without small basal bulb, fistulose, pale ochre-yellow to cream-coloured at apex, pale brownish orange below, becoming orange-brown from base upwards, entirely pruinose-striate lengthwise, in addition pubescent under a hand-lens. Context concolorous with surface, fragile.

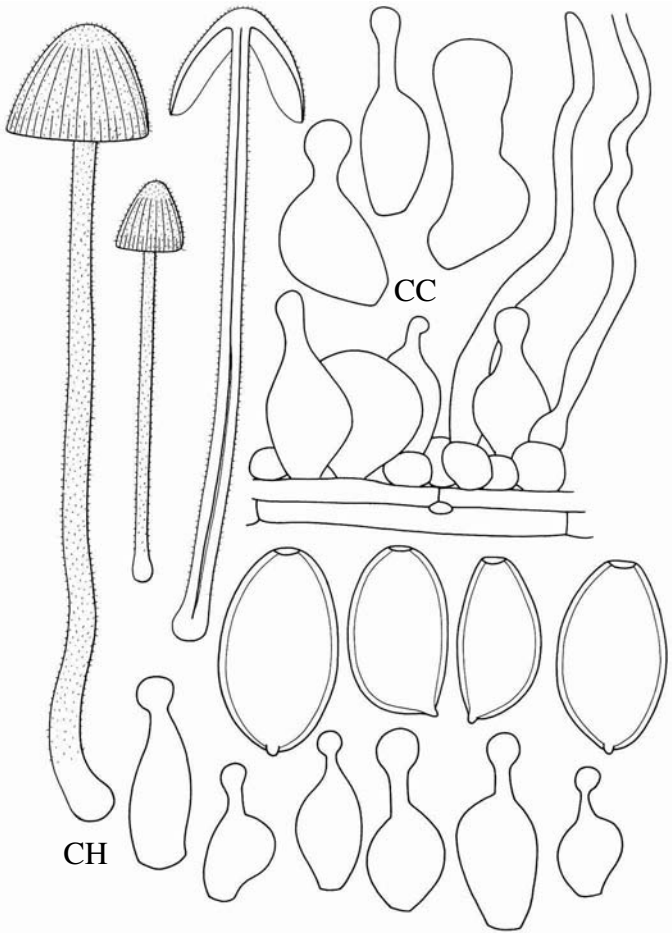


Fig. 155. *Conocybe pubescens*

Smell very weak, not distinctive. Taste mild, not distinctive. Spore print rusty brown.

Spores (13)14–18.5(20) × (7.0)7.5–10.0 µm, av. 14.6–17.0 × 8.2–9.2 µm, Q = 1.6–2.0(2.1), Qav. = 1.75–1.9, not flattened, ellipsoid-oblong to subamygdaliform in side-view, slightly thick-walled (< 0.5 µm), with large apical germ pore, 2.0–3.0 µm wide, orange-brown in ammonia. Basidia 18–36 × 11–16 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 17–25(30) × 7.0–11 µm, lecythiform with subglobose to ellipsoid basal part, gradually tapering into a short to rather long neck (1.5–6.0 × 1.5–2.0 µm), with small, globose capitulum, 3.5–4.5(5.5) µm broad. Pleurocystidia absent. Hymenophoral trama made up of subcylindrical to strongly inflated, subglobose elements, 3.0–23 µm broad, often with pale yellow wall. Pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate elements, 28–56 × 15–33 µm, with yellow-brown wall, often with darker brown pedicel, intermixed with scattered, filiform hairs. Pileocystidia up to 120 × 2.5–5.0 µm, filiform, often with broader base, up to 8.0 µm, often with yellow-brown or orange-brown content. Stipitipellis a cutis made up of parallel hyphae, 3.0–7.0 µm broad, with clusters of cystidia. Caulocystidia a mixture of (1) scattered to numerous lecythiform cystidia, 17–30 × 8.0–12 µm, similar to cheilocystidia but more irregular, often with longer and thicker neck (2.0–9.0 × 2.0–3.5(6.0) µm) and larger capitulum, 3.0–6.5(8.5) µm broad; (2) subglobose, ellipsoid and lageniform elements, 12–18 × 10–15 µm; (3) slender, cylindrical, often tortuous hairs up to 150 µm long, as the pileocystidia, often with brown contents. Clamp-connections present, but occasionally scarce. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, usually in small groups on old dung of horse or cow, characteristic of straw-rich excrements in semi-natural grasslands, also on manured soil in grasslands and occasionally on litter or humus in deciduous and coniferous forests. July–Nov. Widespread but uncommon in the Netherlands. Widespread elsewhere in Europe and common in some regions. Recorded from most continents and apparently cosmopolitan.

Conocybe pubescens is recognised by the large spores in combination with 4-spored basidia and mixed covering of the stipe. It has been thought for a long time that this species was restricted to dung or heavily manured soil. However, *C. pinetorum*, described from pine wood-chips in Spain, seems to be identical with *C. pubescens*. Other collections were made on humus-rich soil in such a deviating habitat as subalpine scrub of *Alnus viridis*. Consequently, only microscopic study can discriminate between terrestrial populations of *C. pubescens* on the one hand and *C. pulchella* and *C. digitalina* on the other. The latter two species have never been reported from dung. Dung-inhabiting collections of *C. pubescens* may be confused in the field with *C. merdaria*, different in 2-spored basidia and smaller spores, as well as *C. lenticulospora*, a much rarer species with duller brown colours and in addition smaller, flattened spores and a hairy stipe without lecythiform cystidia.

25. **Conocybe merdaria** Arnolds & Hauskn. in Persoonia 18: 239. 2003.

SEL. DESCR. & FIGS. — Arnolds & Hauskn. in Persoonia 18: 239–241, fig. 1. 2003.

CHARACTERISTICS — Pileus 15–18 mm broad, 12–16 mm high, conico-campanulate, hygrophanous, when moist and fresh orange-brown, on drying becoming pale orange (K. & W. 5B5) at centre, ochraceous orange (5B4) towards the margin, pubescent (hand-lens); lamellae, L = 20–22, l = 3, crowded, adnexed, ventricose, up to 4 mm broad, rusty brown when mature, with white flocculose edge; stipe 50–75 ×

1–1.5 mm, cylindrical, slightly thickened towards base, not rooting, pale ochre-yellow at first, then becoming flesh-coloured brown in lower half from base upwards, entirely pruinose-striate and pubescent; context fragile, concolorous with surface; smell and taste weak, not distinctive; spore print not recorded.

Spores (11.0)12.0–15.0 × (6.5)7.5–9.5 µm, av. 13.7–14.1 × 8.1–8.4 (11.0)12.0–15.0 × (6.5)7.5–9.5 µm, Q = 1.5–1.9, Qav. = 1.6–1.75, not or slightly flattened, ellipsoid-oblong to ovoid-oblong, orange-brown in ammonia, moderately thick-walled (0.5–1.0 µm) with apical germ pore, 2.0–2.5 µm wide; basidia 16–22 × 10–11 µm, 2-spored; lamella edge sterile; cheilocystidia 14–19 × 6.0–10.5 µm, lecythiform with ellipsoid to clavate basal part, short neck (1.0–3.0 × 1.0–2.0 µm) and small capitulum, 3.0–5.0 µm broad, hyaline; pleurocystidia absent; hymenophoral trama made up of cylindrical and inflated elements, 4.0–18 µm broad. Pileipellis an epithelioid hymeniderm, made up of spheropedunculate and clavate elements, 18–47 × 12–30 µm, often with yellowish pedicel; pileocystidia scarce, lecythiform like cheilocystidia but larger, 26–33 × 7.5–9.5 µm with neck 4.5–7.5 × 1.0–2.0 µm and capitulum 3.5–4.5 µm broad, in addition some cylindrical hairs up to 40 × 2.0–3.0 µm; stipitipellis a cutis, made up of repent hyphae, 2.0–6.0 µm broad; caulocystidia a mixture of (1) numerous lecythiform cystidia, 15–20 × 6.0–9.0 µm with neck 1.5–4.0 × 1.0–2.0 µm and capitulum 2.5–4.5 µm broad; (2) numerous globose and ellipsoid to lageniform elements, 10–17 × 8–14 µm; (3) cylindrical hairs, 30–130 × 2.0–4.0 µm, often with brown content. Clamp-connections not seen. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on old dung of horse and cattle in semi-natural grasslands. Sept.–Oct. Not yet recorded from the Netherlands, but collected close to the eastern border in the Teutoburgerwald-region, Germany, and in various localities in Austria.

Conocybe merdaria is close to *C. pubescens* in its coprophilous habitat, macroscopical appearance, and stipe covering of lecythiform cystidia and hairs, characteristic of sect. *Mixtae*. It differs from that species mainly in the exclusively 2-spored basidia. In addition the spores are distinctly smaller than in the 4-spored *C. pubescens*.

Within sect. *Mixtae*, *C. ambigua* is another 2-spored species with spores in the same size range. However, that species differs from *C. merdaria* in the terrestrial habitat and narrower spores (in collections from the Netherlands (10.0)10.5–15.5(16.5) × 5.5–7.5(8.5) µm, av. 12.5–14.0 × 6.3–7.0 µm) that are, moreover, subamygdaliform in side-view. The related *C. rubiginosa* has considerably longer spores and also grows on soil.

26. Conocybe cettoiana Hauskn. & Enderle in Z. Mykol. 58: 198. 1992. – Fig. 156.

SEL. ICON. — Cetto in Boll. Gruppo micol. G. Bres. 37: 149. 1994; Cetto, Funghi Vero 7: pl. 2655. 1993; Enderle in Z. Mykol. 57: pl. opposite p. 96. 1991 (as *Conocybe* spec. 1).

SEL. DESCR. & FIGS. — Cetto in Boll. Gruppo micol. G. Bres. 37: 147–151. 1994; Enderle in Z. Mykol. 57: 93–94, figs. 1991 (as *Conocybe* spec. 1); A. Hauskn. in Österr. Z. Pilzk. 5: 174–175, figs. 4a–f. 1996; A. Hauskn. & Enderle in Z. Mykol. 58: 197–200. 1992.

VERN. NAME — Witwortelbreeksteeltje.

Pileus 20–30 mm broad, 10–15 mm broad, hemispherical, hygrophanous, when moist and fresh orangey brown (K. & W. 6D8), only slightly paler towards margin, translucently striate up to one-fourth of the radius, on drying soon not striate, fading to pale greyish orange (5B3), slightly rugulose at centre, not pubescent. Lamellae rather crowded, adnexed, slightly ventricose, up to 5 mm wide, orangey brown (6D6-7) with slightly paler edge. Stipe 50–60 × 2.5–3 mm (without root), slightly thicker to base, fistulose, white then pale ochraceous, entirely pruinose-striate, in addition pubescent (hand-lens), in particular at apex; base tapering into a white root up to 35 mm long, often curved and fragile. Context concolorous with surface. Smell and taste weak, not distinctive. Spore print not recorded.

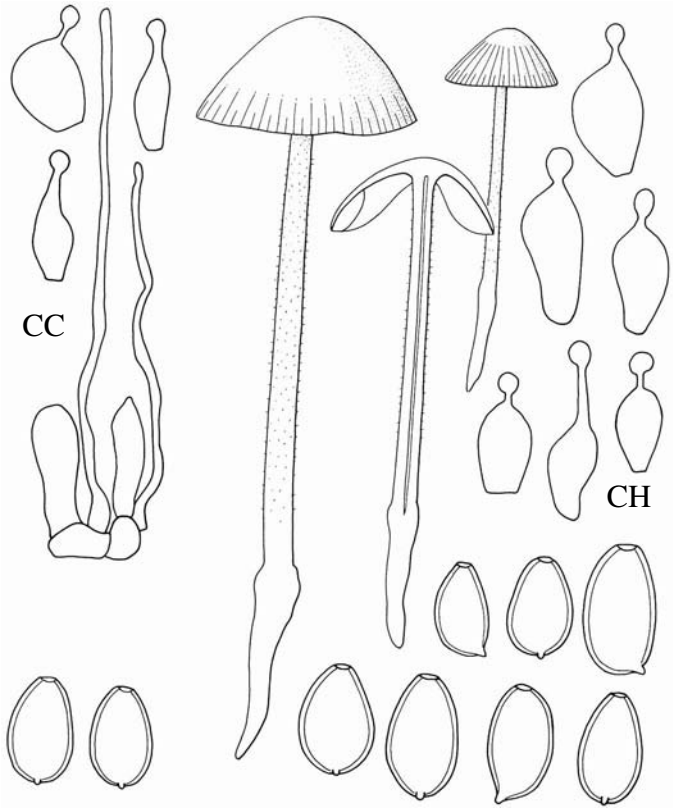


Fig. 156. *Conocybe cettoiana*

Spores 8.5–11.5 × 5.5–6.5 × (4.5)5.0–6.0 µm, av. 9.6–10.5 × 5.9–6.2 × 5.2–5.5 µm, flattened, in frontal view ovoid to ovoid-oblong, some slightly hexagonal (Q = 1.4–1.7(1.8), Qav. = 1.55–1.65), in side-view ellipsoid-oblong to subamygdaliform (Q = 1.6–2.0, Qav. = 1.8–1.9), orange-brown in ammonia, thick-walled (0.6–1.2 µm), with large apical germ pore, 1.2–1.6 µm broad. Basidia 22–28 × 9.0–11 µm, 4-spored. Lamella edge sterile. Cheilocystidia 21–27 × 9.0–12 µm, lecythiform with ovoid to clavate basal part, short to long neck (1.5–6.0 × 1.0–1.5 µm) and small capitulum, 3.0–4.2 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 5.0–25 µm broad, with hyaline or pale yellow wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 23–47 × 9.0–22 µm, hyaline, thin-walled. Pileocystidia absent. Stipitipellis a thin cutis, made up of cylindrical hyphae, 1.5–5.0 µm broad, with hyaline or pale yellow wall. Caulocystidia variable: (1) numerous lecythiform like cheilocystidia but often smaller, 15–20 × 5.0–10.0 µm with neck 2.0–4.5 × 1.5 µm and capitulum 3.0–4.0 µm broad; (2) numerous globose, clavate to utriform elements, 4.5–15 × 4.5–7.5 µm; (3) numerous cylindrical, often tortuous hairs, 35–140 × 1.5–2.0 µm, often with brown refractive content. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary, in small groups or subfasciculate, in strongly manured meadow grazed by sheep, elsewhere

recorded from cow dung and compost. In the Netherlands very rare (Wijster, Linthorst-Homan Kanaal) but possibly confused with other rooting species in the past. Oct. Also recorded from Italy, Austria, and Finland.

The above description is exclusively based on the two collections from a single locality in the Netherlands. They differ in some details from the original description of *C. cettoiana*, viz. in clearly flattened, slightly smaller spores with thicker wall. In this respect they approach *C. antipus*, but in that species the spores are slightly smaller, stronger flattened, and more distinctly hexagonal. In addition the caulocystidia in *C. antipus* are almost exclusively lecythiform, and hairs are absent or extremely rare. *Conocybe cettoiana* was originally described with a pileipellis of spheropedunculate elements intermixed with numerous lecythiform pileocystidia. In our collection pileocystidia are absent, but this character is variable in many species and of doubtful taxonomic importance.

According to Hausknecht (in letter) several collections of *Conocybe cettoiana* are known at present with smaller, flattened spores, linked by intermediates with the original collections from Italy with nonflattened spores. He confirmed the identification of the collection from the Netherlands. The relationship with *C. antipus* remains to be studied further. *C. cettoiana* and *C. antipus* may represent variants of a single, variable species.

A related species is *Conocybe fiorii* (D. Sacc.) Watling, also with a rooting stipe, covered with a mixture of lecythiform cystidia, lageniform cystidia and cylindrical hairs. According to Hausknecht (in Österr. Z. Pilzk. 5: 180–181, figs 5 f–k. 1996) it differs from *C. cettoiana* in the predominantly 2-spored basidia, larger spores, measuring (10.5)11.5–14.5 × (6.5)7.5–9.5 µm, av. 12.8 × 8.1 µm, larger basidiocarps (pileus 20–40 mm, stipe 40–50 × 1.5–2 mm), and different habitat on bare sand in a riverbed. The size of the basidiocarps is no differentiating character (see description of *C. cettoiana*), but the dark red-brown colour of the pileus is an additional difference (see photograph and description by Hausknecht and Zuccherelli in Boll. Gruppo micol. G. Bres. 41: 100. 1998). So far *C. fiorii* is only known from two places in Italy.

27. Conocybe ambigua Watling in Notes R. bot. Gdn Edinb. 38: 331. 1980. – Fig. 157.

Conocybe siliginea var. *ambigua* Kühner, Genre Galera: 106. 1935 (invalid); *Galera ambigua* (Kühner) J. Lange in Dansk bot. Ark. 9: 38. 1938 (invalid); *Conocybe ambigua* (Kühner) Sing. in Lilloa 22: 485. ('1949') 1951 (invalid).

EXCL. — *Conocybe ambigua* sensu Mos. & Jül. (= *C. bispora*).

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 375. 1995; J. Lange, Fl. agar. dan. 4: pl. 129D. 1939.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 298, figs A–E. 1995; Derbsch & Schmitt, Atlas Pilze Saarland 2: 299. 1987; A. Hauskn. in Österr. Z. Pilzk. 7: 116–119, figs 7g–k. 1998; Kühner, Genre Galera: 106–108, fig. 30. 1935; Watling in Br. Fung. Fl. 3: 69–70, figs 109, 153–156. 1982.

VERN. NAME — Gazonbreeksteeltje.

Pileus 7–20(23) mm broad, 5–18 mm high, paraboloid, obtusely conical to conico-convex, hardly expanding, hygrophanous, when moist vividly coloured, yellow-brown to orange-brown, (K. & W. 6D6, 6D7) darker reddish brown striate up to the warm brown centre (7E7), on drying soon not striate, ochraceous to flesh-coloured (5D5, 6C5), dull, smooth, pubescent (hand-lens) when young. Lamellae, L = 15–19, l = 3(7), rather crowded, adnexed, slightly ventricose, cream-coloured when young, then ochre-brown to orange-brown (e.g., 6D7) with paler, flocculose edge. Stipe (25)30–70(90) × 0.5–1.5 mm, cylindrical, base often subbulbous (2 mm), fistulose, whitish at first, then ochraceous, becoming reddish brown with age from base upwards, minutely pruinose and pubescent (hand-lens). Context concolorous with surface, very thin. Smell weak, fungoid. Taste weak, mild. Spore print rusty brown.

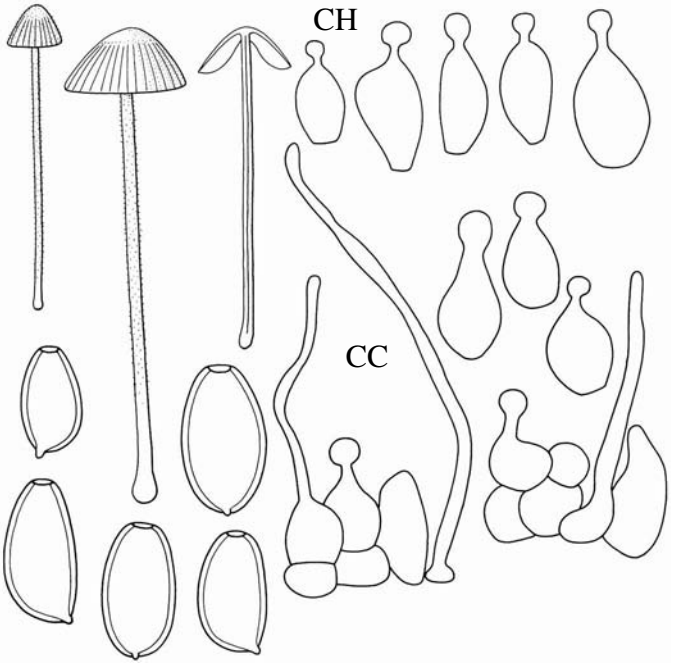


Fig. 157. *Conocybe ambigua*

Spores (10.0)10.5–15.5(16.5) × 5.5–7.5(8.5) µm, av. 12.5–14.0 × 6.3–7.0 µm, Q = 1.7–2.1(2.2), Qav. = 1.85–2.0, not flattened, ellipsoid-oblong to ovoid-oblong in frontal view, in side-view mainly subamygdaliform, orange-brown in ammonia, rather thick-walled (up to 1.0 µm), with large central germ pore, 2.0–2.5 µm wide. Basidia 17–28 × 8.0–11 µm, clavate, 2–(1) spored. Lamella edge sterile. Cheilocystidia 14–25 × 6.0–11 µm, lecythiform with ellipsoid to clavate basal part, short neck (1.0–2.8 × 1.2–1.8 µm) and small capitulum, (2.0)2.5–4.0 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 5.0–30 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate to spheropedunculate elements, 22–60 × 12–28 µm, often with brown pedicels, usually intermixed with cylindrical hairs. Pileocystidia rare to numerous, filiform, flexuous, up to 80 µm × 1.5–2.8 µm, sometimes broader at base, hyaline. Stipitipellis a cutis made up of repent hyphae, 2.0–7.0 µm broad, with clusters of caulocystidia. Caulocystidia a mixture of (1) lecythiform cystidia, 13–22 × 6.0–10 µm, similar to cheilocystidia but more variable, often with thick neck (1.4–2.8 × 1.4–2.8 µm) and with small capitulum, 3.5–5.0 µm broad; (2) subglobose, clavate and ovate elements up to 18 × 10 µm; (3) narrowly lageniform to filiform elements, 37–100 µm long, with long cylindrical neck, 2.0–3.0 µm broad, occasionally swollen at base up to 10 µm. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, often solitary or in small groups, on soil or litter, usually in grasslands, parks, lawns, and along roadsides on basic, sandy and loamy soils rich in minerals, occasionally in forests. Distribution insufficiently known, in the Netherlands probably rare. July–Oct. Widespread in Europe but uncommon.

Conocybe ambigua is recognised by the pubescent and pruinose stipe in combination with 2-spored basidia and large spores that are mostly subamygdaliform in side-view. Most collections deposited in Dutch herbaria under the name *C. ambigua* appeared to belong to *C. rubiginosa*, which seems to be much more common in the Netherlands. See also remarks on *C. rubiginosa*. Some other collections belonged to *C. siliginea*, a species showing some similarity to *C. ambigua* in equally large spores and 2-spored basidia, but different in the pale, non-striate pileus, absence or scarce occurrence of lecythiform caulocysidia, and the shape of spores, being ellipsoid in side-view.

28. Conocybe rubiginosa Watling in Notes R. bot. Gdn Edinb. 38: 353. 1980. – Fig. 158.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 389. 1995; Enderle in Z. Mykol. 63: 8. 1997.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 307, fig. 126 ('1982') 1983; Breitenb. & Kränzl., Pilze Schweiz 4: 308, figs A–E. 1995; Enderle in Z. Mykol. 63: 16–18, fig. 9. 1997; Watling in Notes R. bot. Gdn Edinb. 38: 353–354, figs 1, 2H, 4G–I. 1980; Watling in Br. Fung. Fl. 3: 67–68, figs 143–145. 1982.

VERN. NAME — Wimperbreeksteeltje.

Pileus 6–18 mm broad, 6–13 m high, paraboloid, campanulate to conico-convex, hardly expanding, hygrophanous, when moist orange-brown, date-brown, rusty brown to reddish brown (e.g., K. & W. 6C7, D8, 7D7, D8, 7D7-8D7), often gradually paler towards margin, translucently striate up to 1/3 to 9/10 of radius, soon non-striate, on drying pale brownish orange or ochraceous, minutely pubescent at first (hand-lens), then appearing glabrous. Lamellae, L = 14–20, l = 3, moderately crowded to crowded, adnexed, ventricose, orange-brown to rusty brown, with slightly paler flocculose edge. Stipe (30)50–100(160) × 1–1.5(2) mm, slender, cylindrical or slightly swollen at base to distinctly bulbous (up to 3.5 mm broad), pale yellow to pale orange at first, often darker orange-brown downwards, gradually becoming entirely orange-brown or reddish brown from base upwards, pruinose and minutely pubescent (hand-lens), at least at apex. Context concolorous with surface. Smell weak, not distinctive or raphanaceous. Taste mild, not distinctive. Spore print rusty brown.

Spores 13.0–18.0(21.0) × 7.5–10.5(11.0) µm, av. 15.0–17.0 × 8.2–9.5 µm, Q = (1.5)1.6–1.9(2.0), Qav. = 1.75–1.85, not flattened, ellipsoid-oblong in side-view and frontal view, yellow-brown to orange-brown in ammonia, moderately thick-walled (0.5–1.0 µm) with large apical germ pore, 1.8–3.0 µm wide. Basidia 20–27(33) × 10–12.5(15) µm, 2-spored or 2- and 1-spored intermixed. Lamella edge sterile. Cheilocystidia 17–25 × 7.0–12(14) µm, lecythiform with subglobose or ellipsoid basal part, short to rather long neck (1.0–3.5 × 1.0–1.7 µm) and small capitulum, (2.5)3.0–4.5 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and inflated, subglobose elements, 3.0–30 µm broad. Pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate elements, 18–60 × 13–36 µm, often with brown pedicels, usually intermixed with cylindrical hairs. Pileocystidia scattered to numerous, filiform, up to 80 × 1.5–3.0 µm, hyaline. Stipitipellis a cutis of hyaline hyphae, 2.0–5.0 µm broad, with clusters of cystidia. Caulocystidia a mixture of (1) lecythiform cystidia, 15–21(32) × 4.5–9.5 µm, similar to cheilocystidia but more variable, with neck 1.0–5.0 × 1.5–2.5 µm, sometimes furcate and capitulum 2.8–4.5 µm broad; (2) subglobose, ovate and lageniform elements, 8.0–20 × 7.0–10 µm; (3) cylindrical hairs up to 200 µm long, 2.0–4.0 µm broad, often scarce and difficult to find. Clamp-connections absent. Chemical reactions: ammonia reaction negative.

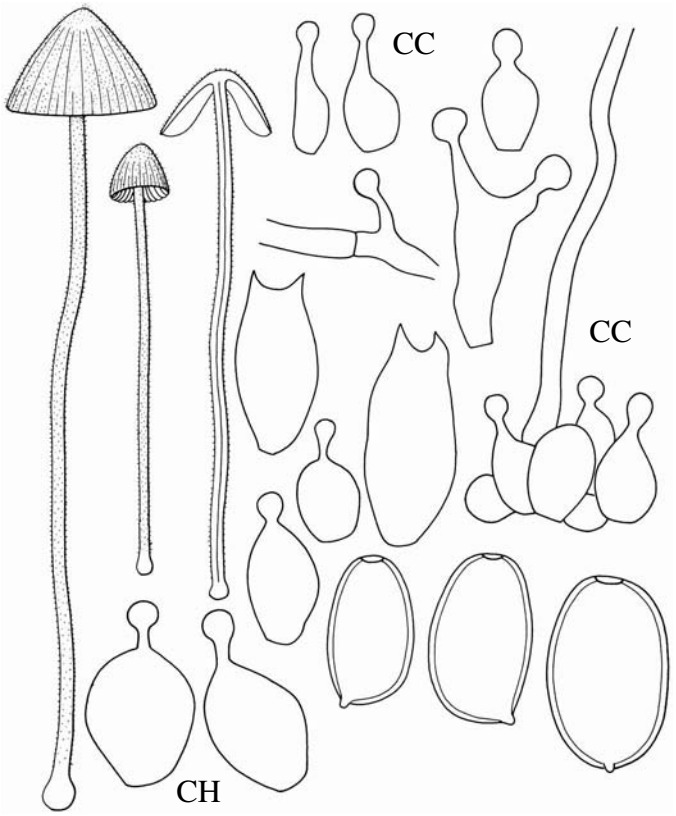


Fig. 158. *Conocybe rubiginosa*

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, on fertile, weakly acidic to basic, moist to dry, sandy, loamy and peaty soils in pastures, ruderal places, along roadside verges, and in gardens; in Central Europe also in forests, e.g., in stands of *Picea*. July–Oct. Widespread but uncommon in the Netherlands. Also recorded from Great Britain, Germany, and France, but European distribution insufficiently known.

Conocybe rubiginosa is close to *C. ambigua*, but differs in slightly larger spores that are not amygdaliform in side-view. *C. pubescens* is very similar and seems to differ only in 4-spored basidia and a preference for dung. Some Dutch collections, recorded as *C. rubiginosa*, appeared to belong to *C. siliginea*. That species has spores of similar size and shape, but lecythiform caulocystidia are lacking or scarce, and the pileus is much paler and not striate, even when moist and fresh.

29. Conocybe tuxlaensis Sing. in Fieldiana, Bot., n.S. 21: 105. 1989.

SEL. DESCR. & FIGS. — A. Hauskn. in Feddes Repert. 113: 41–44, figs 1–9. 2002; Sing. in Fieldiana, Bot., n.S. 21: 105. 1989.

CHARACTERISTICS — Pileus 4–12(20) mm broad, conico-convex or convex, hygrophanous, when moist and fresh at first brown to grey-brown (K. & W. 6D4, D5, 6E5), occasionally at centre blackish brown, translucently striate up to one-third of the radius, on drying soon not striate, turning very pale flesh-coloured or whitish, smooth to slightly rugulose; lamellae, moderately distant, adnexed, slightly ventricose, rusty brown with pale flocculose edge; stipe 28–40 × 1–2 mm, cylindrical with slightly smaller base, cream-coloured to pale yellow, entirely pubescent under hand-lens; context very thin, whitish; smell and taste not recorded; spore print not recorded.

Spores (4.5)5.5–7.5 × 3.5–4.5 µm, av. 5.8–6.6 × 3.6–4.0 µm, Q = 1.4–1.8, Qav. = 1.55–1.65, not flattened, ellipsoid to ellipsoid-oblong, pale orange-yellow in ammonia, thin-walled, without germ pore but often with small pale spot (callus); basidia 13–21 × 7.0–8.5 µm, 4-spored; cheilocystidia 15–20 × 4.0–9.0 µm, lecythiform with capitulum 3.0–4.5 µm broad; pleurocystidia absent; pileipellis an epithelioid hymeniderm, made up of clavate and spheropendunculate elements, 26–35 × 15–20 µm, occasionally intermixed with lecythiform pileocystidia, similar to cheilocystidia; caulocystidia a mixture of (1) lecythiform cystidia, 15–35 × 4.5–8.0 µm with long neck and capitulum 1.5–5.0 µm broad; (2) subcylindrical, utriform and lageniform elements and (3) slender, cylindrical hairs. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, on soil, mostly in poor, open grassland on calcareous loam on sunny slopes, also at edges of forests. Not yet record from the Netherlands, but not uncommon in Austria and also recorded from Germany and Italy. June–Nov. Originally described from rain forest in Mexico.

Conocybe tuxlaensis is very similar to *C. pilosella* in both macroscopic characters, habitat, and spore morphology. The main difference is the mixed covering of the stipe in *C. tuxlaensis* with both cylindrical hairs and lecythiform cystidia in approximately equal proportions. In *C. pilosella* lecythiform caulocystidia are usually completely absent, but occasionally scarce at stipe apex (e.g., Kühner, Genre Galera: 95. 1935). *Conocybe tuxlaensis* may be found in the Netherlands, in particular on calcareous slopes in southern Limburg.

A related species, described from steep, exposed slopes in Austria, is *Conocybe roseipes* A. Hauskn. It is easily recognised by the very small basidiocarps with dark brown, 3–6 mm broad pileus, contrasting with the pink stipe, measuring 15–28(40) × 1 mm, and the small spores measuring (7.0)7.5–9.5 × 4.5–5.5(6.0) µm, with slightly thickened wall and distinct germ pore (Hausknecht in Beih. Sydowia 10: 97–100. 1995). The stipe is mainly covered with lecythiform caulocystidia, but intermixed with clavate elements and cylindrical hairs.

Sect. **Candidae** Sing.

Basidiocarps mycenoid; pileus and lamellae soft and soon deliquescent; stipe slender, up to 5(7) mm thick, pubescent, at least when young, with lageniform to filiform caulocystidia, in addition with small, subglobose elements; lecythiform cystidia absent or scattered near apex; pseudoparaphyses in between basidia prominent and large, at least in young basidiocarps.

30. Conocybe apala (Fr. :Fr.) Arnolds in Persoonia 18.: 225. 2003.

Agaricus apalus Fr., Observ. mycol. 2: 142. 1818; *Agaricus apalus* Fr. :Fr., Syst. mycol. 1: 265. 1821; *Pluteolus apalus* (Fr. :Fr.) Quél., Enchir. Fung.: 105. 1886. — *Bolbitius albipes* Otth in Mitt. naturf. Gesellsch. Bern 711–744: 92. 1871; *Conocybe albipes* (Otth) A. Hauskn. in Österr. Z. Pilzk. 7: 102. 1998. — *Conocybe albipes* var. rugata A. Hauskn. in Österr. Z. Pilzk. 7: 110. 1998. — *Bolbitius tener* B. & Br., Outl. Br. Fungology: 183. 1860, non *Conocybe tenera* (Schaeff. :Fr.) Fay. 1889. – *Galera lactea* J. Lange, Fl. agar. dan. 5: IV. 1940; *Conocybe lactea* (J. Lange) Métrod in Bull. trimest. Soc. mycol. Fr. 56: 46. 1940. – *Conocybe huijsmanii* Watling in Nordic J. Bot. 3: 262. 1983. — *Conocybe huijsmanii* var. *conica* Watling in Gdns' Bull. Singapore 45: 377. 1994.

MISAPPL. — *Galera lateritia* sensu Rick., Blätterpilze: 224. 1915; *Conocybe lateritia* sensu Kühner, Genre Galera: 121. 1935, sensu auct. eur. plur.

KEY TO THE VARIETIES

1. Pileus broader than high, obtusely conical to hemispherical, expanding to broadly campanulate, conico-convex or plano-convex 29a. var. **apala**
1. Pileus usually higher than broad, subcylindrical, paraboloid to narrowly campanulate, not or slightly expanding . . . 29b. var. **albipes**

30a. var. **apala** – Fig. 159B.

Conocybe huijsmanii Watling in Nordic J. Bot. 3: 262. 1983. — *Bolbitius huijsmanii* (Watling) M. Bon in Doc. mycol. 20(78): 39. 1990. — *Galera lactea* f. *semiglobata* J. Lange, Fl. agar. dan. 4: 33. 1939 (invalid); *Conocybe albipes* var. *rugata* A. Hauskn. in Österr. Z. Pilzk. 7: 110. 1998

SEL. ICON. — J. Lange, Fl. agar. dan. 4: pl. 128G. 1939 (as Galera lactea f. semiglobata).

SEL. DESCR. & FIGS. — M. Bon in Doc. mycol. 21(84): 62. 1992 (as *Bolbitius huijsmanii*); A. Hauskn. in Österr. Z. Pilzk. 7: 110–111, figs 6a–d. 1998 (as *C. albipes* var. *rugata*); Watling in Nordic J. Bot. 3: 262–263, fig. 1A–D. 1983 (as *C. huijsmanii*).

VERN. NAME — Bolhoedbreeksteeltje.

Pileus 20–35 mm broad, 10–20 mm high, hemispherical to obtusely conical at first, expanding to broadly campanulate, conico-convex or plano-convex with broad umbo in age, not or weakly hygrophanous, at centre pale orange, pale ochraceous or cream-coloured (K. & W. 5A3, 4), to the margin ivory white, margin not or slightly translucent-striate; brown lamellae becoming translucent in age; surface smooth to radially rugulose, occasionally strongly wrinkled at centre, dry or slightly sticky when moist (but not really viscid). Lamellae, L = 25–46, l = (1)3–7, very crowded, adnexed to free, slightly ventricose, up to 4 mm broad, very thin, in age often becoming wrinkled, finally deliquescent, cream-coloured at first, soon yellow-brown to orange-brown, with white flocculose edge. Stipe (40)50–90 × 1–3 mm, subcylindrical with slightly swollen to bulbous base up to 7 mm broad, fistulose, white to cream-coloured or very pale orange, densely pruinose-pubescent, slightly striate. Context concolorous with surface, in pileus up to 1 mm thick, fragile and soft. Smell and taste weak, not distinctive. Spore print rusty brown.

Spores 10.0–14 × 6.5–9.0 × 6.0–8.0 µm, av. 11.2–13.0 × 7.0–8.4 × 6.6–7.2 µm, very weakly to distinctly flattened, in frontal view ellipsoid to ovoid (Q = 1.3–1.6(1.7), Qav. = 1.35–1.5), in side-view ellipsoid to ellipsoid-oblong (Q = 1.5–1.8, Qav. = 1.55–1.7), yellow-brown to orange-brown in ammonia, more or less thick-walled (0.5–1.5 µm), with central germ pore, 1.0–2.0 µm wide. Basidia 20–31 × 10–13 µm, clavate to spheropedunculate, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia 20–26 × 7.0–11 µm, lecythiform with ellipsoid to clavate basal part, short to rather long neck (1.5–4.5 × 1.0–1.5 µm) and small capitulum, 2.5–4.5 µm broad. Pleurocystidia absent, but basidia surrounded by 5–6 clavate to spheropedunculate pseudoparaphyses (pavement cells), 15–20 × 7.0–18 µm. Hymenophoral trama made up of hyaline, cylindrical and inflated elements, 5–20 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 25–55 × 10–25 µm, hyaline or pedicel with slightly thickened, yellowish wall, usually intermixed with cylindrical hairs. Pileocystidia scarce to scattered, filiform,

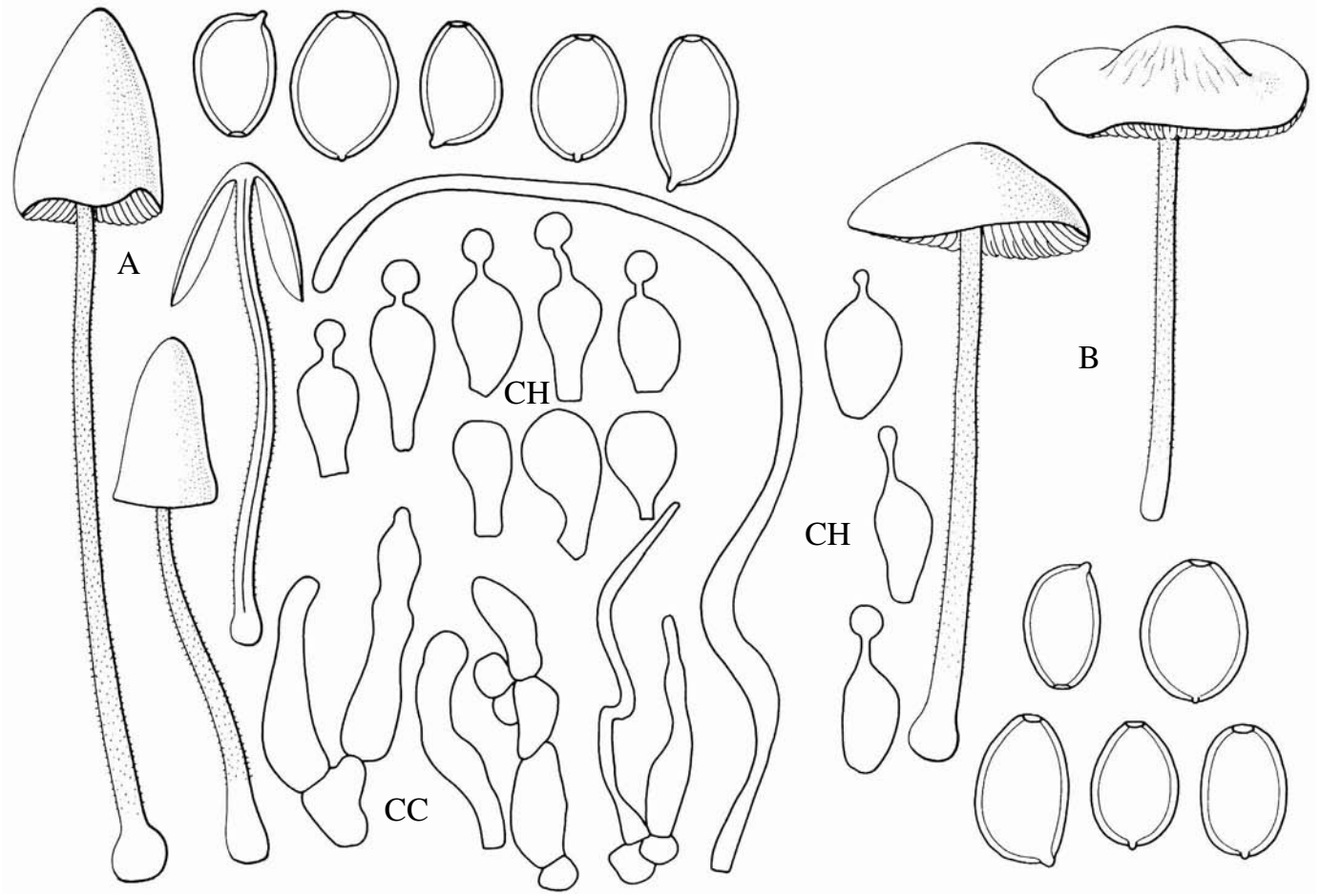


Fig. 159. *Conocybe apala*. A. var. *albipes*. B. var. *apala*

30–150 × 2.0–4.0 µm, straight or tortuous, hyaline with refractive content. Stipitipellis a cutis of repent, hyaline hyphae, 2.0–7.0 µm broad, with clusters of caulocystidia. Caulocystidia a mixture of (1) cylindrical, lageniform to clavate cystidia, 18–35 × 5.0–8.0 µm; (2) numerous small subglobose elements, 6.0–12 µm broad; (3) straight or tortuous, cylindrical hairs, up to 200 × 1.5–4.5 µm; lecythiform cystidia absent or very rare at extreme apex of stipe. Clamp-connections present, although scarce. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on soil and compost in gardens, fertilised meadows, roadsides, and ruderal sites, also in nonheated glasshouses, on humus-rich, weakly acid to basic sandy, loamy and clayey soils, rich in nutrients. June–Sept. In the Netherlands rare in the Holocene part of the country. Also recorded from Denmark, Germany, Great Britain, and Switzerland.

Conocybe apala is characterised by the very pale basidiocarps with very thin and crowded lamellae, pubescent stipe, and remarkably soft, easily collapsing context in pileus. The variety *apala* differs from the more common var. *albipes* only in the different shape of the pileus that is considerably broader than high and expanding during development. This is a striking character on population level and populations with both subcylindrical and hemispherical pilei were observed neither in the Netherlands, nor by Hausknecht (in Österr. Z. Pilzk. 7: 104. 1998) in his extensive, comparative study of sect. *Candidae*. However, Hausknecht recorded some collections that were difficult to assign to one of the two taxa by intermediate shape of pileus.

Conocybe apala var. *apala* may occur with a smooth to strongly rugulose-wrinkled pileus. The smooth variant has been described by Watling (in Nordic J. Bot. 3: 262. 1983) as *C. huijsmanii*. That taxon was said to be different from *C. apala* var. *albipes* also in narrower spores, but this could be confirmed neither by Hausknecht (in Österr. Z. Pilzk. 7: 104. 1998) nor in the present revision. Hausknecht included collections of *C. huijsmanii* in his description of *C. apala* var. *albipes*, in contrast to this Flora.

Variants with a rugulose pileus have been described by Hausknecht as *Conocybe albipes* var. *rugata,* also because of slightly smaller spores with thicker wall. However, in Dutch collections of *C. apala* var. *apala*, basidiocarps with a smooth pileus occasionally occurred side by side with basidiocarps with a radially wrinkled pileus. Some basidiocarps with a smooth surface had thick-walled spores in the range of var. *rugata.* Therefore, *C. albipes* var. *rugata* is considered here synonymous with var. *apala*.

In some basidiocarps of both varieties of *C. apala* normal spores are mixed with a small proportion (less than 5%) of considerably smaller spores, measuring 6.0–9.0 × 4.5–6.5 µm, with the same colour and structure of normal spores. According to Hausknecht (in Österr. Z. Pilzk. 7: 103. 1998) the presence of these "microspores" is a constant character of *C. apala*, but this could not be confirmed in the studied

collections. It is questionable whether the occurrence of microspores has any taxonomic significance.

C. apala is better known under the names *C. lactea* and *C. huysmanii*. Hausknecht (in Österr. Z. Pilzk. 7: 102. 1998) found out that the name *Bolbitius albipes* Otth has priority over these two names. However, the latter name is preceded by the sanctioned name *Agaricus apalus* Fr.:Fr. (Arnolds in Persoonia 18: 225–226. 2003).

30b. var. **albipes** (Otth) Arnolds in Persoonia 18: 227. 2003. – Fig. 159A.

EXCL. — *Conocybe lactea* sensu Zuccherelli, *Funghi Pinete Zone* medit.: pl. 317. 1993 (= *C. pseudocrispa*).

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987 (as *Bolbitius lacteus*); Breitenb. & Kränzl., Pilze Schweiz 4: pl. 381. 1995; Gerhardt, Gr. Pilzf.: 385 (top). 1999; G.J. Keizer, Paddestoelenencyclopedie: 235. 1997; J. Lange, Fl. agar. dan. 4: pl. 128F. 1939; Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 200. 1985; R. Phillips, Paddest. Schimm.: 155. 1981 (all as *C. lactea*).

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 302, figs A–E. 1995 (as C. lactea); Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 102–103, figs A–E. 1986 (as *C. lactea*); A. Hauskn. in Österr. Z. Pilzk. 7: 102–106, figs 4f–j, 5a–d. 1998; Kühner, Genre Galera 121–124, fig. 37. 1935 (as *C. lateritia*); Watling in Br. Fung. Fl. 3: 80–81, figs 91, 92, 96–100. 1982 (as *C. lactea*).

VERN. NAME — Izabelkleurig breeksteeltje.

CHARACTERISTICS — Differing from var. *apala* in the subcylindrical, paraboloid to narrowly campanulate, not or very slightly expanding pileus (8)10–25(30) mm broad, (10)12–35 mm high, usually higher than broad, occasionally with wavy-lobed margin; lamellae, L = 20–40, l = 3–7, very crowded, adnexed to free, strongly ascending, very thin, in age often becoming wavy to wrinkled or sticking together, finally deliquescent, cream-coloured at first, soon yellow-brown to rusty brown, with white flocculose edge; stipe (40)50–110 × 1–3 mm, subcylindrical with bulbous base up to 7 mm broad, fistulose, white throughout at first, in age becoming cream-coloured in lower half, densely pruinose-pubescent.

Spores (9.0)10.0–15.0(16.5) × 7.0–9.0(9.5) × 6.0–8.0 µm, av. 11.5–13.5(14.5) × 7.5–8.3(9.0) × 6.7–7.6 µm, weakly to strongly flattened, in frontal view ovoid or ellipsoid(-oblong), sometimes slightly angular, Q = 1.3–1.7, Qav. = 1.4–1.6, in side-view ellipsoid-oblong to ovoid-oblong, rarely slightly phaseoliform, Q = 1.5–1.9, Qav. = 1.6–1.8, yellow-brown to orange-brown in ammonia (5C7,8; 6C8), slightly to clearly thick-walled (0.5–1.2 µm) with large, truncate germ pore, 1.7–2.5 µm wide; basidia 4-spored; lamella edge sterile or heterogeneous; cheilocystidia 17–26 × 7.0–12 µm, lecythiform with short to rather long neck (1.5–4.0 × 1.0–1.5 µm) and small capitulum, 3.5–5.0 (5.5) µm broad; pleurocystidia absent, but basidia surrounded by 5–6 clavate to spheropedunculate pseudoparaphyses (pavement cells), 14–20 × 7.0–15 µm; pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 22–60 × 10–28 µm, hyaline or pedicel with slightly thickened, yellowish wall, usually intermixed with cylindrical hairs; pileocystidia scarce to scattered, filiform, 30–200 × 2.0–5.0 µm, straight or tortuous, hyaline with refractive content; caulocystidia a mixture of (1) cylindrical, lageniform to clavate cystidia, 17–32 × 4.0–8.0 µm, sometimes with narrow neck, 2.0–4.0 µm broad; (2) numerous small subglobose elements, 6.0–13 µm broad; (3) straight or tortuous, cylindrical hairs, 45–260 × 1.8–3.5 µm; lecythiform cystidia absent or very rare at extreme apex of stipe; clamp-connections present, although scarce. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on soil in meadows, hayfields, grassy roadside verges, gardens, lawns, ruderal, places and parks, rarely in forests, on moist to dry, weakly acid to basic, sandy, loamy and clayey soils. In the Netherlands widespread and rather common but never in large numbers. June–Aug. (Sept.). Widespread in Europe and in most regions, including the Netherlands, much more common than var. *apala*. Recorded from most continents, but possibly related species are involved.

Conocybe apala var. *albipes* is in West Europe a typical summer fungus. The elegant basidiocarps show up after heavy rains and disappear soon due to their fragile consistency. It is one of the few *Conocybe* taxa that can be easily identified in the field by the remarkably elongate shape of the pileus, pale colours, pubescent stipe, and very soft texture of pileus and lamellae.

In Europe, *Conocybe apala* var. *albipes* is by far the most common representative of sect. *Candidae*, comprising species with pale basidiocarps with very soft context and more or less deliquescent, almost free lamellae, bearing large pseudoparaphyses in between the basidia. The presence of pseudoparaphyses and free lamellae are in common with the genus *Bolbitius*. For that reason Bon (in Doc. mycol. 21 (84): 62. 1992) transferred sect. *Candidae* to *Bolbitius*. However, in agreement with Hausknecht (in Österr. Z. Pilzk. 7: 101. 1998) it is thought that this group is more closely related to *Conocybe* in view of the lecythiform cheilocystidia and the lack of a gelatinous pellicle on the pileus. Moreover, some unrelated *Conocybe* species also have less prominent pseudoparaphyses in the hymenium.

See also notes on var. *apala* and *C. pseudocrispa*.

31. Conocybe pseudocrispa (A. Hauskn.) Arnolds in Persoonia 18: 227. 2003.

Conocybe albipes var. *pseudocrispa* A. Hauskn. in Österr. Z. Pilzk. 7: 106. 1998.

MISAPPL. — *Conocybe crispa* sensu Enderle in Z. Mykol. 57: 66. 1991; sensu Arnolds et al., Overz. Paddest. Nederland: 105. 1995; sensu auct. eur. p.p. (non sensu Watling in Br. Fung. Fl. 3: 80. 1982); *Conocybe lactea* sensu Zuccherelli, *Funghi Pinete Zone* medit.: pl. 317. 1993.

SEL. ICON. — Zuccherelli, *Funghi Pinete Zone* medit.: pl. 317. 1993 (as C. lactea).

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 7: 106–108, figs 5e–h. 1998.

CHARACTERISTICS — Pileus 5–12(20) mm broad, 4–11(15) mm high, obtusely conical, campanulate-convex to hemispherical, not hygrophanous, at centre at first pale isabella, pale yellow or cream-coloured (K. & W. 5B5, 4A3-4, 4A3), to the margin slightly paler, soon pallescent to yellowish white or milk-white, not striate but brown lamellae translucent at margin in age, smooth to slightly rugulose; lamellae moderately crowded to crowded, adnexed, slightly ventricose, in age becoming slightly wavy, not anastomozing, yellow-brown to orange-brown; stipe 35–60(100) × 1–1.5(2) mm, cylindrical with slightly thicker base, white at first, then cream-coloured to pale greyish ochre, entirely pubescent; smell and taste weak, not distinctive.

Spores (10.0)10.5–15 × 6.5–9.5 µm, av. 11.9–13.5 × 7.5–8.5 µm, Q = c. 1.5–1.7, not flattened, ellipsoid to ellipsoid-oblong in side-view and frontal view, yellow-brown to orange-brown in ammonia, rather thick-walled (0.5–1.5 µm) with apical germ pore, 1.2–2.0 µm wide; basidia 18–27 × 9.0–13 µm, 2-(1-)spored; lamella edge sterile; cheilocystidia 15–24 × 7.5–12 µm, lecythiform with subglobose to ellipsoid

basal part, short neck and small capitulum, 3.3–5.0 µm broad; pleurocystidia absent, but clavate to spheropedunculate pseudoparaphyses present; pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate elements; caulocystidia predominantly lageniform, also clavate and subglobose elements, at stipe apex also scattered lecythiform cystidia similar to cheilocystidia; clamp-connections not seen. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, on clayey and sandy soils rich in nutrients, in grasslands and ruderal places, also on old bonfire sites. Occurrence in the Netherlands doubtful (see notes). Not uncommon in Austria, also recorded from Italy. May–Sept.

Conocybe pseudocrispa has been recorded from two localities in the Netherlands (Lelystad, Zwartsluis) (Arnolds in Arnolds et al., Overz. Paddest. Nederland: 105. 1995, as *C. crispa*). However, no authentic collections have been seen. The above description is mainly based on the extensive study by Hausknecht (in Österr. Z. Pilzk. 7: 106. 1998).

Conocybe pseudocrispa is regarded by Hausknecht as a 2-spored variety of *C. apala*. However, it differs from that species also in the not-flattened spores, the regular occurrence of lecythiform cystidia at the apex of the stipe, and probably in the absence of clamp-connections. In addition it differs from var. *albipes* in the smaller, more expanded pileus. Moreover, it is remarkable that the spores in this 2-spored taxon are of similar size as in the 4-spored *C. apala.* Therefore, it is regarded here as a distinct species.

In Europe, *C. pseudocrispa* has usually been misidentified as *C. crispa* [Longyear] Sing. (*Galera crispa* Longyear in Bot. Gaz. 28: 272. 1899 = *C. albipes* var. *crispa* (Longyear) A. Hauskn. in Österr. Z. Pilzk. 7: 106. 1998). This North American taxon is characterised by strongly crisped and anastomozing lamellae. Watling (in Br. Fung. Fl. 3: 80. 1982) described such a collection from Yorkshire, Great Britain. This may be the only true record from *C. crispa* in Europe (see Hausknecht in Österr. Z. Pilzk. 7: 98. 1998), although it has not been proven that this fungus is really identical with the American taxon. Bon (in Doc. mycol. 21(84): 62. 1992) and Meusers (in Österr. Z. Pilzk. 5: 252. 1996) apparently merely copied Watling's description of *C. crispa*.

32. Conocybe zeylanica (Petch) Boedijn in Sydowia 5: 223. 1951. – Fig. 160.

Galera zeylanica Petch in Ann. R. bot. Gdns Peradeniya 6: 317. 1917.

SEL. DESCR. & FIGS. — A. Hauskn. in Feddes Repert. 113: 44–47, figs 10–17. 2002.

VERN. NAME — Kasbreeksteeltje.

Pileus (6–)10–30 mm broad, 7–15 mm high, paraboloid at first, then conico-convex to hemispherical, often with slightly revolute margin and weak umbo, hygrophanous, when moist and fresh at first orange-red, then brown-orange at centre, to the margin orange-beige to ochre-yellow, translucently striate up to three-fourths of radius or more, on drying occasionally with violet-brown tone, smooth or slightly rugulose at centre, pubescent when young, gradually becoming glabrous, soon collapsing; lamellae, L = 20–32, l = 1–3, crowded, narrowly adnate to almost free, segmentiform, pale yellow then yellow-brown to rusty brown with concolorous edge; stipe 22–60 × 1.0–2.5 mm, cylindrical with thickened to bulbous base (up to 4 mm), not rooting, entirely white at first, becoming yellowish or pale ochre with age, entirely pubescent-striate; context white, in pileus thin and fragile; smell and taste weak, not distinctive; spore print not recorded.

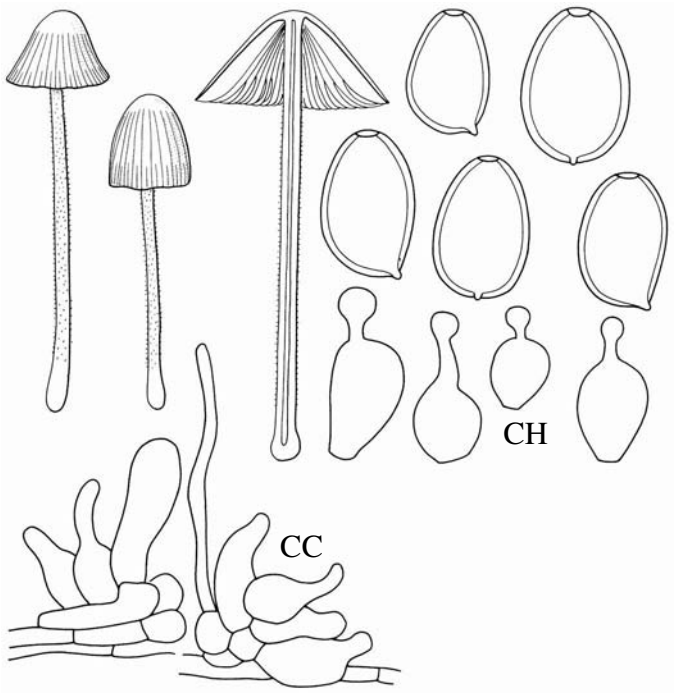


Fig. 160. *Conocybe zeylanica*

Spores 10.5–14.5 × 7.5–9.0 × 6.5–8.0 µm, av. 11.8–13.1 × 7.8–8.2 × 7.2–7.7 µm, slightly flattened, in front-view ellipsoid or ovoid, Q = 1.45–1.65, Qav. = 1.5–1.55, in side-view ellipsoid- to ovoid-oblong, Q = 1.6–1.75, Qav. = 1.65–1.7, brownish orange in ammonia, rather thick-walled (0.5–1.5 µm) with apical germ pore 1.5–2.0 µm wide; basidia 18–29 × 11–13.5 µm, 4-spored;lamella edge sterile;cheilocystidia 14–27 × 6.5–12 µm, lecythiform with ellipsoid or clavate basal part, short to long neck (2.0–7.0 × 1.0–2.0 µm) and small capitulum, 2.5–5.5 µm broad; pleurocystidia absent; pseudoparaphyses not seen in exsiccata; hymenophoral trama made up of cylindrical and strongly inflated elements, 3.0–20 µm broad; pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate cells, 28–60 × 15–28 µm, with thin, hyaline wall, sometimes wih pale brown pedicel; pileocystidia not seen, but according to Hausknecht (in Feddes Repert. 113: 44. 2002) often lecythiform cystidia present, similar to cheilocystidia, occasionally intermixed with cylindrical hairs; stipitipellis a thin cutis, made up of hyaline hyphae, 2.0–5.0 µm broad, with clusters of caulocystidia; caulocystidia mainly clavate, utriform and lageniform, 12–20 × 4.0–8.0 µm, intermixed with numerous smaller, subglobose elements up to 9.0 × 7.5 µm and scattered cylindrical hairs up to 50 × 2.0–3.0 µm; clamp-connections present.

HABITAT & DISTR. — Saprotrophic, solitary or gregarious, in the Netherlands only known from a nonheated glasshouse, on compost in a culture of *Dianthus*, but there abundant. Very rare (Kortenhoef, Kas van Diggelen). In glasshouses the entire year. Widespread in tropical Africa and Asia on dung and rotting plant remains; apparently introduced in Europe.

Conocybe zeylanica is related to *C. apala*, but can be easily recognised by the pileus colour that is orange-red at first.

A related tropical species that is occasionally found in glasshouses in Europe is *C. crispella* (Murrill) Sing. (in Sydowia 4: 132. 1950). It differs from *C. zeylanica* and *C. apala* in the smaller basidiocarps (pileus 5–10 mm, stipe 20–30 × 1mm) with more expanded, dull

coloured, greyish brown to beige pileus, possibly also in the absence of pileocystidia. The microscopic characters are otherwise similar. Descriptions of European collections of *C. crispella* were published by Hausknecht in Boll. Gruppo micol. G. Bres. 40: 261–265. 1998 and Österr. Z. Pilzk. 10: 46. 2001.

Sect. **Pilosellae** Sing.

Basidiocarps mycenoid; pileus not deliquescent; stipe slender, up to 5(7) mm thick, pubescent at least when young; veil absent; caulocystidia lageniform to filiform; lecythiform caulocystidia absent or very scarce near apex; pseudoparaphyses in between basidia absent or small and difficult to find.

33. Conocybe pilosella (Pers. :Fr.) Kühner, Genre Galera: 92. 1935.

Agaricus pilosellus Pers., Syn. meth. Fung.: 387. 1801; *Agaricus tener* "var" *pilosellus* Pers. :Fr., Syst. mycol. 1: 266. 1821; *Galera pilosella* (Pers. :Fr.) Rea, Brit. Basidiomyc.: 407. 1922. — *Conocybe piloselloides* Watling in Notes R. bot. Gdn Edinb. 40: 549. 1983.

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 385. 1995; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1325. 1994; Enderle in Z. Mykol. 62: fig. 4. 1996; A. Hauskn. in Boll. Gruppo micol. G. Bres. 34: 140. 1991; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 6 (lower fig.). 1994.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 306, figs A–E. 1995; Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 104–106, figs A–E. 1986; Enderle in Z. Mykol. 59: 31–33. 1993; Kühner, Genre Galera: 92–96, fig. 25. 1935; Watling in Br. Fung. Fl. 3: 70–71. 1982.

VERN. NAME — Berijpt breeksteeltje.

KEY TO THE VARIETIES

1. Pileus at centre orangey brown, reddish brown, or medium brown when moist, on drying becoming ochre-brown . . 33a. var. **pilosella**
1. Pileus at centre blackish brown when moist, on drying becoming dark brown. . . . . 33b. var. **brunneonigra**

33a. var. **pilosella** – Fig. 161A.

Pileus 10–25 mm broad, 3–12 mm high, conico-campanulate to obtusely conical at first, soon expanding to plano-convex with umbonate to slightly depressed centre, hygrophanous, when moist and fresh at centre orangey brown to medium brown or reddish brown (e.g., K. & W. 7E6, 7D7-E7, 6D8-7D8), paler brown to flesh-coloured brown or ochre-brown towards the margin (e.g., 7D5, 6D5, 5D6-6D6), translucently striate up to 3/4 to 9/10 of the radius, on drying ochraceous with ochre-brown centre, dull, pubescent at first but soon appearing glabrous. Lamellae, L = 15–24, l = 3(7), rather crowded to crowded, adnexed, often ventricose, ochraceous, then orange-brown to rusty brown (6D7, 7D7) with slightly paler, slightly fimbriate edge. Stipe 20–50(60) × 1–2 mm, cylindrical with slightly enlarged to subbulbous base, fistulose, whitish or cream-coloured at first, becoming ochraceous and finally orangey brown in lower half with age, entirely pubescent-striate at first, often remaining pubescent only at apex with age. Context concolorous with surface, in stipe becoming orange-brown with age. Smell and taste weak, not distinctive. Spore print rusty brown.

Spores 5.0–8.0(9.0) × (3.0)3.5–4.5 µm, av. 5.8–7.3 × 3.6–4.2 µm, Q = 1.5–2.0, Qav. = 1.6–1.8, not flattened, ellipsoid to ellipsoid-oblong, in some collections some slightly amygdaliform in side-view, yellow-brown to brownish orange (5C7, 5D8) in ammonia, thin-walled to slightly thick-walled, without germ pore but often with slightly paler spot at apex. Basidia 12–22 × 5.5–8.0 µm, 4-spored. Lamella edge sterile. Cheilocystidia 15–21 × 7.0–10 µm, lecythiform with subglobose to clavate basal part, short neck (1.0–3.0 × 1.0–1.5 µm) and small capitulum, 3.3–4.5 µm broad, often in part with pale brown wall. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and inflated elements, 3.0–30 µm broad, with hyaline to yellow-brown wall. Pileipellis an epithelioid hymeniderm, made up of clavate to spheropedunculate elements, 15–47 × 11–22 µm, often with brown, slightly thick-walled pedicel, intermixed with numerous hairs. Pileocystidia 27–60 × 1.0–2.5 µm, filiform, often tortuous, occasionally furcate. Stipitipellis a cutis made up of repent hyphae, 3.0–7.0 µm broad, with hyaline or pale yellow wall. Caulocystidia in part clavate, subcylindrical or narrowly lageniform, 15–26 × 5.0–7.0 µm, intermixed with numerous subglobose elements up to 10.0 × 8.0 µm and numerous cylindrical, flexuous hairs with refractive content, up to 120 × 1.5–3.0 µm; lecythiform cystidia lacking or very scarce and rudimentary, ± 14–16 × 3.0–4.0 µm with very narrow basal part, long neck (3.5–6.0 × 1.5–2.0 µm) and small capitulum, 2.8–4.0 µm broad. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

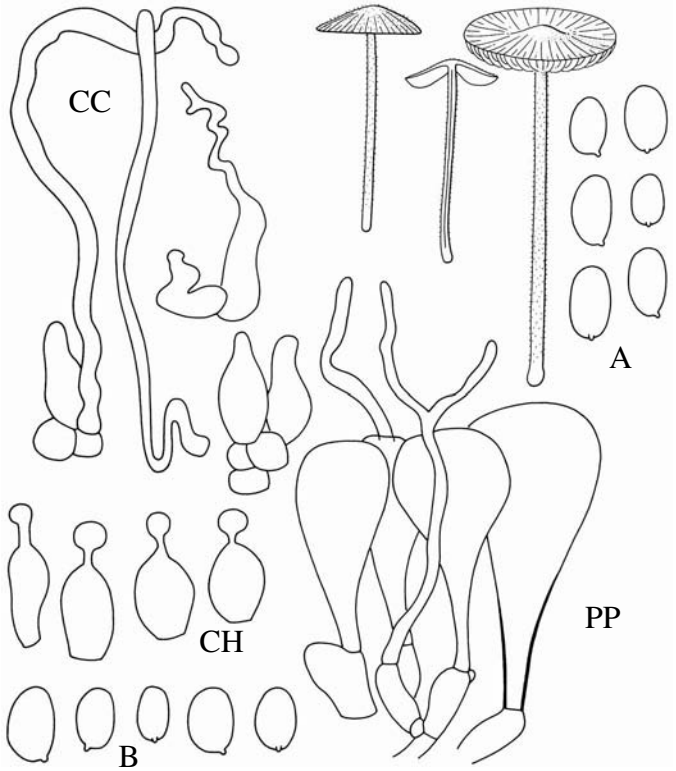


Fig. 161. *Conocybe pilosella*. A = var. *pilosella*; B = var. *brunneonigra*

HABITAT & DISTR. — Saprotrophic, often solitary, occasionally in small groups on soil, in deciduous forests, parks, and poor grasslands (*Mesobromion*) on moist to dry, basic, calcareous clay, loam and sand. In the Netherlands rare, mainly in coastal dunes, southern Limburg and IJsselmeerpolders. Aug.–Nov. Widespread in Europe but probably uncommon.

Conocybe pilosella is well-characterised by the small spores without germ pore in combination with the pubescent stipe and pileus, (almost) without lecythiform cystidia. In the field the soon expanding, strongly striate pileus may be indicative. Nevertheless, part of the collections

under this name in Dutch herbaria appeared to be misidentified. Some collections belonged to *C. rostellata*, with similarly small spores and belonging to sect. *Pilosellae*, but the spores of that species do have a small germ pore, well visible under an oil-immersion lens. Other collections belonged to *C. enderlei*, resembling *C. pilosella* in having small spores without germ pore, but *C. enderlei* has lecythiform caulocystidia and is a member of sect. *Conocybe. Conocybe tuxlaensis* is an extralimital species that resembles *C. pilosella* in many respects, but it differs in the presence of numerous lecythiform caulocystidia and is therefore assigned to sect. *Mixtae* (see there).

Kühner (Genre Galera: 92. 1935) described two forms of *C. pilosella* as "forme macrospore" and "forme microspore." Watling (in Notes R. bot. Gdn Edinb. 40: 549. 1983) described the latter taxon as a different species, *C. piloselloides* Watling. That species was said to differ in the habitat on soil (*C. pilosella* on wood), smaller basidiocarps, slightly smaller spores, and slightly smaller cheilocystidia. In the studied collections the size of both spores and cheilocystidia were quite variable but completely intergrading. In macroscopic and ecological respects all collections from the Netherlands fit better with *C. piloselloides*. No basidiocarps have been collected on wood, and basidiocarps as large as those decribed by Kühner (Genre Galera: 92. 1935) with a pileus up to 45 mm and stipe up to 95 mm long were not observed. However, Hausknecht & Krisai (in Persoonia 14: 659. 1992) collected such large basidiocarps on soil and they did not find any correlation between size of basidiocarps and spore size. Therefore, *C. piloselloides* is regarded as conspecific with *C. pilosella*.

33b. var. **brunneonigra** Hauskn. & Krisai in Persoonia 14: 657. 1992. – Fig. 161B.

SEL. DESCR. & FIGS. — Hauskn. & Krisai in Persoonia 14: 657–659, figs 7–12. 1992; M. Meusers in Österr. Z. Pilzk. 5: 255. 1996.

CHARACTERISTICS — Similar to var. *pilosella* but pileus considerably darker, at centre blackish brown (K. & W. 7F7, 8F6, 9F6) when moist, to the margin reddish brown (7E6, 6, 7F8), on drying remaining dark brown to blackish brown at centre, pale brown to the margin.

Spores (4.5)5.0–8.0(8.5) × 3.5–5.0(5.5) µm, av. 6.5–7.0 × 3.9–4.5 µm, Q = 1.3–1.8, Qav. = 1.55–1.7, ellipsoid to ellipsoid-oblong, yellow-brown to orange-brown in ammonia, without germ pore; cheilocystidia with capitulum 2.5–5.0(5.5) µm broad.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, in the Netherlands in dry dune grassland on calcareous sand; in Central Europe on bare soil and in grassy places in grasslands on limestone and in roadside verges. Very rare (Wijk aan Zee). Aug.–Nov. Also recorded from Austria; apparently rare and possibly restricted to calcareous substrates.

34. Conocybe pallidospora Kühn. & Watl. in Notes R. bot. Gdn Edinb. 40: 540. 1983. – Fig. 162.

Conocybe siliginea var. *pallidospora* Kühner, Genre Galera: 100. 1935 (invalid).

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 384. 1995.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 304, figs A–E. 1995; Contu in Bol. Soc. micol. Madrid 15: 141. 1990; Enderle in Z. Mykol. 62: 25–26, fig. 3. 1996; Kühner, Genre Galera: 100–101, fig. 27. 1935.

VERN. NAME — Bleeksporig breeksteeltje.

Pileus 8–23 mm broad, 4–15 mm high, conico-campanulate, obtusely conical to hemispherical, hygrophanous, when moist and fresh greyish brown, dull brown to reddish brown at centre (e.g., K. & W. 6D4, D5, E7, 7E7, 8E7), paler orangey brown to ochraceous brown towards the margin, translucently striate up to halfway the radius, on drying soon non-striate, pale flesh-coloured to pale ochraceous, glabrous or slightly pubescent. Lamellae, L = 10–20, l = 1–3(5), moderately crowded to subdistant, adnexed, with or without decurrent tooth, ventricose, pale ochre-yellow at first, then pale ochre-orange to brownish orange (5B5, 6C6, 6D7). Stipe 20–65 × 0.5–2.5 mm, cylindrical or subbulbous, at base up to 3.5 mm thick, fistulose, at apex whitish, downwards straw-yellow at first, then becoming honey-yellow at apex and orangey brown to reddish brown near base, pruinose and slightly pubescent, at least at apex. Context concolorous with surface. Smell weak, not distinctive. Taste not recorded. Spore print not recorded.

Spores 6.5–9.5 × 3.5–5.5(6.0) µm, av. 7.4–8.4 × 4.3–5.3 µm, Q = 1.5–1.8, Qav. = 1.55–1.75, not flattened, ellipsoid to ellipsoid-oblong, sometimes a variable proportion slightly amygdaliform in side-view, pale ochraceous to pale orange in ammonia (5A3-B3, 4B4-5B4, 5B6), thin-walled, often in part collapsed, with large, although rather inconspicuous germ pore, 1.0–1.8 µm wide. Basidia 14–20 × 6.5–9.0 µm, 4-spored or some 2-(1-)spored intermixed. Lamella edge sterile or heterogeneous. Cheilocystidia 11–18 × 5.0–8.0 µm, lecythiform, with subglobose, ellipsoid or clavate basal part, short to moderately long neck (1.0–5.0 × 1.0–1.5 µm) and globose capitulum, 2.5–4.0 µm broad, hyaline or with pale brown wall, easily collapsed and occasionally difficult to find. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to inflated, globose elements, 4.0–30 µm broad, with hyaline or ochraceous wall. Pileipellis an epithelioid hymeniderm, made up of pyriform, clavate and spheropedunculate elements, 20–51 × 12–33 µm, hyaline or with slightly thick-walled, brown pedicel. Pileocystidia absent. Stipitipellis a cutis, made up of hyphae 3.0–6.0 µm broad with hyaline to pale brown wall. Caulocystidia predominantly lageniform to clavate, 18–40 × 3–11 µm, intermixed with cylindrical, straight to slightly tortuous hairs up to 220 × 1.5–4.0 µm; in some basidiocarps near stipe apex also a few narrowly lecythiform cystidia, 15–20 × 3.0–4.5 µm, with long neck (6.5–7.5 × 1.0–2.0 µm) and small capitulum, 3.5–4.5 µm broad. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

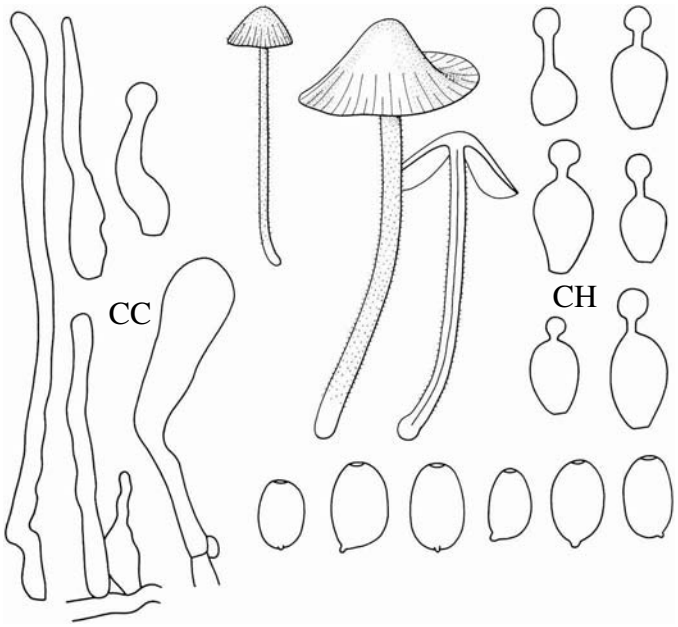


Fig. 162. *Conocybe pallidospora*

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, in grasslands, along ditches and roadsides, and in scrub on moist to dry, basic, sandy and clayey soils. June–Sept. Very rare in the Netherlands (Amsterdam, Ruigoord; Waar [Groningen]; Gulpen, De Hut) but possibly overlooked. Also recorded from Germany, Finland, Switzerland, France, and Spain; apparently widespread but rare in Europe.

Conocybe pallidospora is characterised by rather small, thin-walled, pale coloured spores and consequently relatively pale lamellae in mature basidiocarps. According to several authors, e.g., Meusers (in Österr. Z. Pilzk. 5: 255. 1996), a germ pore in the spores is lacking or obscure. This statement is apparently based on the drawings by Kühner (Genre Galera: 100, fig. 27. 1935) in which the spores do not show a germ pore indeed. However, Watling (in Notes R. bot. Gdn Edinb. 40: 541. 1983) studied the lecotype and mentioned the presence of a relatively large, yet inconspicuous germ pore. This observation agrees with data on collections from the Netherlands. The pore is not very striking because of the thin spore wall.

Several collections, identified as *C. pallidospora* in Dutch herbaria, appeared to belong to *C. enderlei*. The misidentifications are apparently due to the lacking germ pore in the latter species. However, *C. enderlei* is in fact not closely related to *C. pallidospora* since the stipe is covered with lecythiform cystidia (sect. *Conocybe*) and the spores are well-pigmented.

35. Conocybe rostellata (Velen.) Hauskn. & Svrček in Czech Mycol. 51: 61. 1999. – Fig. 163.

Galera rostellata Velen., Novit. mycol.: 129. ('1939') 1940; *Conocybe siliginea* var. *ochracea* Kühner, "récoltes microspores," Genre Galera: 101. 1935 (invalid).

MISAPPL. — *C. sienophylla* sensu Chrispijn, Champ. Jordaan: 67. 1999.

SEL. ICON. — Chrispijn, Champ. Jordaan: 67. 1999 (as *C. sienophylla*).

SEL. DESCR. & FIGS. — A. Hauskn. in Czech Mycol. 51: 61, fig. 9a–e. 1999; Kühner, Genre Galera: 101–104, fig. 28. 1935 (as *C. siliginea* var. *ochracea*, "récoltes microspores").

VERN. NAME — Bermbreeksteeltje.

Pileus 5–27 mm broad, 5–15 mm high, conico-campanulate, obtusely conical to hemispherical, gradually expanding to conico-convex or plano-convex, often with broad umbo, hygrophanous, when moist and fresh ochre-brown, orange-brown or warm brown at centre (e.g., K. & W. 5C6,7, 6C7, 6D6, D7), slightly paler towards margin, translucently striate up to halfway the radius or more, on drying becoming ochraceous to greyish ochre, dull, glabrous, pubescent when young but soon appearing glabrous. Lamellae, L = 14–19, l = 3(7), moderately distant to fairly crowded, adnexed, segmentiform or slightly ventricose, pale orange (5A3, B4,5) at first, then ochre-brown (5B6, C6, C7) with concolorous, crenulate edge. Stipe 25–62 × 0.5–2(2.5) mm, subcylindrical with equal or subbulbous base, fistulose, cream-coloured to straw-yellow or pale ochraceous at first (e.g., 4A3, 5A3, 4B4), gradually turning flesh-coloured brown, pale greyish brown to reddish brown (e.g., 5C3, 6C3, 6D4, 7D7) in lower half from base upwards, pruinose-striate lengthwise, in addition entirely pubescent. Context concolorous with surface, thin. Smell and taste weak, not distinctive. Spore print not recorded.

Spores 6.5–9.5(10.5) × 4.0–6.0(6.5) µm, av. 7.6–9.1(9.4) × 4.3–5.5 µm, Q = 1.5–1.9, Qav. = 1.55–1.75, not flattened, ellipsoid- to ovoid-oblong in frontal view, sometimes a variable proportion subamygdaliform in side-view, yellow-brown to brownish orange (5C7,8, 5D8, 6C6) in ammonia, thin-walled (<0.5 µm) with small, sometimes slightly eccentric germ pore, 1.0–1.3(1.7) µm wide. Basidia 14–23 × 7.5–9.5 µm, clavate, 4-spored, sometimes a minority 2-(1-)spored. Lamella edge sterile or heterogeneous. Cheilocystidia 15–22 × 6.5–10.5 µm, lecythifom with ovoid to clavate basal part, short to rather long neck (1.0–6.0 × 1.0–1.8 µm) and small capitulum, 2.0–4.8(5.2) µm broad, occasionally some with brown wall. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated, subglobose elements, 4.0–23 µm broad, with hyaline or yellowish walls. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 28–50 × 12–31 µm, often with slightly thick-walled, brown pedicel, intermixed with cylindrical hairs; upper hyphae of pileitrama strongly brown encrusted. Pileocystidia scattered to fairly numerous, filiform, 28–40 × 2.5–3.5 µm, sometimes base swollen up to 8.0 µm, with yellow-brown, refractive content. Stipitipellis a cutis, made up of hyphae 2.0–6.0 µm broad, with hyaline to pale yellow wall, with numerous clusters of cystidia. Caulocystidia variable: (1) clavate, subcylindrical or lageniform elements, 16–47 × 4.0–8.0 µm, in part with thin, tortuous neck, 1.5–2.0 µm broad; (2) numerous subglobose and ellipsoid elements, often in chains, 6.0–16 × 5.0–12 µm; (3) slender, cylindrical, often tortuous hairs up to 70 × 1.0–2.5 µm; lecythiform cystidia absent or very rare near apex, similar to cheilocystidia. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

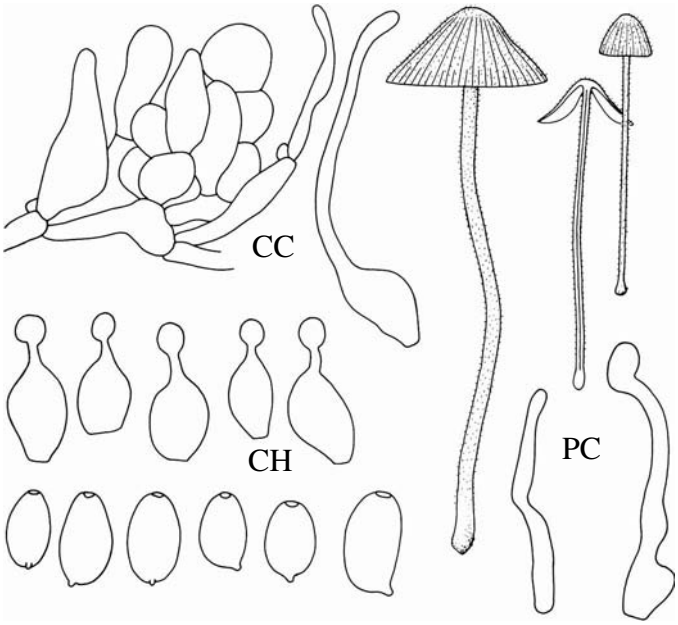


Fig. 163. *Conocybe rostellata*

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on soil, mainly short grasslands, lawns, and grassy roadside verges, also in deciduous forests and young plantations, on weakly acidic to basic, moist to dry, often calcareous sand, loam and clay. Probably rather common and widespread in the Netherlands but distribution insufficiently known because of taxonomic confusion with related species. July–Nov. Widespread in Europe but exact distribution unknown.

Conocybe rostellata is in the Netherlands probably the most common representative of the *C. sienophylla* complex and recognised by the fairly small, thin-walled spores. Hausknecht (in letter) investigated 10 collections, identified by Kühner as *C. siliginea* var. *ochracea*, "récoltes microspores," and found them in all characters identical with *C. rostellata*. *Conocybe sienophylla* has slightly larger spores that are in

addition slightly to fairly thick-walled, considerably darker and more or less flattened. The macroscopic characters of these species are very similar. The spores in *C. velutipes* are considerably larger.

The shape and size of the spores in *Conocybe rostellata* are similar to *C. moseri* and *C. pallidospora*. The former species has a dirty brown to grey-brown pileus, quite different from the warm ochre- to orange-brown colours in *C. rostellata*. *C. pallidospora* has considerably paler spores with a very thin wall. Some collections of *C. rostellata* in herbaria were identified as *C. pilosella*. That species differs clearly from *C. rostellata* in smaller spores without germ pore.

36. Conocybe sienophylla (B. & Br.) Sing. in Sydowia 9: 402. 1955, sensu auct. Leur. – Fig. 164.

Agaricus sienophyllus B. & Br. in J. linn. Soc., Bot. 11: 545. 1871; *Naucoria sienophylla* (B. & Br.) Sacc., Syll. Fung. 5: 858. 1878.

EXCL. — *Conocybe sienophylla* sensu Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 308. ('1982')1983 (= *C. velutipes*); sensu Chrispijn, Champ. Jordaan: 67. 1999 (= *C. rostellata*).

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 391. 1995; R. Phillips, Paddest. Schimm.: 155. 1981.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 310, figs. A–E. 1995; Enderle in Z. Mykol. 57: 86–89. 1991; Enderle in Z. Mykol. 60: 35–40. 1994; Watling in Br. Fung. Fl. 3: 74–75, fig. 159. 1982.

VERN. NAME — Oker breeksteeltje.

Pileus 6–18 mm broad, 4–12 mm high, broadly conical to campanulate then conico-convex or convex, hygrophanous, when moist and fresh orange-brown to brownish orange or yellow-brown at centre, (e.g., K. & W. 6C8, 5D6-6D6) with broad, paler, ochre-yellow to ochre-brown marginal zone (4B5-5B5, 4C5-5C5), translucently striate up to halfway the radius or more, on drying soon non-striate, pale ochraceous, dull, pubescent (hand-lens) at first, often soon appearing glabrous. Lamellae, L = 12–28, l = 3(7), rather crowded or moderately distant, adnexed, not to distinctly ventricose, pale ochraceous, then orange-brown to rusty brown with concolorous, slightly flocculose edge. Stipe 25–65 × 0.5–1.5 mm, cylindrical or subbulbous, not rooting, fistulose, cream-coloured to straw-yellow at first, then ochre-yellow, in lower half becoming brownish orange to reddish brown from base upwards, pruinose-striate, in addition minutely pubescent under hand-lens at first but hairs often difficult to find in older basidiocarps. Context concolorous with surface, thin. Smell and taste weak, not distinctive. Spore print orange-brown to rusty brown.

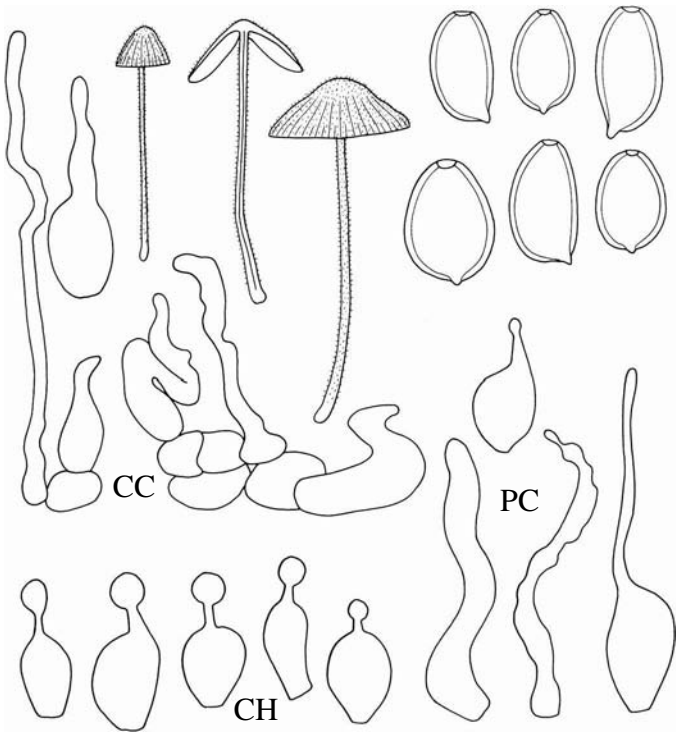


Fig. 164. *Conocybe sienophylla*

Spores 9.0–11.5 × 5.5–7.5 × 5.0–7.0 µm, av. 9.7–10.8 × 6.0–6.8 × 5.6–6.5 µm, at least in part slightly to moderately flattened, in frontal view ellipsoid to ovoid, Q = 1.4–1.7, Qav. = 1.5–1.65, in side-view predominantly ellipsoid- to ovoid-oblong, sometimes a variable proportion subamygdaliform, Q = 1.5–1.85, Qav. = 1.6–1.75, orange-brown to rusty brown (6D8, 7C8, D8) in ammonia, slightly to distinctly thick-walled (0.5–1.0 µm) with distinct apical germ pore, 1.2–2.3 µm wide. Basidia 14–27 × 8.0–10 µm, clavate, 4-spored. Lamella edge sterile. Cheilocystidia 17–25 × 5.0–10 µm, lecythiform with subglobose to clavate basal part, short to rather long neck (1.5–4.0 × 1.0–1.5 µm) and small capitulum, 2.5–4.5 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 4.0–23 µm broad, with hyaline to pale brown, sometimes encrusted walls. Pileipellis an epithelioid hymeniderm, made up of pyriform, clavate, and spheropedunculate elements, 23–50 × 13–28 µm, with hyaline or pale yellow wall, sometimes with thick-walled, brown pedicel, intermixed with cylindrical hairs and cystidia. Pileocystidia scattered to numerous, often inconspicuous, 20–44 × 3.0–10 µm, subcylindrical to lageniform, in addition with scattered lecythiform cystidia similar to the cheilocystidia and cylindrical hairs up to 60 µm × 1.0–4.0 µm. Stipitipellis a cutis of repent, cylindrical hyphae, 3.0–7.5 µm broad, with clusters of caulocystidia. Caulocystidia variable: (1) subcylindrical clavate or lageniform, 15–28 × 4.0–9.5 µm, often tortuous or with tortuous neck, 2.0–5.0 µm broad; (2) numerous small globose to ellipsoid elements, often in chains, 8.0–16 × 7.0–12.0 µm; (3) filiform, tortuous hairs up to 65 × 1.5–3.0 µm; lecythiform cystidia absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on soil in grasslands, lawns, roadside verges, parks, and gardens on poor and fertilised, weakly acidic to basic, sandy and loamy soils. In the Netherlands not uncommon, but distribution insufficiently known due to confusion with related species. May–Nov. Widespread in Europe but exact distribution unknown.

The name *Conocybe sienophylla* (earlier *C. ochracea*) has been used in the past for a species complex, comprising also *C. rostellata* and *C. velutipes* (= *C. kuehneriana*). The macroscopic appearance of these species is very similar. *Conocybe sienophylla* in the current European interpretation is characterised by medium-sized, with or without flattened spores with thickened, deeply coloured wall. *Conocybe kuehneriana* has larger spores, *C. rostellata* smaller, thin-walled spores (see there).

Agaricus sienophyllus was originally described from Sri Lanka (Berkeley & Broome in J. linn. Soc., Bot. 11: 545. 1871) and is said to be different in several respects from European populations (Thomas et al. in Österr. Z. Pilzk. 10: 96. 2001). In that case the European collections are in need of a new name.

Another member of the *C. sienophylla* complex is *C. juncicola* A. Hauskn. (in Österr. Z. Pilzk. 10: 209. 2001), recently described from

remains of *Juncus effusus* near Ravenna, Italy. It is distinguished from *C. sienophylla* by the more robust basidiocarps with short stipe (pileus 6–40 mm, stipe 15–45 × 1.5–3 mm), the non-striate pileus in moist condition, and in particular by spores measuring 8.0–11.0 × 5.5–6.5 µm with eccentric germ pore.

37. Conocybe velutipes (Velen.) Hauskn. & Svrček in Czech Mycol. 51: 66. 1999. – Fig. 165.

Galera velutipes Velen., Novit. mycol.: 128. ('1939')1940. *Conocybe siliginea* var. *ochracea* Kühner, "récoltes macrospores," Genre Galera: 104. 1935. — *Conocybe kuehneriana* Sing. in Beih. Nova Hedwigia 29: 212. 1969.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol.: 77–79. 1991 (as *C. kuehneriana*); Kühner, Genre Galera: 104–106, fig. 29. 1935 (as *C. siliginea* var. *ochracea* "récoltes macrospores" pro parte; Watling in Br. Fung. Fl. 3: 72, fig. 111. 1982 (as *C. kuehneriana*).

VERN. NAME — Grasbreeksteeltje.

Pileus 8–22(32) mm broad, up to 15 mm high, campanulate, conical or convex at first, slightly expanding to conico-convex, hygrophanous, when moist and fresh at centre orangey brown, reddish brown or dull brown (e.g., K. & W. 6C7, 6D6, 6D7; Mu. 7.5YR5/6) to the margin pale brown or ochraceous, translucently striate up to halfway of the radius or more, on drying soon not striate, pallescent to ochre-brown or ochre-yellow, pubescent when young, becoming glabrous in age. Lamellae, L = 12–22, l = 3(7), moderately crowded, adnexed, often slightly ventricose, ochraceous at first, becoming orange-brown with concolorous or slightly paler, fimbriate edge. Stipe 30–90 × 1–2.5 mm, cylindrical with base slightly thicker to subbulbous, up to 6 mm, not rooting, cream-coloured at apex, pale orange to pale brown at first, becoming orange-brown to reddish brown in lower half from base upwards, without veil remains, entirely striate lengthwise and minutely pubescent. Context thin, fragile, concolorous with surface. Smell and taste not distinctive. Spore print orange-brown.

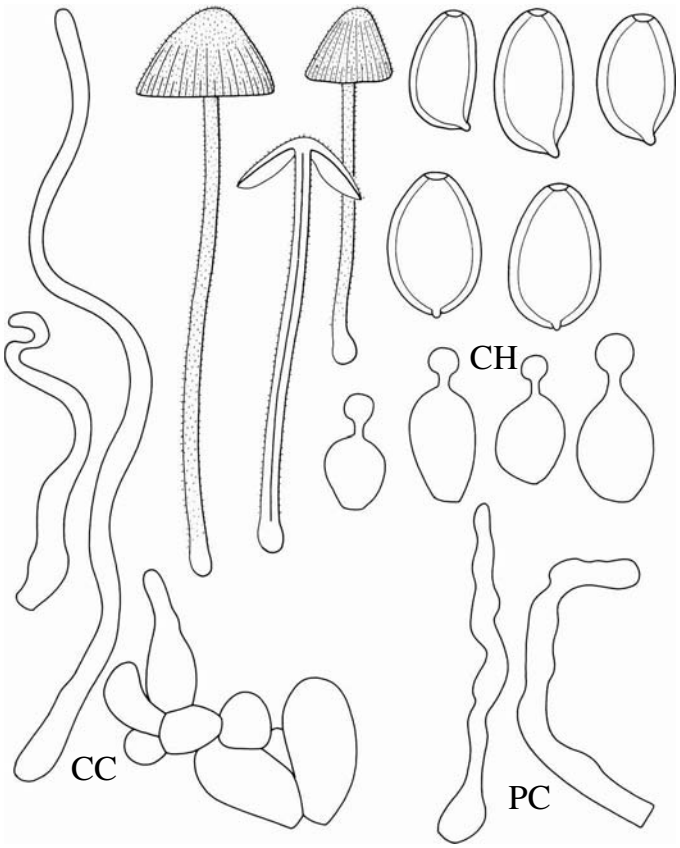


Fig. 165. *Conocybe velutipes*

Spores (10.0)10.5–13.5(14.0) × 6.5–8.5 × 6.0–7.5 µm, av. 11.0–12.5 × 7.2–7.8 × 6.4–7.0 µm slightly to distinctly flattened, in frontal view ellipsoid- to ovoid-oblong, sometimes slightly rhomboid, (Q = (1.4)1.5–1.7(1.8), Qav. = 1.5–1.7, in side-view ellipsoid-oblong to subamygdaliform, Q = (1.6)1.65–1.9, Qav. = 1.65–1.8, thick-walled (1.0–1.5 µm), orange-brown to rusty brown (6D8, 7D8) with large germ pore, 1.0–2.3 µm broad. Basidia 17–28 × 9.0–12 µm, clavate, 4-spored, exceptionally a few 2-spored. Lamella edge sterile. Cheilocystidia 14–25 × 8.0–11 µm, lecythiform with short to moderately long neck (1.5–4.5 × 1.2–1.8 µm) and small globose capitulum, 3.5–5.5 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 3.0–17 µm broad. Pileipellis an epithelioid hymeniderm, made up of pyriform to spheropedunculate elements, 26–63 × 10–34 µm, often with thick-walled, brown pedicel, occasionally with entirely brown wall, intermixed with cylindrical hairs. Pileocystidia scattered, 35–60 × 2.5–5.0 µm, filiform or slightly broader at base, often tortuous, hyaline or with pale brown content. Stipitipellis a cutis of repent hyphae, 2.0–6.0 µm broad, hyaline or pale yellow. Caulocystidia a mixture of (1) numerous globose to clavate elements (5.0–22.5 × 4.0–12 µm); (2) slender, lageniform elements, 18–50 × 4.0–10 µm with cylindrical, often flexuous neck, 1.5–3.5 µm broad; (3) cylindrical, often flexuous hairs, up to 100 × 2.5 µm. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in groups, terrestrial, usually in grassy places, in nutrient-poor hayfields as well as fertilised meadows, in roadside verges and lawns, on humus-rich, sandy to clayey, weakly acidic to basic soils, also in gardens and along forest edges. Probably uncommon in the Netherlands; distribution insufficiently known because of confusion with other taxa in the past. June–Oct. Also recorded from France, Germany, Great Britain, Austria, and Czech Republic.

Conocybe velutipes is characterised by slender basidiocarps with pubescent, vividly coloured pileus and pubescent stipe without lecythiform cystidia, 4-spored basidia, and in particular fairly large, thick-walled spores that are more or less flattened. *Conocybe. velutipes* has been recognised only recently in the Netherlands. It was considered conspecific with *C sienophylla* in the past, but it is different in consistently larger spores.

38. Conocybe incarnata (J. Schaeff.) Hauskn. & Arnolds in Arnolds & Hauskn in Persoonia 18: 246. 2003. – Fig. 166.

Galera incarnata J. Schaeff. in Z. Pilzk. 9: 165. 1930.

MISAPPL. — *Conocybe fragilis* sensu Arnolds in Arnolds et al., Overz. Paddest. Nederland: 106. 1995.

SEL. DESCR. & FIGS. — J. Schaeff. in Z. Pilzk. 9: 165. 1930; Arnolds & Hauskn in Persoonia 18: 246–248, figs. 4–5. 2003.

VERN. NAME — Vleeskleurig breeksteeltje.

Pileus 7–20 mm broad, 5–12 mm high, obtusely conical to campanulate, then conico-convex, hygrophanous, when fresh and moist pinkish red to wine-red or brick-red at first, then discolouring to brown-red or flesh-coloured brown, finally losing all red colour, translucently striate up to half of the radius or more, rapidly drying and becoming non-striate, pallescent to flesh-coloured or ochraceous-vinaceous, dull, glabrous. Lamellae, L = 18–28, l = 3, fairly crowded to crowded,

slightly ventricose, ochraceous at first, then orange-brown to rusty brown, with slightly paler, fimbriate edge. Stipe 25–50 × 0.7–1.5 mm, cylindrical with base tapering into a pseudorhiza up to 30 mm long, fistulose, pink to vinaceous, then becoming brown-red from the base upwards, minutely pruinose-striate and pubescent, in particular near apex. Context concolorous with surface, fragile. Smell and taste weak, not distinctive. Spore print orange-brown.

Spores 7.5–9.5(10.0) × 4.0–5.5 µm, av. 7.9–8.9 × 4.5–5.1 µm, Q = 1.6–1.9, Qav. = 1.65–1.75, not or weakly flattened, ellipsoid- to ovoid-oblong, in side-view occasionally slightly amygdaliform, yellow-brown to pale orange-brown (5C7, 6B6-C6, 6C7) in ammonia, slightly thick-walled (± 0.5 µm), with central germ pore, 1.0–1.5 µm wide. Basidia 14–20(25) × 6.0–9.0 µm, clavate, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia 14–20(25) × 6.0–9.0 µm, lecythiform with subglobose to clavate basal part, rather short neck (1.0–3.5 × 1.0–1.5 µm) and small capitulum, 3.0–4.5 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and inflated elements, 4.0–20 µm broad, with hyaline or pale yellow wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 23–50 × 10–32 µm, some with brownish, slightly thick-walled pedicel, in fresh basidiocarps with reddish intracellular pigment. Pileocystidia absent. Stipitipellis a cutis of cylindrical hyphae, 2.0–7.0 µm broad, with hyaline or pale yellow wall, with clusters of caulocystidia. Caulocystidia predominantly globose to broadly clavate, 6.0–18 × 5.0–10 µm, also with longer, narrowly clavate and subcylindrical elements, 20–38 × 6.0–10 µm, and with thin, cylindrical hairs up to 120 µm long, 1.0–2.0 µm broad; lecythiform cystidia lacking. Clamp-connections present but scarce and difficult to find. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or gregarious to subfasciculate, on compost or humus-rich soil very rich in nutrients, in gardens, orchards, flower-beds, and in unheated glasshouses with, e.g., cucumber. In the Netherlands very rare ('s-Graveland, Boekesteijn; Kortenhoef, Steenvoorde). Aug.–Oct., in glasshouses the entire year. Also known from Finland and Austria; apparently very rare in Europe.

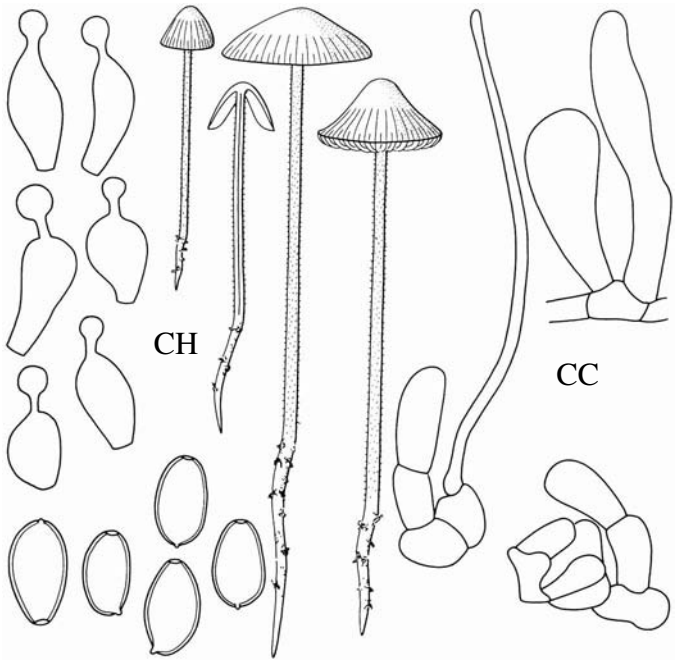


Fig. 166. *Conocybe incarnata*

Conocybe incarnata is a beautiful species, easily recognised by the pink or red colours of pileus and the rooting stipe. Ageing basidiocarps and exsiccata gradually lose pinkish tones and are more difficult to identify. The red colours are caused by intracellular pigment, an unusual phenomenon in *Conocybe.* This character is in common with *C. aurea*, another species of this genus with striking, in this case golden-yellow, colours.

Another pink *Conocybe* species, reported from Europe, is *C. fragilis* (Peck) Sing. (in Trudy bot. Inst. Akad. Nauk SSSR 2 (6): 438. 1950; basionym *Galera fragilis* Peck in Bull. Torrey bot. Club 24: 144. 1897). That species was originally described from the United States and belongs to sect. *Mixtae*. It differs from *C. incarnata* in the nonrooting stipe, the covering of the stipe with both lecythiform cystidia and cylindrical hairs, and the spores with small germ pore (0.5–0.8 µm) (Arnolds & Hausknecht in Persoonia 18: 246–247. 2003). *Conocybe fragilis* has not yet been collected in Europe with certainty. The descriptions by Kühner (Genre Galera: 112. 1935) and Watling (in Br. Fung. Fl. 3: 76. 1982) are ambiguous since they combine a nonrooting, slightly bulbous stipe with absence of lecythiform caulocystidia. However, the rooting stipe was also overlooked in the original diagnosis of *C. incarnata* by Schaeffer (in Z. Pilzk. 9: 165. 1930).

39. Conocybe moseri Watling in Notes R. bot. Gdn Edinb. 38: 342. 1980. – Fig. 167.

Conocybe kuehneri Sing. in Collect. bot. 1: 236. 1947 (invalid). — *Conocybe sienophylla* f. *cinerascens* Sing. in Mycologia 51: 397. 1959 (invalid). — *Conocybe murinacea* Watling in Notes R. bot. Gdn Edinb. 38: 352. 1980.

MISAPPL. — *Conocybe siliginea* sensu Kühner (f. *typica*, 'récoltes tétrasporiques'), Genre Galera: 108. 1935; sensu Kúhner & Romagn., Fl. anal. Champ. sup.: 345. 1953 ('f. tétrasporique'); sensu Mos., Blätter-Bauchpilze, 2. Aufl.: 220. 1955; *Galera siliginea* sensu Rick., Blätterpilze: 224. 1915; *Conocybe plumbeitincta* sensu Sing. in Sydowia 51: 137. 1950; sensu Dennis et al. in Trans. Br. mycol. Soc. 43 (suppl.): 35. 1960; sensu Mos., Röhrlinge Blätterpilze, 3. Aufl.: 229. 1967, 4. Aufl.: 282. 1978; sensu auct. eur. p.p. maj.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 383. 1995; Cetto, Funghi Vero 6: pl. 2220. 1989; Chrispijn, Champ. Jordaan: 67. 1999 (as *C. moseri* and *C. murinacea*).

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 304, figs A–E. 1995; Kühner, Genre Galera: 108–109, fig. 31. 1935 (as *C. siliginea* f. *typica*, 'récoltes tétrasporiques'); Watling in Notes R. bot. Gdn Edinb. 38: 352–353, figs 1C, 2G, 4A–C. 1980 (as *C. murinacea*); Watling in Br. Fung. Fl. 3: 72–73, figs 157, 160, 161; 79, figs 166–169. 1982 (as *C. murinacea*).

VERN. NAME — Grijs breeksteeltje.

Pileus 5–20 mm broad, 4–15 mm high, obtusely conical, campanulate or hemispherical at first, then slightly expanding to conico-convex or convex, hygrophanous, when moist and fresh at centre dull brown, greyish brown, dark grey-brown, occasionally with weak olivaceous tone or almost black or violaceous black when young (e.g., K. & W. 5D5-E6, 6D5, E4, F4, 7E5, F5), towards margin slightly paler, not striate or weakly translucent-striate at margin only, on drying only slightly paler, dull coloured, greyish brown, greyish ochre-brown (e.g., 5D4-E4, 6D4, E5), glabrous or minutely pubescent when young. Lamellae, L = 16–24, l = 3(7), moderately distant to fairly crowded, adnexed, slightly ventricose, pale yellow or ochraceous at first, then ochre-brown to orange-brown with slightly paler, fimbriate edge. Stipe 20–75(100) × 0.7–2 mm, cylindrical or slightly thickened at base, fistulose, apex whitish, downwards pale ochre to flesh-coloured pink

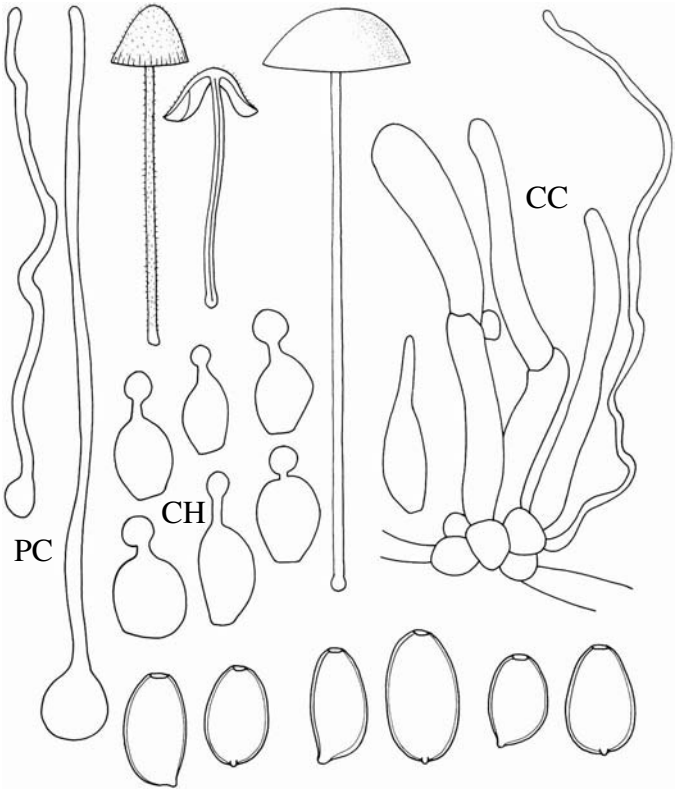


Fig. 167. *Conocybe moseri*

at first, becoming pale brown to pinkish brown from base upwards, pubescent-striate lengthwise. Context concolorous with surface, thin, fragile. Smell and taste weak, not distinctive. Spore print not recorded.

Spores 8.0–12.5 × (4.5)5.0–7.0(7.5) µm, av. 9.1–11.4 × 5.4–6.8 µm, Q = 1.5–1.9, Qav. = 1.55–1.75, not or hardly flattened, in frontal view ellipsoid- or ovoid-oblong, in side-view ellipsoid-oblong to slightly amygdaliform, orange-brown to rusty orange (6C8, 7C8) in ammonia, slightly thick-walled (< 0.5 µm) with apical germ pore 1.0–2.2 µm wide. Basidia 14–26 × 7.0–11 µm, clavate or subcylindrical, 4-spored, rarely a few 2-spored. Lamella edge sterile. Cheilocystidia 13–21 × 6.0–11 µm, lecythiform, with subglobose to clavate basal part, short to moderately long neck (1.0–4.5 × 1.0–1.8 µm) and small capitulum, 2.8–4.7 µm broad, hyaline. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 4.0–32 µm broad, hyaline or with pale brown parietal to encrusting pigment. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 23–77 × 15–50 µm, often with slightly thickened, brown pedicel, often intermixed with cylindrical hairs. Pileocystidia absent, scattered, or numerous, up to 200 µm × 1.2–2.5 µm, filiform, often flexuous, often with swollen base, 3.0–8.0 µm broad. Stipitipellis a cutis, made up of repent hyphae, 2.0–6.0 µm broad, with hyaline or pale yellow wall. Caulocystidia lageniform, utriform or subcylindrical, 16–75 × 3.0–9.0 µm, intermixed with numerous smaller, subglobose to ellipsoid elements, 4.0–13 × 4.0–10 µm, and numerous cylindrical, straight or tortuous hairs, 40–140 × 1.0–2.5 µm, often with swollen base; lecythiform cystidia lacking. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, occasionally subfasciculate, terrestrial, on humus-rich soil, dung, compost, and decaying organic matter, e.g., on burnt reed (*Phragmites*), in gardens, parks, fertilised grasslands, on roadside verges, and in ruderal places. In the Netherlands widespread but uncommon. May–Oct. Widespread in West and Central Europe but not common.

Conocybe moseri has unusually dull and dark colours for the genus *Conocybe*. The species is furthermore characterised by a pubescent stipe, predominantly 4-spored basidia and medium-sized spores. *Conocybe bisporigera* is very similar in macroscopic characters but it differs in 2-spored basidia and distinctly flattened spores. *Conocybe anthracophila* has also a dark pileus colour, but with distinct reddish brown tones. In addition, the basidiocarps are more robust and the spores are slightly broader.

Watling (in Notes R. bot. Gdn Edinb. 38: 352. 1980) distinguished *C. murinacea*, which is said to differ mainly in the mouse-grey to almost black pileus in young basidiocarps, often with vinaceous or violaceous tones. Such collections were also made in the Netherlands, but mature basidiocarps have similarly greyish brown colours as *C. moseri* (see photographs of the two taxa in Chrispijn, Champ. Jordaan: 67. 1999). According to Watling (in Br. Fung. Fl. 3: 79. 1982), *C. murinacea* has also slightly larger spores (10.5–12.5 × 6.0–7.0 µm) than *C. moseri* (8.5–11.5(12.5) × 5.0–7.0 µm). In the Dutch collections no difference in spore size was found. Furthermore, *C. murinacea* was described from dung, *C. moseri* from soil. However, a rich population with the typical colours of *C. murinacea* was found on soil mixed with compost.

40. Conocybe anthracophila Kühn. & Watl. in Notes R. bot. Gdn Edinb. 40: 540. 1983. – Fig. 168.

Conocybe siliginea var. *anthracophila* Maire & Kühner in Kühner, Genre Galera: 97. 1935 (invalid); *Conocybe anthracophila* (Maire & Kühner) Singer in Trudy bot. Inst. Akad. Nauk SSSR: 2 (6): 437. 1950 (invalid).

SEL. ICON.: Enderle in Beitr. Kenntn. Pilze Mitteleur. 12: opposite p. 80. 1999

SEL. DESCR. & FIGS. — Derbsch & Schmitt, Atlas Pilze Saarland 2: 300. 1987; Enderle in Beitr. Kenntn. Pilze Mitteleur. 12: 76–78. 1999; Kühner, Genre Galera: 97, fig. 26A. 1935; Peintner et al. in Österr. Z. Pilzk. 8: 102–103, figs 41–45. 1999; Watling in Br. Fung. Fl. 3: 78. 1982.

VERN. NAME — Brandplekbreeksteeltje.

Pileus 20–35(45) mm broad, 8–20 mm high, conico-campanulate at first, then conico-convex with broad umbo, often with wavy margin, hygrophanous, when moist and fresh red-brown to dark reddish brown, sometimes almost blackish brown at centre, to the margin pale reddish brown to ochre-brown, translucently striate up to three-fourths of the radius or more, on drying ochre-brown to ochraceous, dull, minutely pubescent (hand-lens). Lamellae, L = 22–28, l = 3(7), crowded, adnexed, often slightly ventricose, ochraceous at first, then ochre-brown to rusty brown with slightly paler, fimbriate edge. Stipe 35–60(80) × 1.5–4 mm, subcylindrical or with bulbous base 5–8 mm thick, fistulose, whitish to pale straw-yellow at first, then brownish ochre to dark reddish brown in lower part, entirely pruinose-striate and pubescent. Context concolorous with surface. Smell and tast weak, not distinctive. Spore print rusty brown.

Spores (9.0)9.5–12.5(13.5) × (5.5)6.0–7.5(8.5) µm, av. 10.5–11.2 × 6.4–7.2 µm, Q = 1.5–1.75, Qav. = 1.55–1.65, ellipsoid or ovoid to ellipsoid-oblong or ovoid-oblong, not flattened in frontal view, orange-brown in ammonia, slightly to moderately thick-walled (0.5–1.0 µm), with central to slightly eccentric germ pore, 1.5–1.8 µm wide. Basidia 16–25 × 8.0–11 µm, 4-spored or 4- and 2-(1-)spored intermixed. Lamella edge sterile. Cheilocystidia 14–26 × 6.5–11(12) µm, lecythiform with ellipsoid to clavate basal part, short neck (1.0–2.5 ×

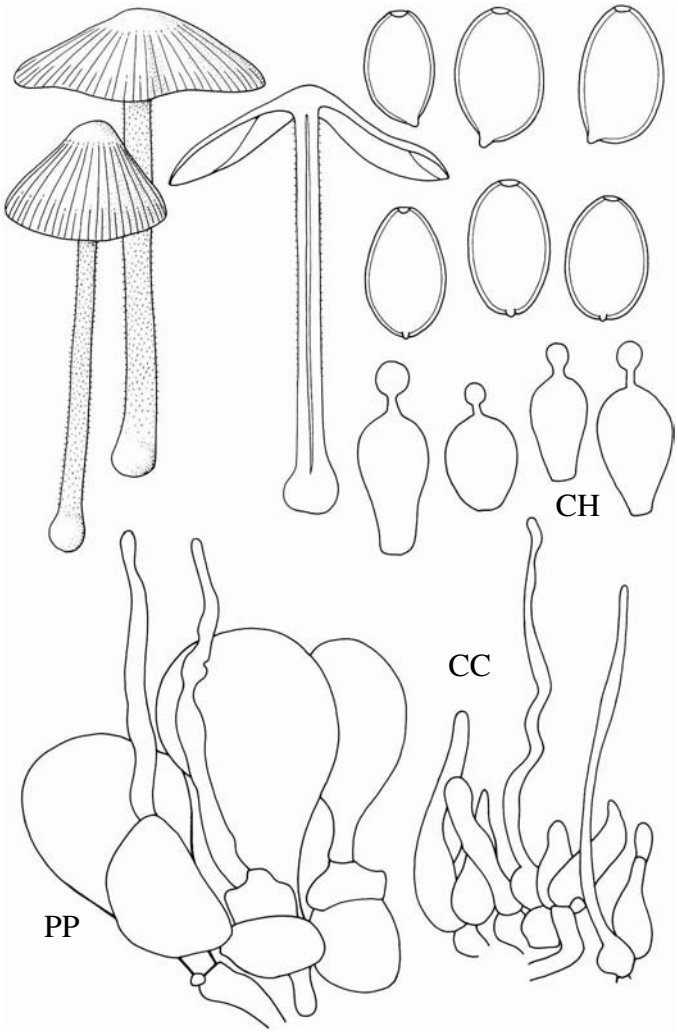


Fig. 168. *Conocybe anthracophila*

1.4–1.8 µm) and small capitulum, 2.5–4.5 µm broad. Pleurocystidia absent. Hymenophoral trama made up of narrowly cylindrical and strongly inflated elements, 3.0–35 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 27–65 × 11–27 µm, some pedicels with slightly thickened, yellow-brown wall, intermixed with numerous hairs. Pileocystidia 20–80 × 1.2–4.0 µm, filiform, often broader to the base, often strongly tortuous, some with yellow-brown walls, only slightly projecting outside elements of pileipellis. Stipitipellis a cutis, made up of cylindrical hyphae, 2.0–7.0 µm broad, with hyaline to pale yellow walls. Caulocystidia variable: (1) irregularly lageniform, clavate and subcylindrical elements 12–28 × 3.0–8.0 µm; (2) numerous small subglobose and ellipsoid elements, up to 12 × 8.0 µm; (3) numerous cylindrical, straight, or tortuous hairs, 25–60 × 1.5–4.0 µm, often swollen at base up to 8.0 µm; lecythiform cystidia absent. Clamp-connections present but rare. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, usually in small groups, in the Netherlands on soil between remains of burnt wood in old bonfire places, elsewhere also recorded from other disturbed habitats on basic soils, rich in nutrients, such as gardens and ruderal sites. In the Netherlands very rare (Westerbork, Zwiggelte; Cadier en Keer, Örenberg). June. Also known from Great Britain, Germany, Austria, France, and North Africa; apparently rare everywhere.

Conocybe anthracophila is a remarkable species within sect. *Pilosellae* because of rather large basidiocarps with a dark reddish brown pileus and medium-sized spores. *Conocybe fimetaria* may be found in the same nutrient-rich habitats but differs in a rooting stipe and flattened spores. *Conocybe moseri* has also dark brown colours, but the basidiocarps of that species are less robust, they lack reddish tones, and the spores are slightly smaller. *Conocybe sienophylla* and *C. velutipes* differ in paler, more ochraceous colours and flattened spores with thicker wall. *Conocybe anthracopophila* may also be mistaken for *C. pubescens* (sect. *Mixtae*), but the spores in that species are considerably larger and the stipe bears numerous lecythiform cystidia between the hairs.

Conocybe anthracophila is not restricted to burnt sites, since it is also found on compost or in other sites rich in nutrients. On the other hand, other species of *Conocybe* are incidentally found between burnt wood. Consequently, ecological characteristics alone are not sufficient for recognition of this species.

41. Conocybe lenticulospora Watling in Notes R. bot. Gdn Edinb. 38: 351. 1980. – Fig. 169.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 59: 28–29. 1993; Watling in Notes R. bot. Gdn Edinb. 38: 351–352, figs 1E, 2F, 2I, 4D–F. 1980; Watling in Br. Fung. Fl. 3: 76–77, figs 162–165. 1982.

VERN. NAME — Paardevijgbreeksteeltje.

Pileus 8–25 mm broad, 6–13 mm high, conico-convex to campanulate, hygrophanous, rather dull coloured, when moist and fresh dark brown to reddish brown at centre (K. & W. 7E8; Mu. 10YR6/6, 7/8), towards the margin pale to fairly dark brown with only weak orange or ochraceous tones (6E7, 6D6; 2.5Y7/4, 7/6), translucently striate up to three-fourths of the radius, on drying pallescent to pale yellow or ochraceous brown, glabrous or pubescent under a hand-lens. Lamellae, L = 20–28, l = 1–7, adnexed, ascending, rather crowded, ventricose, up to 3 mm,

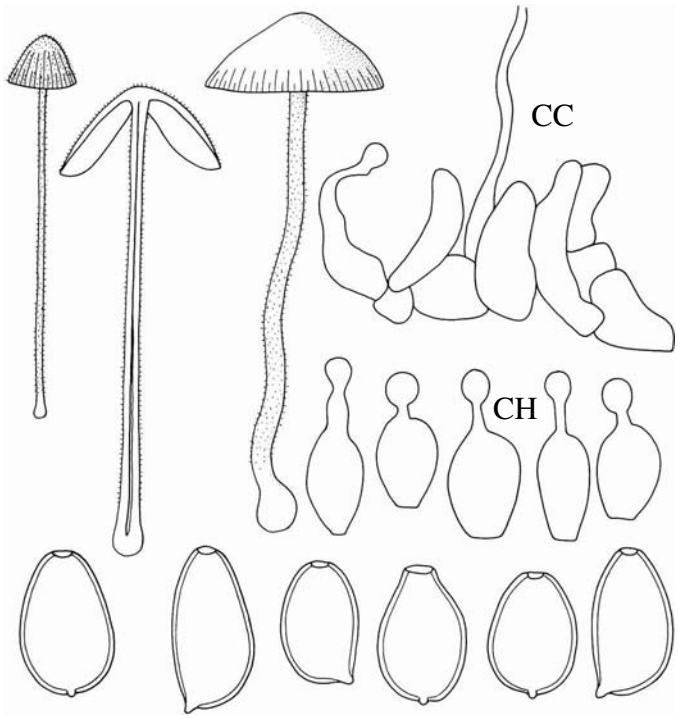


Fig. 169. *Conocybe lenticulospora*

pale ochraceous at first, then warm orange-brown. Stipe 30–85 × 1–2 mm, cylindrical or slightly thickened towards base, often with basal bulb up to 5 mm, cream to pale orange, gradually darkening to orange-brown or reddish brown from base upwards, pruinose-striate, in addition pubescent (hand-lens). Context concolorous with surface. Smell weak, not distinctive. Taste mild. Spore-print rusty brown.

Spores (8.5)9.0–14.0 × 6.0–8.5(9.0) × 5.5–7.5(8.0) µm, av. 10.0–12.0 × 6.6–7.5 × 5.9–6.7 µm, weakly to distinctly flattened, in frontal view ovoid, a very small to large proportion slightly to distinctly angular, Q = 1.3–1.7 (1.8), Qav. = 1.45–1.65, in side-view ellipsoid-oblong to subamygdaliform, Q = 1.6–2.0, Qav. = 1.7–1.85, orange-brown in ammonia, moderately thick-walled (< 1.0 µm) with large, apical germ pore, 1.3–2.3 µm wide. Basidia 16–25 × 8.0–11 µm, 4-spored. Lamella edge sterile. Cheilocystidia 14–25 × 7.0–11.0 µm, lecythiform with ellipsoid to clavate basal part tapering into a short to moderately long neck (1.5–5.5 × 1.0–1.8 µm), with a small capitulum, 3.0–4.5(5.5) µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated, subglobose elements, 3.0–23 µm broad. Pileipellis an epithelioid hymeniderm, made up of subglobose, pyriform and spheropedunculate elements, 20–65 × 13–40 µm, intermixed with cylindrical hairs. Pileocystidia scarce to numerous, in some collections rather short (up to 40 µm long), in others long hairs, up to 350 × 1.5–5.5 µm, filiform, flexuous, hyaline or with brown content. Stipitipellis a cutis of parallel hyphae, 3.0–8.0 µm broad, with numerous clusters of cystidia. Caulocystidia mainly lageniform, clavate to utriform, 15–36 × 4.0–12 µm, rarely with subcapitate neck, intermixed with subglobose elements, 7.5–15 × 5.5–12 µm and cylindrical hairs up to 250 µm long, 1.5–4.0 µm broad; lecythiform cystidia absent. Clamp-connections present. Chemical reactions: Ammonia rection negative.

HABITAT & DISTR. — Saprotrophic, usually in small groups, most often recorded from old, straw-rich horse dung but also terrestrial on subneutral to basic soils in poor grasslands. July–Oct. In the Netherlands rarely collected but probably overlooked. Also recorded from Great Britain, Germany, and Austria, probably uncommon.

It is difficult to distinguish *Conocybe lenticulospora* in the field from other, mainly dung-inhabiting species of *Conocybe*, such as *C. pubescens*. *Conocybe lenticulospora* is recognised by the dull colours of the pileus, the pubescent pileus and stipe, and in particular by the flattened, often in part hexagonal spores. The proportion of hexagonal spores is quite variable, however, and in some collections they are difficult to find. As in most other European *Conocybe* species, the coprophilous habitat is not obligatory.

A related species with slightly angular spores in frontal view is *C. hexagonospora* Hauskn. & Enderle (in Österr. Z. Pilzk. 2: 40. 1993) (= *C. hexagonospora* Métrod in Bull. trimest. Soc. mycol. Fr. 56: 48. 1940, invalid). It differs from *C. lenticulospora* mainly in smaller spores, measuring 8.0–9.5 × 6.0–7.0 × 5.0–6.0 µm, possibly also in the paler pileus and the habitat on soil, litter, and burnt wood in coniferous forests. *Conocybe hexagonospora* is known from France, Austria, and Germany and apparently not uncommon in subalpine coniferous forests.

42. Conocybe farinacea Watling in Notes R. bot. Gdn Edinb. 25: 309. 1964. – Fig. 170.

SEL. DESCR. & FIGS. — Arnolds & Hauskn. in Persoonia 18: 243–244, fig. 3. 2003; Watling in Notes R. bot. Gdn Edinb. 25: 309–311, fig. 1. 1964; Watling in Br. Fung. Fl. 3: 65–66, figs 148–152. 1982.

VERN. NAME — Melig breeksteeltje

Pileus 18–27 mm broad, 10–20 mm high, conico-campanulate to hemispherical, hygrophanous, when moist at centre rusty brown (K. & W. 7D8), towards the margin paler orange-brown (6D8), translucently striate up to three-fourths of the radius, on drying fading to pale orange-brown to slightly greyish orange (5B4, 6C7), pubescent at first, then glabrous, at centre smooth or slightly wrinkled. Lamellae, L = 28–33, l = 3, fairly crowded, adnexed, segmentiform, yellow-brown at first, then orange-brown, with slightly paler fimbriate edge. Stipe 35–78 × 2–4 mm, cylindrical, at base slightly thickened to bulbous, up to 7 mm thick, not rooting, pale orange (5A5, 5B5), at first pubescent slightly striate lengthwise, then becoming glabrous. Context concolorous with surface. Smell of undamaged basidiocarp weak and not distinctive, but readily farinaceous when crushed or cut; taste strongly farinaceous. Spore print rusty brown.

Spores 12.0–15.0(17.0) × 7.0–9.5(10.5) µm, av. 13.0–14.1 × 7.7–8.4 µm, Q = 1.6–1.9, Qav. = 1.65–1.7, not or weakly flattened, ellipsoid-oblong to ovoid-oblong in frontal view, ellipsoid-oblong to slightly phaseoliform in side-view, brownish orange to rusty brown (5C7, 6D8, 7D8) in ammonia, thick-walled (0.5–2.0 µm), with large, apical pore, 1.8–2.5 µm wide. Basidia 20–29 × 12–14 µm, 4-spored. Lamella edge sterile. Cheilocystidia 18–25 × 6.0–10.0 µm, lecythiform

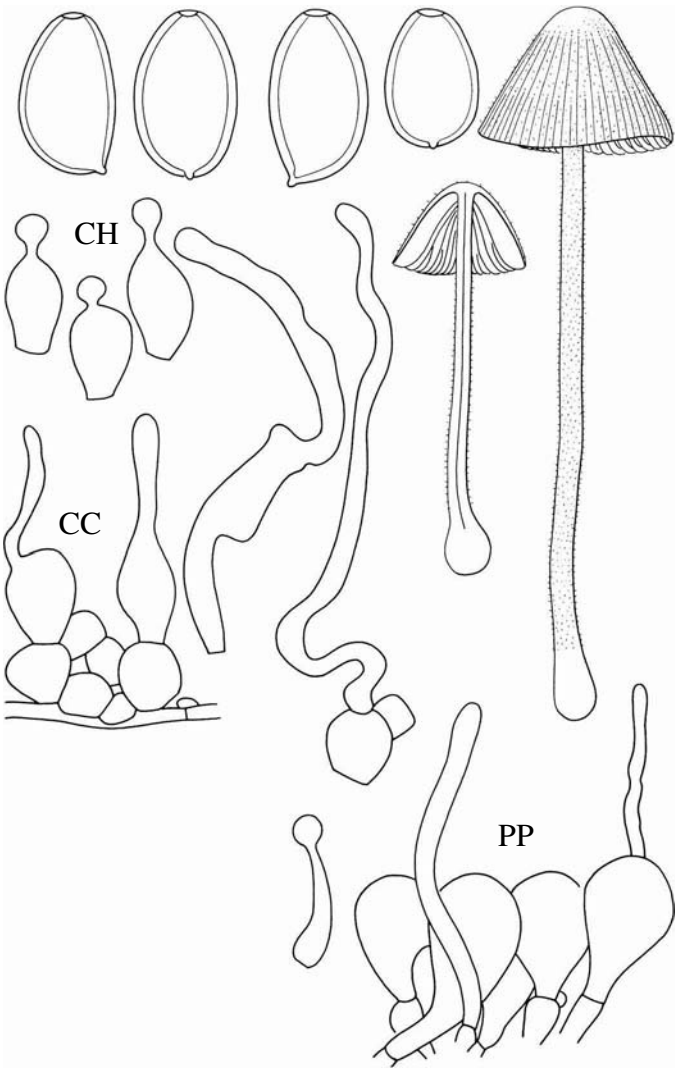


Fig. 170. *Conocybe farinacea*

with ellipsoid or clavate basal part, moderately long neck (2.5–4.5 × 1.5–2.0 µm) and small capitulum, 3.0–4.5 µm. Hymenophoral trama made up of cylindrical hyphae and inflated, globose elements, 4.0–18 µm broad, often with yellow-brown wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate cells, 20–47 × 10–20 µm, often with pale brown pedicel, intermixed with scattered cystidia. Pileocystidia rare to scattered, mainly filiform, up to 60 µm long and 2.5–4.0 µm wide, often tortuous, hyaline or with yellow content; occasionally with few capitate cystidia, c. 23 × 4.5 µm with neck 2.0 µm and capitulum 4.5 µm broad. Stipitipellis a cutis, made up of parallel hyphae, 2.0–6.0 µm broad, with clusters of caulocystidia. Caulocystidia predominantly subglobose and ellipsoid, often in chains, 7.0–14 × 5.0–11 µm, intermixed with clavate and lageniform elements, 16–33 × 4.5–11 µm and scattered cylindrical hairs, 18–160 × 2.0–5.5 µm; lecythiform cystidia absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative or rarely weak.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on dung of horse and donkey in woodlands. Aug.–Sept. In the Netherlands very rare (Vledder, Boschoord, and Vledderhof). Also recorded in Scotland and England.

Conocybe farinacea is characterised in the first place by the farinaceous smell and taste, a unique feature in the genus *Conocybe*. However, in the collections from the Netherlands this smell was absent or weak in undamaged basidiocarps and became only very clear when basidiocarps were crushed or cut.

Conocybe farinacea was placed by Watling (in Br. Fung. Fl. 3: 65. 1982) in sect. *Mixtae* in view of the presence of lecythiform cystidia on the stipe along with cylindrical hairs. In the collections from the Netherlands lecythiform cystidia were absent on the stipe. They were also not found during renewed examination of the type collection (Arnolds & Hausknecht in Persoonia 18: 243–246. 2003). Therefore, *C. farinacea* is assigned here to sect. *Pilosellae.*

Within sect. *Pilosellae*, *Conocybe singeriana* A. Hauskn. shows much resemblance to *C. farinacea*. *Conocybe singeriana* is also a coprophilous species with rather robust basidiocarps. It differs in the absence of a mealy smell, a strongly bulbous stipe base, 5–12 mm broad, and larger spores, measuring (12.0)13.0–17.0(18.5) × (7.0) 8.0–11.0 µm, av. 14.0–16.5 × 8.2–9.7 µm (Hausknecht in Fungi non del. 2: 6. 1997; Arnolds & Hausknecht in Persoonia 18: 245. 2003). *Conocybe farinacea* may also be confused at first sight with the common coprophilous species *C. pubescens*. The latter species differs not only in the absence of the farinaceous smell, but also in the considerably larger spores, measuring (13.0)14.0–18.5(20.0) × (7.0)7.5–10.0 µm, av. 15.8–17.0 × 8.3–9.2 µm, and the frequent occurrence of lecythiform caulocystidia. Watling (in Notes R. bot. Gdn Edinb. 25: 311. 1964) demonstrated that cultures of *C. farinacea* are incompatible with cultures of *C. pubescens*, as well with two non-coprophilous species of sect. *Mixtae*, viz. *C. pseudopilosella* Kühn. & Watl. (= *C. pulchella* [Velen.] Hauskn. & Svrček) and *C. subpubescens* P.D. Orton (= *C. digitalina* [Velen.] Sing.).

43. Conocybe magnispora (Murrill) Sing. in Sydowia 4: 135. 1950. – Fig. 171.

Galerula magnispora Murrill in Mycologia 35: 530. 1943.

SEL. DESCR. & FIGS. — Arnolds & Hauskn. in Persoonia 18: 241–242, fig. 2. 2003; Sing. in Sydowia 4: 135–136. 1950.

Pileus 5–12 mm broad, 4–8 mm high, conico-campanulate to hemispherical, only slightly expanding, hygrophanous, when moist and fresh at centre greyish ochre-brown to orangey brown (K. & W. 5D5, 5E6, 6E7), only slightly paler towards margin, translucently striate up to three-fourths of the radius, on drying pale ochraceous, pubescent at first, then glabrous. Lamellae, L = 14–17, l = 3, fairly crowded, adnexed, slightly ventricose, ochraceous at first, then rusty brown, with concolorous fimbriate edge. Stipe 18–30 × 0.8–1.5 mm, cylindrical, at base not bulbous, not rooting, whitish at first, then pale straw-yellow to ochraceous, pubescent at least at apex. Context concolorous with surface. Smell and taste weak, not distinctive. Spore print not recorded.

Spores 13.5–20.5 × 7.5–10.5(11.0) µm, av. 14.6–17.0 × 8.3–9.3 µm, Q = (1.5)1.6–2.0, Qav. = 1.75–1.85, not flattened, ellipsoid-oblong to ovoid-oblong in frontal view, ellipsoid-oblong to subamygdaliform in side-view, ochre-brown, brownish orange to orange-brown in ammonia, thick-walled (0.5–2.0 µm) with large, apical pore, 1.8–2.5 µm wide. Basidia 20–28 × 12–14 µm, 4-spored. Lamella edge sterile. Cheilocystidia 17–28 × 6.0–13 µm, lecythiform with subglobose, ellipsoid or clavate basal part, short to moderately long neck (1.0–4.0 × 1.0–1.5 µm) and small capitulum, 3.0–4.0(5.0) µm. Hymenophoral trama made up of cylindrical hyphae and inflated, globose elements, 6.0–20 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate cells, 29–51 × 11–30 µm. Pileocystidia not seen in exsiccata. Stipitipellis a cutis, made up of parallel hyphae, 2.0–5.0 µm broad, with clusters of caulocystidia. Caulocystidia predominantly clavate to lageniform, 16–22 × 4.0–7.0 µm, intermixed with numerous subglobose elements, 5.0–10.0 × 4.5–9.0 µm and scattered cylindrical hairs up to 70 × 2 µm; lecythiform cystidia absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on dung of horse and cow, in the Netherlands so far only in nutrient-poor habitats, such as heathland and forest on acidic, sandy soil. Very rare (Emmen, Bargerbos, Westerbork, Orvelterzand). Sept.–Oct. In Europe also recorded once from France and Sweden. More widespread in North and South America.

Conocybe magnispora is characterised by the very large spores in combination with 4-spored basidia and stipe covering exclusively with cylindrical hairs and clavate to lageniform elements, without lecythiform cystidia. In sect. *Pilosellae* two other species combine very large spores with 4-spored basidia. *Conocybe singeriana* A. Hauskn. grows also on dung, but differs in much larger basidiocarps with the pileus 10–40 mm and the stipe (45)60–90(110) mm with a distinctly bulbous base. *Conocybe watlingii* A. Hauskn. is another coprophilous species

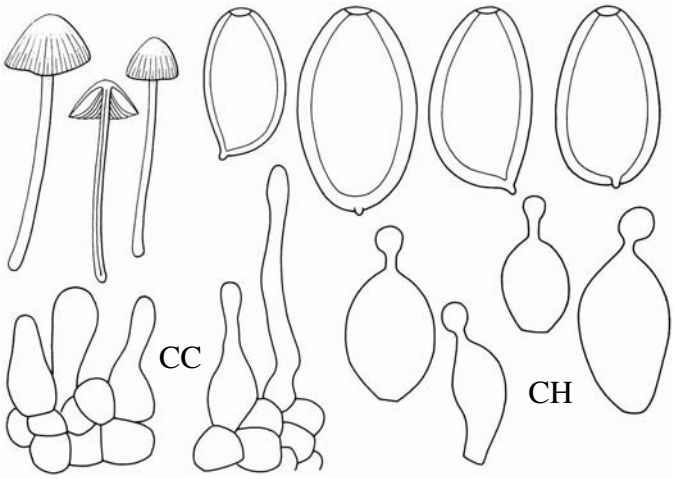


Fig. 171. *Conocybe magnispora*

in this group with very large spores (14.5–18.0 × 7.5–9.5 µm, av. 16.0–16.7 × 8.5–9.0 µm), but it has a rooting stipe base and the stipe covering is intermixed with some scattered lecythiform cystidia.

Conocybe magnispora may also be easily confused with *C. pubescens*, a much more common coprophilous species with similar habit and comparable spore size. However, the latter species always has a considerable proportion of lecythiform cystidia among the caulocystidia and therefore belongs to sect. *Mixtae*.

44. Conocybe singeriana A. Hauskn. in Fungi non del. 2: 6. 1997. – Fig. 172.

SEL. ICON. — Enderle & Hübner in Z. Mykol. 65: pl. 5. 1999; Hauskn. & Krisai in Fungi non del. 2: pl. 2. 1997.

SEL. DESCR. & FIGS. — Enderle & Hübner in Z. Mykol. 65: 9–11, fig. 6. 1999; A. Hauskn. in Agarica 15 (24–25): 2–6, figs 1–7. 1998; Hauskn. & Krisai in Fungi non del. 2: 6–10, figs 2a–f. 1997.

VERN. NAME — Knollig breeksteeltje.

Pileus 10–40 mm broad, up to 20 mm high, campanulate to conico-convex or hemispherical, hygrophanous, when fresh and moist at first orange-yellow (K. & W. 5A6), then pale brown to medium brown (K. & W. 6D5, 6E5, 6, 7E5, 6) at centre, gradually paler towards the ochre-yellow or greyish orange (6C3-4) margin, translucently striate up to 1/2–3/4 of the radius, soon drying and not striate, pallescent to pale ochraceous (5B3) with slightly darker centre, smooth to rugulose-wrinkled, pubescent under hand-lens. Lamellae crowded, adnexed, slightly ventricose, pale yellow-brown at first then pale orangey brown (6D5, D6) with concolorous, crenulate edge. Stipe (45)60–90(110) × 2–4 mm, cylindrical with distinctly bulbous base, 5–12 mm, occasionally with marginate bulb, fistulose, entirely ochre-yellow, orange-yellow to brownish orange, pubescent-striate lengthwise. Context concolorous with surface. Smell weak, not distinctive or reminiscent of cacao. Taste mild. Spore print greyish brown (6E5).

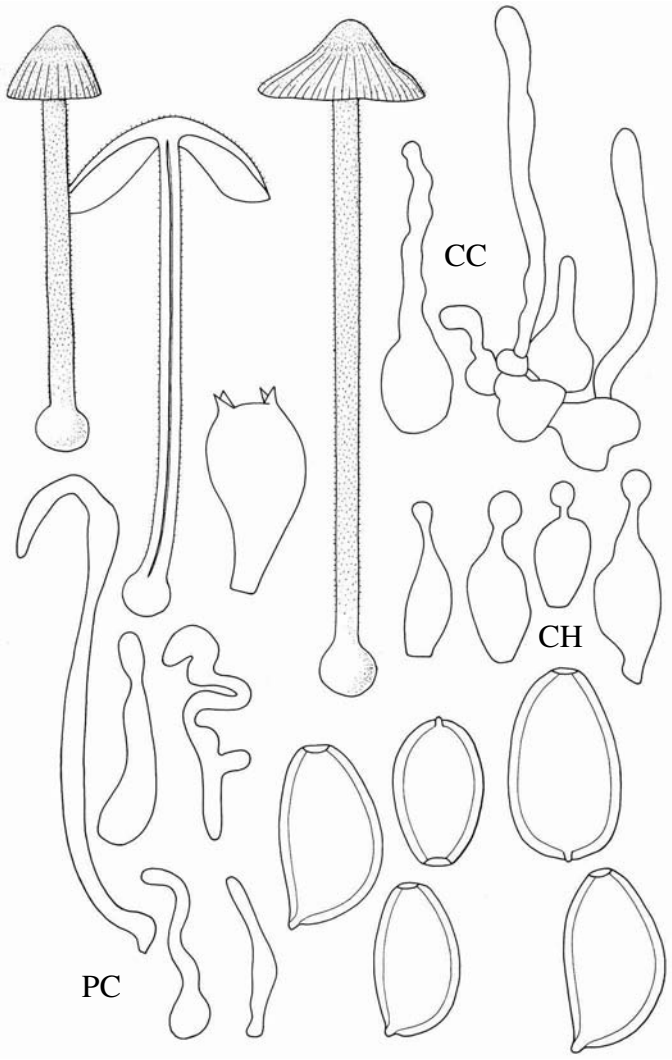


Fig. 172. *Conocybe singeriana*

Spores (12)13–17(18.5) × (7.0)8.0–11 µm, av. 14.0–16.5 × 8.2–9.7 µm, Q = (1.5)1.6–1.9, Qav. = 1.7–1.8, not or weakly flattened, ellipsoid-oblong to ovoid-oblong in frontal view, ellipsoid-oblong to subamygdaliform in side-view, rusty brown (7D8) in ammonia, thick-walled (up to 1.5 µm), with large, truncate germ pore, 2.0–3.0 µm wide. Basidia 23–35 × 13–17 µm, 4-spored or a few 2-spored intermixed. Lamella edge sterile. Cheilocystidia 19–29 × (6.0)7.0–11 µm, lecythiform with ellipsoid to clavate basal part, short to moderately long neck (2.0–5.0 × 1.5–2.0 µm) and small capitulum, 3.0–5.0 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 5.0–30 µm broad, with hyaline or pale brown wall. Pileipellis an epithelioid hymeniderm, made up of pyriform to spheropedunculate elements, 25–60 × 14–37 µm, at the base often with slightly thickened, yellowish wall, intermixed with cylindrical hairs. Pileocystidia numerous, 17–70 × 2.0–5.5 µm, mainly filiform, subcylindrical, often strongly tortuous, often with yellowish content, also some shorter and broader, subcylindrical to lageniform cystidia, 23–30 × 5.5–7.5 µm, sometimes with subcapitate apex; lecythiform cystidia lacking. Stipitipellis a cutis, made up of repent hyphae, 2.0–5.0 µm broad, with hyaline to pale yellow wall, with numerous clusters of cystidia. Caulocystidia 17–52 × 6.0–10 µm, subcylindrical, utriform to narrowly lageniform, often with long, cylindrical, filiform neck, 1.5–2.5 µm broad, intermixed with numerous subglobose elements, 5.0–14 × 5.0–13 µm and cylindrical hairs up to 160 × 1.5–4.5 µm; lecythiform cystidia absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, usually in small groups, in the Netherlands found on cow dung in poor meadow on calcareous sand dunes, elsewhere also mainly on dung but also on soil and decayed woodchips in ruderal places rich in nutrients. In the Netherlands very rare (Vogelenzang, Amsterdamse Waterleidingduinen; Vledder, Boschoord). May–Oct. Also recorded from Austria, Germany, France, Finland, and Sweden; outside Europe from Africa and probably Argentina.

The description of macroscopic characters is mainly copied from the diagnosis by Hauskecht (in Fungi non del. 2: 6. 1997), based on the holotype collected by him near Vogelenzang in 1993. The microscopic characters are based on original observations on this collection and one other, poorly annotated collection from the Netherlands.

Conocybe singeriana is characterised by rather robust basidiocarps with bulbous, not rooting, pubescent stipe in combination with large spores and lack of lecythiform caulocystidia. It is easily confused with *C. pubescens*. That species is also coprophilous, and it also has a brown, pubescent pileus and pubescent stipe as well as large spores. *Conocybe singeriana* may be recognised in the field by the strongly bulbous base of the stipe and generally larger basidiocarps. The most fundamental microscopical difference with *C. pubescens* is the lack of lecythiform cystidia, which are numerous in the latter species. In addition, the

spores in *C. pubescens* are more slender and on the average slightly longer.

Conocybe singeriana seems to be closely related to *Conocybe bulbifera* (Kauffm.) Romagn., originally described from North America. According to Hausknecht & Krisai (in Fungi non del. 2: 8. 1997) the latter species differs in smaller, in particular narrower spores and cheilocystidia with larger capitula, possibly also in stipe covering. See also notes on *C. inocybeoides*.

Conocybe watlingii A. Hauskn. (in Österr. Z. Pilzk. 5: 193. 1996) is a related coprophilous species with large spores (14.5–18.0 × 7.5–9.5 µm, av. 16.0–16.7 × 8.5–9.0 µm) and pubescent stipe. It differs from *C. singeriana* mainly in the rooting stipe base with pseudorhiza up to 40 mm long. In addition the stipe is covered with scattered lecythiform cystidia in between numerous non-lecythiform cystidia and cylindrical hairs, and the spores are only slightly thick-walled (up to 0.5 µm). *Conocybe watlingii* is up to now only known from two localities, in Norway and Great Britain.

Conocybe elegans Watling (in Nord. J. Bot. 3: 263. 1983) is another robust species, related to *C. singeriana*, with a pileus 30–50 mm. It is mainly characterised by the very robust, clavate stipe, 80–140 × 4–6 mm, becoming gradually broader towards the strongly swollen base, 15–25 mm thick. The spores are smaller than in *C. singeriana*, measuring 11.0–13.5 × 6.5–7.5(8.0) µm. *Conocybe elegans* was recorded from Denmark on soil mixed with sawdust.

45. Conocybe fimetaria Watling in Bol. Soc. micol. Madrid 11: 92. 1986. – Fig. 173.

MISAPPL. — *Conocybe siliginea* var. *neoantipus* sensu Kühner, Genre Galera: 98. 1935; *Conocybe neoantipus* sensu Mos., Röhrlinge Blätterpilze 4. Aufl.: 281. 1978, sensu auct. eur.

SEL. ICON. — Enderle in Z. Mykol. 63: pl. 3. 1997.

SEL. DESCR. & FIGS. — Derbsch & Schmitt, Atl. Pilze Saarland 2: 301. 1987 (as *C. neoantipus*); A. Hauskn. in Österr. Z. Pilzk. 5: 178–180, figs 5a–e. 1996; Enderle in Z. Mykol. 63: 9–12, fig. 4. 1997; Kühner, Genre Galera: 98–99, fig. 26N. 1935 (as *C. siliginea* var. *neoantipus*); Paulus in Hoppea 50: 480. 1991; Watling in Bol. Soc. micol. Madrid 11: 92–94, figs A, B, F, G, J. 1986.

VERN. NAME — Wortelend mestbreeksteeltje.

Pileus 15–40 mm broad, 10–25 mm high, campanulate, obtusely conical to hemispherical at first, then conico-convex, hygrophanous, when moist and fresh yellow-brown, ochre-brown, rusty brown or red-brown at centre, slightly paler towards margin, translucently striate up to 1/3 of the radius or more, soon drying and non-striate, pallescent to pale yellow or ochraceous, smooth or slightly rugulose, sometimes minutely pubescent (hand-lens). Lamellae, L = 18–26, l = 3–7, moderately distant to crowded, segmentiform to slightly ventricose, pale yellow at first, then ochre-brown, finally rusty brown with slightly paler, fimbriate edge. Stipe 35–90 × 1.5–3 mm (excl. pseudorhiza), cylindrical, cream-coloured to ochraceous, becoming yellowish brown from base upwards, pruinose-striate and pubescent with base buried in the substrate; pseudorhiza subcylindrical to clavate, up to 50 mm long and 10 mm thick but often smaller and less conspicuous, rarely tapering downwards, whitish. Context concolorous with surface. Smell and taste weak, not distinctive. Spore print not recorded.

Spores 9.5–15.0(16.0) × 6.5–10.0 × 5.5–8.5 µm, av. 10.3–13.7 × 6.7–8.7 × 6.3–7.8 µm, weakly to moderately flattened, in frontal view ellipsoid or ovoid to oblong (Q = 1.4–1.75, Qav. = 1.5–1.65), in side-view ellipsoid-oblong (Q = 1.55–1.85(1.9), Qav. = 1.6–1.75), orange-brown to rusty brown (K. & W. 6D8, 7D8) in ammonia, slightly to strongly thick-walled (up to 1.5 µm), with apical to slightly eccentric germ pore, 1.5–2.0 µm wide. Basidia 16–26 × 8.0–11 µm, ellipsoid to clavate, 4-spored. Lamella edge sterile. Cheilocystidia 13–22(28) × 5.5–11(13) µm, lecythiform with globose, ellipsoid to clavate basal part, short neck (1.5–3.0 × 1.2–1.8 µm) and small capitulum, (2.5)3.0–4.5(5.5) µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 5.0–26 µm broad, with hyaline or pale yellow walls. Pileipellis an epithelioid hymeniderm, made up of clavate to spheropedunculate elements, 30–50 × 13–31 µm, thin-walled, hyaline, occasionally intermixed with scattered hairs. Pileocystidia 28–50 × 1.5–4.5 µm, filiform, often strongly tortuous with refractive content. Stipitipellis a cutis made up of repent hyphae 2.0–5.0 µm broad, with hyaline or pale yellow wall, with clusters of caulocystidia. Caulocystidia a mixture of (1) clavate, subcylindrical to lageniform cystidia, 10–24 × 3.0–10 µm; (2) small globose elements, 4.0–7.0 µm broad; (3) numerous cylindrical hairs, 28–110 × 1.5–3.5 µm, often tortuous and with refractive content; lecythiform cystidia absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

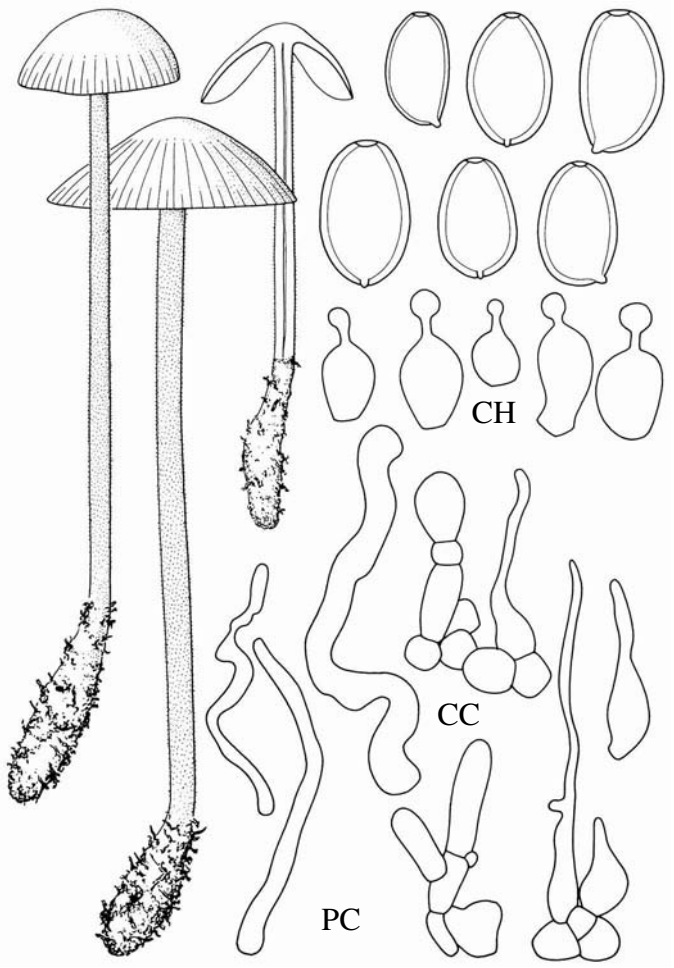


Fig. 173. *Conocybe fimetaria*

HABITAT & DISTR. — Saprotrophic, solitary or subgregarious on old dung of horse or cow, more rarely on strongly manured soil, in meadows and gardens. In the Netherlands very rare (Baarn; Haarlemmerliede; Helmond, Coovelsbos; Vledder) but probably often confused with other species. July–Nov. Also recorded from Germany, Austria, France, Great Britain, and Spain but apparently rare everywhere.

Conocybe fimetaria can be recognised by the coprophilous habitat and rooting, pubescent stipe without lecythiform cystidia in combination with rather large spores. The length and shape of the pseudorhiza is variable in *C. fimetaria*, ranging from a long, clavate extension of the stipe to a cylindrical stipe base only slightly buried in the substrate. It has been confused with *C. pubescens*, but that species has a stipe with rounded base, covered with both hairs and lecythiform cystidia, and considerably larger spores.

Conocybe fimetaria has been described by various European authors under the name *C. neoantipus*. The latter species was originally described from North America by Atkinson (in Proc. Amer. Phil. Soc. 57: 371. 1918). Watling (in Bol. Soc. micol. Madrid 11: 92. 1986) concluded, after study of the type collection, that *C. neoantipus* differs from the European taxon and he introduced the name *C. fimetaria*.

Conocybe watlingii A. Hauskn. is another coprophilous species with rooting stipe base. It differs from *C. fimetaria* in much larger spores (14.5–18.0 × 7.5–9.5 µm, av. 16.0–16.7 × 8.4–8.9 µm) and the presence of scattered lecythiform cystidia between the hairs on the stipe. See also notes on *C. singeriana*.

46. Conocybe microrrhiza A. Hauskn. in Czech Mycol. 5: 55. 1999.

MISAPPL. — *Conocybe leporina* sensu Sing. & Hauskn. in Pl. Syst. Evol. 159: 111. 1988; sensu Krisai in Libri bot. 6: 113. 1992; sensu A. Hauskn. in Österr. Z. Pilzk. 5: 187. 1996.

VERN. NAME — Spitsvoetbreeksteeltje.

KEY TO THE VARIETIES

1. Basidia 2-spored. Spores slightly flattened, 10.0–12.0 × 7.5–8.0 × 7.0–7.5 µm. . . . . 46a. var. **microrrhiza**
1. Basidia 4-spored. Spores not flattened.
   2. Spores 8.0–11.0 × 4.5–7.0 µm, slightly thick-walled, rusty brown in ammonia. . . . . 46b. var. **tetraspora**
   2. Spores 7.0–8.5 × 4.0–5.0 µm, thin-walled, yellow-brown in ammonia. . . . . 46c. var. **parvispora**

46a. var. **microrrhiza** – Fig. 174.

SEL. ICON. — A. Hauskn. in Pl. Syst. Evol. 159: pl. 1B. 1988 (as *C. leporina* var. *leporina*).

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 5: 187–188, figs 7a–f. 1996; Krisai, Libri bot. 6: 113. 1992; Sing. & Hauskn. in Pl. Syst. Evol. 159: 111–112, figs 3a–c, f, h, i. 1988 (all as *C. leporina* var. *leporina*).

CHARACTERISTICS — Differing from var. *tetraspora* in 2-spored basidia and larger spores that are slightly flattened, measuring (9.0)10.0–12.0 × 7.5–8.0 × 7.0–7.5 µm, av. 10.1–10.9 × 7.4–7.6 × 7.1–7.3 µm.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, in poor, dry, exposed grasslands on sandy or stoney soil. Not collected in the Netherlands; only recorded with certainty from Austria. Sept.

Concybe microrrhiza var. *microrrhiza* is, together with *C. leporina*, the only taxon within sect. *Pilosellae* combining a rooting stipe and predominantly 2-spored basidia. This variety might deserve the rank of species, but more extensive research is required.

Until recently, *Conocybe microrrhiza* has been known as *C. leporina* (Velen.) Sing. & Hauskn. Hausknecht (in Czech Mycol. 51: 53. 1999) studied the holotypus of *Galera leporina* Velen. and found that it differs in narrower, papillate spores that are not flattened, measuring 9.0–12.0(15.0) × 5.0–6.5(8.5) µm, av. 11.8 × 6.1 µm. In addition the basidia are not exclusively 2-spored but intermixed with 3- and 4-spored basidia, the stipe apex has scattered lecythiform cystidia in between hairs, and the habitat, hare dung in coniferous forest, is completely different from the dry, sunny habitat of *C. microrrhiza*. *Conocybe leporina* has been recorded from Czech Republic and Austria.

46b. var. **tetraspora** (Sing. & Hauskn.) A. Hauskn. in Czech Mycol. 51: 55. 1999.

Conocybe leporina var. *tetraspora* Sing. & Hauskn. in Pl. Syst. Evol. 159: 112. 1988.

SEL. ICON. — M. Bon in Doc. mycol. 21(84): pl. 2B. 1992 (as *C.* aff. *leporina*).

SEL. DESCR. & FIGS. — M. Bon in Doc. mycol. 20(78): 57. 1990 (as *C.* aff. *leporina*); Enderle in Z. Mykol. 59: 29-31. 1993 (as *C. leporina* var. *tetraspora*); A. Hauskn. in Österr. Z. Pilzk. 5: 188–190, figs 7g–k. 1996 (as *C. leporina* var. *tetraspora*); Sing. & Hauskn. in Pl. Syst. Evol. 159: 112–114, fig. 3d,g. 1988 (as *C. leporina* var. *tetraspora*).

Pileus 10–20(40) mm broad, up to 20 mm high, acutely conical, campanulate or conico-convex, hygrophanous, when moist and fresh reddish brown to dark brown (e.g., K. & W. 6E6,7, 6F6, 7F6-8), translucently striate up to halfway the radius, soon drying paler, glabrous, slightly greasy when moist. Lamellae subdistant to crowded, adnexed, ventricose, yellowish brown at first, then rusty brown with slightly paler edge. Stipe 30–60 × 1–2(4) mm (EXCL. pseudorhiza), cylindrical, fistulose, white at first, soon cream-coloured, at base becoming brown to pinkish brown, entirely pubescent-striate, at base passing into a tapering, whitish pseudorhiza, 5–10(35) mm long. Context concolorous with surface. Smell and taste weak, not distinctive. Spore print not recorded.

Spores (7.5)8.0–11.0(12.0) × 4.5–7.0(7.5) µm, av. 8.7–9.7(10.7) × 5.2–7.0 µm, Q=1.5–1.8, not flattened, ellipsoid to ellipsoid-oblong, rusty brown in ammonia, slightly thick-walled, with central germ pore, 1.0–1.7 µm wide. Basidia 15–33 × 8.5–10 µm, 4-spored, sometimes a few 2-spored. Lamella edge sterile. Cheilocystidia 15–25 × (6.0)8.0–10 µm, lecythiform with clavate basal part, short neck

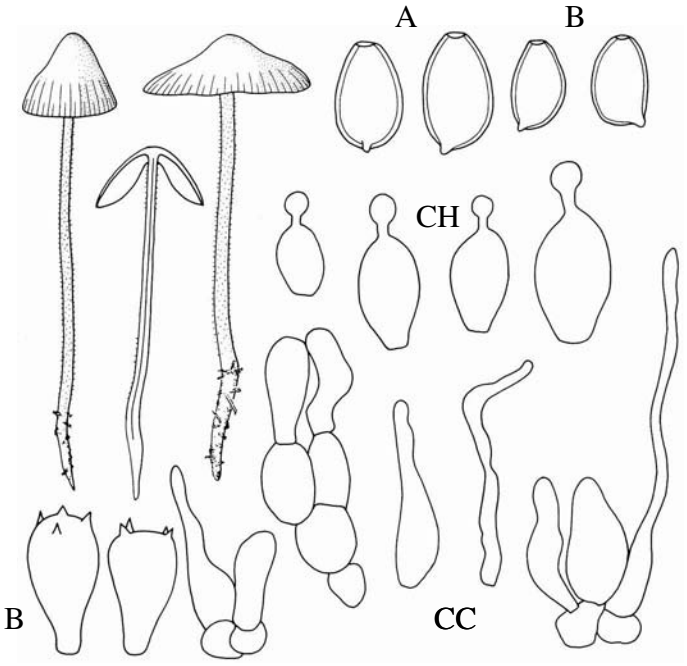


Fig. 174. *Conocybe microrrhiza.* A. var. *macrorrhiza*; B. var. *tetraspora.*

(1.5–3.0 × 1.0–1.5 µm) and small capitulum, 2.0–4.0 µm broad. Pleurocystidia absent. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 22–50 × 17–22 µm. Pileocystidia scattered, lecythiform, similar to cheilocystidia. Caulocystidia subcylindrical, lageniform and subglobose, intermixed with cylindrical hairs up to 80 × 3.0 µm; lecythiform cystidia absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, in the Netherlands recorded from fertilised soil in a botanical garden, in Central Europe usually on dry, sandy or stony soil in open grasslands. Very rare in the Netherlands (Amsterdam, Hortus Botanicus). July–Nov. Also recorded from Austria, France, and Italy. Apparently rare everywhere.

Conocybe microrrhiza is characterised by the distinctly rooting stipe, covered with hairs and non-lecythiform cystidia. The other species of sect. *Pilosellae* with rooting stipe, *C. fimetaria* and *C. watlingii,* have much larger spores and grow on dung.

Conocybe microrrhiza var. *tetraspora* was recorded for the Netherlands by Hausknecht (in Österr. Z. Pilzk. 5: 190. 1996) on the basis of a collection in the National Herbarium Leiden from 1919. Since then this fungus has never been collected in the Netherlands again.

46c. var. **parvispora** (A. Hauskn.) A. Hauskn. in Czech Mycol. 51: 55. 1999.

Conocybe leporina var. *parvispora* A. Hauskn. in Österr. Z. Pilzk. 5: 190. 1996.

SEL. ICON. — A. Hauskn. in Österr. Z. Pilzk. 5: pl. 2. 1996 (as *C. leporina* var. *parvispora*).

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 5: 190–192, figs 8a–f. 1996 (as *C. leporina* var. *parvispora*).

CHARACTERISTICS — Differing from var. *tetraspora* in smaller spores, 7.0–8.5 × 4.0–5.0 µm, av. 7.7–8.1 × 4.6–4.7 µm, that are in addition thin-walled and paler, yellow-brown in ammonia.

HABITAT & DISTR. — Saprotrophic, solitary or in groups in meadows and arable fields on dry, calcareous soil. Not known from the Netherlands; only recorded with certainty from Germany (Bavaria).

This variety might deserve the rank of species in view of the considerable differences in spore characters, but more extensive research is required.

47. Conocybe fuscimarginata (Murrill) Sing. in Beih. Nova Hedwigia 29: 210. 1969. – Fig. 175.

Galerula fuscimarginata Murrill in Lloydia 5: 148. 1942. – *Conocybe rickenii* 'forme tétrasporique' Kühner, Genre Galera: 118. 1935 (invalid).

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 379. 1995; Chrispijn, Champ. Jordaan: 65. 1999; Consiglio in Boll. Gruppo micol. G. Bres. 42: 70. 1999; Enderle in Z. Mykol. 59: 32d. 1993.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 302, figs A–E. 1995; Consiglio in Boll. Gruppo micol. G. Bres. 42: 70–71. 1999; Enderle in Z. Mykol. 57: 76–77. 1991; Kühner, Genre Galera: 118–119, fig. 34–4. 1935 (as *C. rickenii* 'forme tétrasporique'); Watling in Br. Fung. Fl. 3: 71–72. 1982.

VERN. NAME — Compostbreeksteeltje.

Pileus (6)10–26(40) mm broad, 6–15(25) mm high, conico-campanulate to obtusely conical or hemispherical at first, then convex to conico-

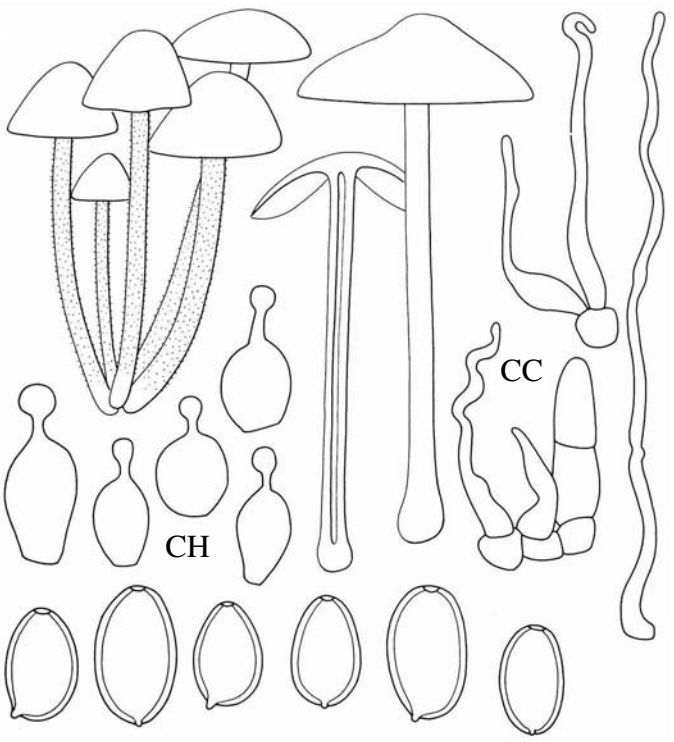


Fig. 175. *Conocybe fuscimarginata*

convex, occasionally with broad, obtuse umbo, weakly hygrophanous, when moist and young pale greyish brown, greyish ochre, loam-brown, pale yellow-brown (e.g., K. & W. 5D4, D5, 5C4, C5, 4B3, B4, 4C4), occasionally centre pale brownish orange (6C5, 6) or greyish brown (7D6-E7), gradually pallescent with age, not translucently striate, often slightly marbled, on drying becoming very pale ochraceous or greyish cream-coloured (5B3-C3, 5B2-C2, 4B3-A3), surface smooth or slightly wrinkled-rugulose, not or faintly pubescent, dull to shiny, sometimes subviscid when moist. Lamellae, L = 20–38, l = 3(7), crowded, adnexed, ventricose, ochraceous at first, then yellow-brown to rusty brown with concolorous edge. Stipe 15–55(80) × 1–5 mm, cylindrical or subbulbous, solid to fistulose, not rooting, whitish at first, then greyish ochre, flesh-coloured or pale brownish orange, occasionally in older basidiocarps pale brown, yellow-brown or reddish brown in lower half, entirely white pubescent-striate. Context concolorous with surface, in pileus up to 3 mm thick. Smell and taste weak, not distinctive. Spore print rusty brown.

Spores (8.5)9.0–12.0(13.0) × 5.5–7.5(8.0) µm, av. 10.0–11.3 × 5.9–6.9 µm, Q = 1.5–1.9(2.0), Qav. = 1.55–1.75, not or only slightly flattened, ellipsoid to ovoid or oblong, yellow-brown, pale orange-brown to orange-brown in ammonia (5C8, 6C8, 7C8-D8), slightly to clearly thick-walled (up to 1.0 µm), with apical germ pore, 1.2–1.8 µm wide. Basidia 17–27 × 8.5–12 µm, clavate, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia 16–22 × 7.0–11 µm, lecythiform with subglobose, ellipsoid or clavate basal part, rather short neck (1.5–3.5 × 1.0–1.8 µm) and small capitulum, 2.5–5.0 µm broad, hyaline. Pleurocystidia absent. Hymenophoral trama made up of slender, cylindrical and strongly inflated elements, 4.0–30 µm broad, with hyaline wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 28–54 × 9.0–32 µm, with thin hyaline wall, often intermixed with cylindrical hairs. Pileocystidia 18–56 × 3.5–6.0 µm, filiform or slenderly lageniform, often with long, flexuous neck, 1.5–3.5 µm broad, scattered to numerous, only slightly projecting outside the hymeniderm. Stipitipellis a thin cutis of repent hyphae,

1.5–6.0 µm broad, with hyaline to pale yellow walls. Caulocystidia variable: (1) lageniform to subcylindrical, 9.0–18 × 4.0–7.0 µm with neck 2.5–3.5 µm broad; (2) numerous subglobose elements, 4.5–10 × 3.5–9.0 µm; (3) cylindrical, often tortuous hairs up to 50 × 1.5–3.5 µm, often with suddenly enlarged base; lecythiform cystidia absent or very scarce near apex of stipe. Clamp-connections present, at least in stipitipellis. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in groups, sometimes subfasciculate, in particular on compost and on soil mixed with compost or manure, less often directly on dung heaps or old excrements, in gardens, ruderal places, fertilised meadows, and cold glasshouses with, e.g., cucumber cultures. In the Netherlands fairly common in the western provinces, in particular in urban areas, rare elsewhere. Distribution incompletely known (see notes). June–Nov.; in glasshouses the entire year. Widespread in Europe and North and South America, from the arctic to the subtropics.

Conocybe fuscimarginata is similar to *C. siliginea* in the pale, not striate pileus, whitish stipe and habitat on dung, compost and other substrates rich in nitrogen. However, *C. fuscimarginata* differs macroscopically in the more expanding, often umbonate pileus and the generally more robust stipe. Under the microsope *C. siliginea* is easily distinguished by predominantly 2-spored basidia and considerably larger spores with thicker wall and larger germ pore. It is also possible to confuse *C. fuscimarginata* with *C. fimetaria*, which grows in similar habitats. The latter species differs in the much darker brown, striate pileus when moist, the rooting stipe base (easily overlooked), and slightly larger, distinctly flattened spores.

Conocybe fuscimarginata had not yet been reported for the Netherlands by Arnolds (in Arnolds et al., Overz. Paddest. Nederland. 1995), although the oldest identified herbarium collection dates from 1958. The species has formerly been recorded as *C. rickenii* or *C. siliginea*, occasionally with the addition "f. *tetraspora*." In reality *C. fuscimarginata* appears to be widespread and locally common, in particular in urban areas. For instance, the species has been observed in 5-km squares in Amsterdam by Chrispijn (Champ. Jordaan: 240. 1999).

48. Conocybe siliginea (Fr. :Fr.) Kühner, Genre Galera 96. 1935. – Fig. 176.

Agaricus siligineus Fr., Observ. mycol. 2: 168. 1818; *Agaricus tener* ("var.") *siligineus* (Fr. :Fr.) Fr., Syst. mycol. 1: 266. 1821; *Galera siliginea* (Fr. :Fr.) Quél. in Mém. Soc. Ëmul. Montbéliard, Sér. II, 5: 136. 1872 (Champ. Jura Vosges: 1). — *Galera rickenii* J. Schaeff. in Z. Pilzk. 9: 171. 1930; *Conocybe rickenii* (J. Schaeff.) Kühner, Genre Galera: 115. 1935; *Conocybe siliginea* f. *rickenii* (J. Schaeff.) Arnolds in Persoonia 18: 228. 2003.

MISAPPL. — *Galera pygmaeoaffinis* sensu Rick., Blätterpilze: 225.1915; *Conocybe coprophila* sensu Lundell in Lund. & Nannf., Fungi exs. suec. 49–50: 906. 1957.

EXCL. — *Galera siliginea* sensu Rick., Blätterpilze: 224. 1915 (= *C. moseri*); *Conocybe siliginea* f. *typica* 'récoltes tétrasporiques' sensu Kühner, Genre Galera: 108. 1935 (= *C. moseri*); *Conocybe siliginea* f. *typica* 'récoltes bisporiques' sensu Kühner, Genre Galera: 109. 1935 (= *C. bisporigera*); *Conocybe siliginea* 'forme tétrasporique' sensu Kühn. & Romagn., Fl. anal. Champ. sup.: 345. 1953 (= *C. moseri*); *Conocybe rickenii* sensu Breitenb. & Kränzl., Pilze Schweiz 4: 308, pl. 388. 1995 (= *C. spec.*).

SEL. ICON. — Cacialli et al. in Schweiz. Z. Pilzk. 11: 224. 1996; Cetto, Funghi Vero 4: pl. 1295. 1983; Funghi Vero 7: pl. 2648. 1993 (as *C. rickenii*) ; Enderle in Z. Mykol. 65: pl. 3. 1999 (as *C. rickenii*); Gerhardt, Gr. Pilzf.: 385 (below). 1999 (as *C. rickenii*); J. Lange, Fl. agar. dan. 4: pl. 128E, B. 1939; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 9 (upper fig.). 1992 (as *C. rickenii*); R. Phillips, Paddest. Schimm.: 155. 1981 (as *C. rickenii*).

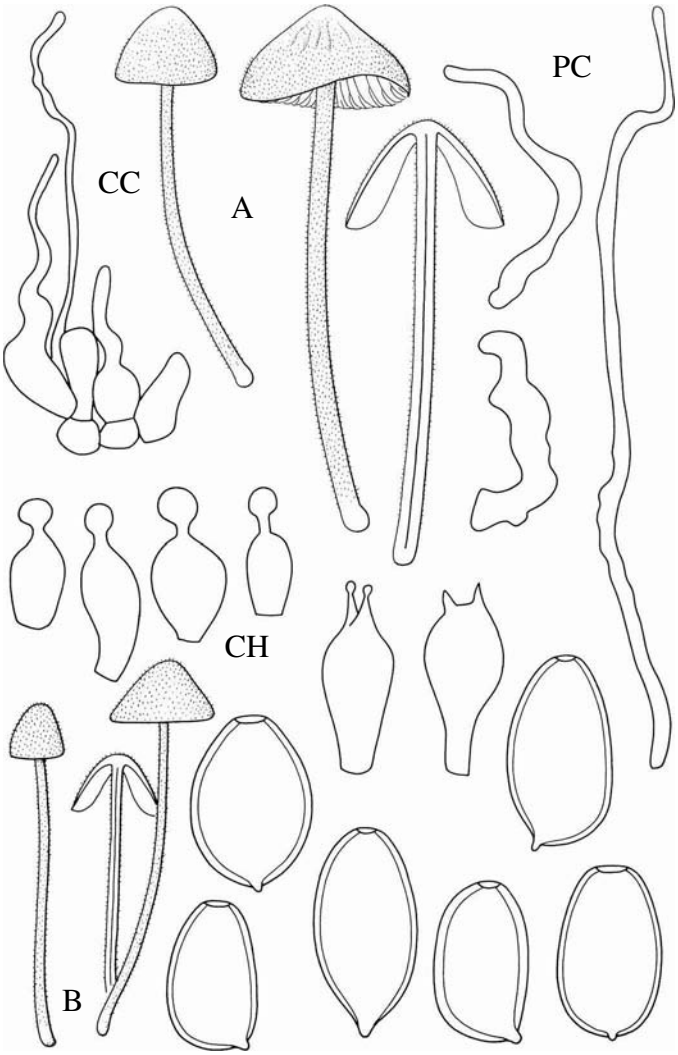


Fig. 176. *Conocybe siliginea*. A. f. *siliginea*. B. f. *rickenii*

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 308 ('1982') 1983; Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 106–107, figs. 1986 (as *C. rickenii*); Enderle & Hübner in Z. Mykol. 65: 5–9, figs. 4. 1999 (as *C. rickenii*); A. Hauskn. in Österr. Z. Pilzk. 6: 38–41, figs. 1–6; 41–43, figs. 7–11 (as *C. rickenii*). 1997; Kühner, Genre Galera: 115–118, fig. 34A, C, S. 1935 (as *C. rickenii* 'forme bisporique'); Lund. & Nannf. in Fungi exs. suec. 41–42: 32 (nr. 2051). 1953; Watling in Br. Fung. Fl. 3: 73–74, figs. 75C, 158. 1982 (as *C. rickenii*).

VERN. NAME — Vaal breeksteeltje.

KEY TO THE FORMAE

1. Pileus 5–15 mm, stipe 15–50 × 1–1.5 mm. Pileus dry, without olivaceous tone . . . . . ***f. siliginea***
1. Pileus 10–30(40) mm, stipe 35–80(100) × 1–3 mm. Pileus when moist and fresh slightly greasy, often with olivaceous tone ***f. rickenii***

Pileus 5–15 mm broad, 4–10 mm high (in f. *siliginea*) or 10–30(40) mm broad and 7–20 mm (in f. *rickenii*), obtusely conical to paraboloid at first, then slightly expanding to conico-convex, sometimes with slightly recurved margin, hygrophanous, when moist and fresh remarkably pale: greyish ochre, greyish orange, isabella, pale beige, very pale brown (e.g., K. & W. 6C4, 6D3,4, 5C4, 5B3) with slightly darker centre (often with olivaceous tone in f. *rickenii*), not striate or very weakly translucently striate, on drying becoming cream-coloured or greyish to brownish white, smooth to slightly rugulose, rarely strongly rugulose, minutely pubescent when young (slightly greasy and shiny in f. *rickenii*). Lamellae, L = 13–26, l = 1–3(7), moderately crowded, adnexed, slightly ventricose, up to 3.5 mm, pale ochraceous at first, then orange-brown to rusty brown with white fimbriate edge. Stipe 15–50 × 1–1.5 mm (in f. *siliginea*) or 35–80(100) × 1–4 mm (in f. *rickenii*), subcylindrical, base occasionally slightly thickened, not bulbous or rooting, whitish at first, soon cream-coloured to pale flesh-coloured, hardly darkening in age, entirely pruinose-striate and pubescent when young and fresh, gradually becoming glabrous. Context thin, fragile, concolorous with surface. Smell and taste very weak, not distinctive. Spore print rusty brown.

Spores (10.5)12.0–19.0(22.5) × 7.0–10.5 µm, av. 13.4–16.0 × 7.8–9.0 µm, Q = 1.5–2.0(2.3), Qav. = 1.7–1.9, not to distinctly flattened, in frontal view ellipsoid to ovoid or oblong, in side-view ellipsoid-oblong to subamygdaliform, rusty brown to reddish brown (7D8, 8D8) in ammonia, slightly to strongly thick-walled (0.5–1.5 µm), with large apical germ pore, 1.8–3.0 µm wide, in some collections a minor proportion of spores without pore. Basidia 18–27 × 8.0–12 µm, 2-(1-)spored or 2- and 1-spored intermixed. Lamella edge sterile. Cheilocystidia 15–28 × 6.0–12 µm, lecythiform with globose to ellipsoid basal part, short neck (1.5–3.0 × 1.0–2.0 µm) and small capitulum, 3.0–5.5 µm broad. Hymenophoral trama made up of cylindrical and strongly inflated elements, 3.0–20 µm broad, with hyaline or pale yellow wall. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 25–56 × 14–40 µm, thin-walled, hyaline or at pedicel with pale yellow parietal pigment, intermixed with cylindrical hairs. Pileocystidia scattered to numerous, 25–120 × 2.0–5.5 µm, mainly filiform and 2.0–3.5 µm broad; also shorter and broader subcylindrical, tortuous hairs and narrowly lageniform cystidia, hyaline or with refractive content. Stipitipellis a cutis made up of cylindrical hyphae, 2.0–6.0 µm broad, with hyaline wall and clusters of caulocystidia. Caulocystidia predominantly subcylindrical, clavate or lageniform, 15–60 × 6.0–9.0 µm, intermixed with numerous smaller, subglobose elements up to 12 × 10 µm and numerous cylindrical, often tortuous hairs up to 120 µm long, 1.5–4.0 µm broad, often with yellowish intracellular pigment; lecythiform cystidia usually absent or very rare, but occasionally rather frequent near apex, 15–24 × 5.0–8.0 µm, as cheilocystidia but with larger neck (2.5–6.0 × 1.5–2.0 µm) and capitulum 3.0–4.0 µm broad. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in groups on substrates rich in nutrients, such as dung (in particular f. *rickenii*), compost, and manured soil, in meadows, gardens, city-parks, ruderal places, and arable fields. In the Netherlands widespread and common. July–Nov. Cosmopolitan, widespread in Europe.

Conocybe siliginea is well-characterised by the pale, dull-coloured, hardly striate pileus, the whitish, pubescent stipe and 2-spored basidia with large, thick-walled spores. In the field it may be confused with *C. fuscimarginata.* That species usually has more robust basidiocarps with a slightly darker pileus, especially along the margin. *Conocybe fuscimarginata* differs microscopically in 4-spored basidia and much smaller spores. See also notes on *C. inocybeoides*.

Some basidiocarps of *Conocybe siliginea* show rather numerous lecythiform cystidia at the stipe apex. These specimens may be keyed-out in sect. *Mixtae*. In that case confusion with other 2-spored species is possible, in particular with *C. ambigua* and *C. rubiginosa*. However, the two species differ from *C. siliginea* in the much darker, vivid colour of the strongly striate pileus and in the different shape of the spores.

Conocybe siliginea is a variable species concerning size and general appearance of basidiocarps. Many authors distinguish two species, viz. *C. siliginea* with small basidiocarps, growing on soil, and *C. rickenii* with larger basidiocarps, growing on dung (e.g., Hausknecht in Österr. Z. Pilzk. 6: 35. 1997). In Dutch collections the characters of the two taxa are intergrading. Enderle (in Z. Mykol. 65: 9. 1999) suggested that *C. rickenii* is probably only a luxuriant form of *C. siliginea* due to a richer substrate. Therefore, the taxa are distinguished at the rank of forma.

The nomenclature of *C. siliginea* has been much disputed. Enderle (in Z. Mykol. 65: 9. 1999) stated correctly that the identity of *Agaricus siligineus* Fr. cannot be established with any certainty. On the other hand, recent interpretations of this name are consistent and always concern the taxon described above. In addition, a neotype has been recently designated in agreement with current interpretations (Hausknecht in Österr. Z. Pilzk. 6: 36. 1997). Therefore, the name *C. siliginea* is maintained for this fungus. For more extensive comments on the nomenclature, see Cacialli et al. (in Schweiz. Z. Pilzk. 11: 219. 1996), Hausknecht (in Österr. Z. Pilzk. 6: 35. 1997), and Enderle (in Z. Mykol. 65: 5. 1999).

49. Conocybe inocybeoides Watling in Notes R. bot. Gdn. Edinb. 38: 350. 1980. – Fig. 177.

Galera bulbifera f. *bispora* Romagn. in Bull. trimest. Soc. mycol. Fr. 58: 147. 1942 (invalid).

MISAPPL. — *Conocybe bulbifera* sensu Arnolds in Arnolds et al., Overz. Paddest. Nederland: 105. 1995; sensu auct. eur.

SEL. ICON. — M. Bon in Doc. mycol. 21 (84): pl. 2C. 1992; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1324. 1994; Enderle in Z. Mykol. 63: pl. 5. 1997; Hauskn. & Zucch. in Boll. Gruppo micol. G. Bres. 41: 103. 1998.

SEL. DESCR. & FIGS. — Courtecuisse in Beitr. Kenntn. Pilze Mitteleur. 3: 313–315, fig. 1. 1987; Daams in Coolia 14: 122–124. 1970 (as *C. bulbifera*); Enderle in Z. Mykol. 63: 12–15, fig. 6. 1997; Hauskn. & Zucch. in Boll. Gruppo micol. G. Bres. 41: 102–103, figs 3a–f. 1998; Romagn. in Bull. trimest. Soc. mycol. Fr. 58: 147–148. 1942 (as *G. bulbifera* f. *bispora*); Svrček in Česká Mykol. 37: 213. 1983; Watling in Notes R. bot. Gdn. Edinb. 38: 350–351, figs 1A, 2B–D, 3F–I. 1980; Watling in Br. Fung. Fl. 3: 77–78, figs 125, 170–173. 1982.

VERN. NAME — Knollig breeksteeltje.

Pileus 12–48 mm broad, 5–15 mm high, campanulate to conico-convex at first, then convex to plano-convex, with or without umbo, weakly hygrophanous, when moist with dull colours, ochre-brown, greyish ochre to pale flesh-couloured brown (e.g., K. & W. 6C4-B4, Mu. 10 YR 7/6, 5/6) with slightly darker brown centre (e.g., 7.5 YR 5.6-6.6), margin not striate or weakly translucent-striate, on drying becoming slightly paler ochraceous, greyish ochre to cream-coloured, smooth or occasionally radially wrinkled, pubescent. Lamellae, L = 24–42, l = (1)3–7, crowded, adnexed, often slightly ventricose, whitish to pale greyish brown at first, then rusty brown, with white flocculose edge. Stipe 40–65(75) × 2–6 mm, cylindrical or slightly broader downwards, at

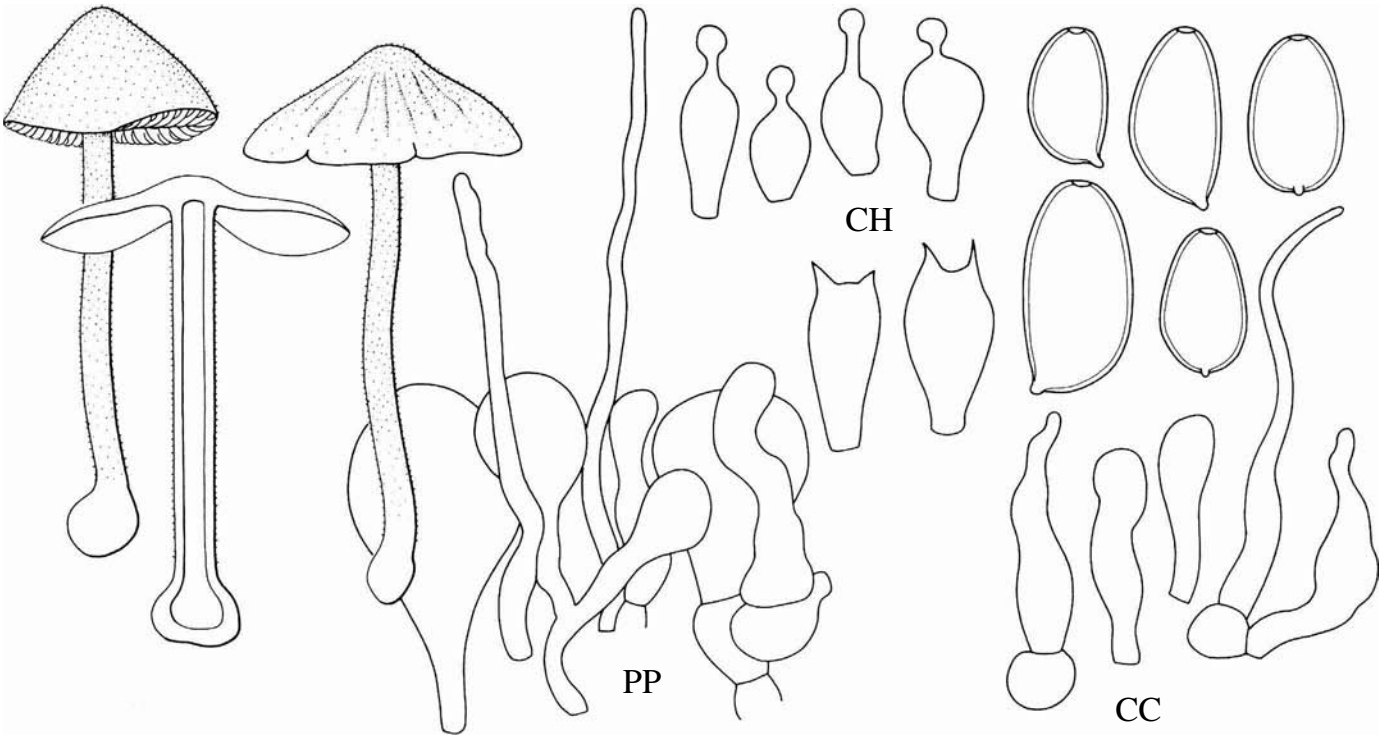


Fig. 177. *Conocybe inocybeoides*.

base with distinct, often marginate bulb, 6–10(12) mm, entirely cream-coloured at first, then becoming ochraceous brown to brown in lower half from base upwards, flocculose-pubescent striate lengthwise. Context concolorous with surface. Smell not distinctive. Taste mild, not distinctive. Spore print orange-brown.

Spores 11.0–18.0(19.0) × (6.0)6.5–9.0 µm, av. 12.8–15.5 × 7.3–7.8 µm, Q = 1.6–2.1, Qav. = 1.75–2.05, not flattened, ellipsoid-oblong in frontal view, often slightly amygdaliform in side-view, moderately thick-walled (± 0.5 µm), brownish orange in ammonia, mostly with distinct germ pore, 1.2–1.5 µm wide, but in some collections part of spores without pore. Basidia 16–27 × 8.0–12 µm, clavate, predominantly 2-spored, some 1-spored, exceptionally a few 4-spored. Lamella edge sterile. Cheilocystidia 16–28(31) × 6.5–13 µm, lecythiform, with clavate basal part, short to rather long neck (1.0–6.0(10) × 1.0–2.5 µm) and globose capitulum, 2.5–4.5 µm broad; sometimes neck and capitulum slightly thick-walled. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated, subglobose elements, 4.0–20 µm broad. Pileipellis an epithelioid hymeniderm, made up of spheropedunculate and pyriform elements, 17–62 × 9.0–31 µm, with hyaline to pale yellow walls, intermixed with cylindrical hairs. Pileocystidia numerous, varying from rather short, subcylindrical, tortuous cystidia up to 70 µm long and 4.0–7.0 µm broad to narrow, cylindrical hairs up to 200 µm long, 2.0–3.0 µm broad, both with refractive content. Stipitipellis a cutis of parallel hyphae, 2.0–7.0 µm broad, with numerous clusters of cystidia. Caulocystidia ovoid, clavate or lageniform, 14–38(60) × 6.0–12(16) µm, intermixed with long cylindrical hairs up to 300 × 1.5–3.0 µm; lecythiform cystidia absent. Clamp-connections absent (but present according to Enderle in Z. Mykol. 63: 13. 1997). Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, on fertile, humus-rich, sandy and clayey soils and compost, often mixed with wood-chips, in parks, gardens, lawns, and along roadsides. Known from the Netherlands since 1970 (Daams in Coolia 14: 122. 1970) and in that time regarded as very rare. Rapidly spreading in recent years and at present not uncommon in some urban areas, e.g., around Amsterdam and Rotterdam. Aug.–Nov. Also known from Great Britain, France, Germany, Czech Republic, and Belgium.

Conocybe inocybeoides is well-characterised by the combination of relatively stout basidiocarps with pubescent, dull-coloured pileus and pubescent, bulbous stipe, large spores and predominantly 2-spored basidia. It differs from *C. siliginea* mainly in the quickly expanding pileus and robust, bulbous stipe, but also microscopically in the paler, not flattened spores with thinner wall and smaller germ pore.

The nomenclature of *C. inocybeoides* is not yet definitely cleared up in view of contradictory observations on the type of the North American species *Galera bulbifera* Kauffm. (Watling in Notes R. bot. Gdn. Edinb. 38: 350. 1980; Enderle in Z. Mykol. 63: 13. 1997). If the two taxa appear to be conspecific, the name *Conocybe bulbifera* (Kauffm.) Romagn. has priority.

A related species with 2-spored basidia is *Conocybe gigasperma* Enderle & Hauskn. (in Z. Mykol. 58: 200. 1992). That species is characterised by a hardly expanding, very dark pileus (in young basidiocarps at centre dark brown to blackish olive) and in particular by the enormous spores, measuring (13.0)16.5–22.5(26.0) × (8.0)10.0–12.5(15.5) µm, with very wide (2.3–3.5 µm), often clearly eccentric germ pore. *C. gigasperma* has the largest spores of all European *Conocybe* species. It was recorded near horse dung in pine forests on several localities in Italy.

50. Conocybe bispora (Sing.) A. Hauskn. in Österr. Z. Pilzk. 7: 114. 1998. – Fig. 178.

Conocybe fuscimarginata var. *bispora* Sing. in Z. Pilzk. 43: 126. 1977.

SEL. ICON. — Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 6 (upper fig.). 1994 (as *C. ambigua*).

SEL. DESCR. & FIGS. — A. Hauskn. in Österr. Z. Pilzk. 7: 114–116, figs 7a–f. 1998; Sing. in Z. Pilzk. 43: 126. 1977.

VERN. NAME — Citroensporig breeksteeltje.

Pileus 5–18 mm broad, 3–10 mm high, conico-campanulate to hemispherical at first, soon expanding to conico-convex, plano-convex or almost applanate, hygrophanous, when young and fresh pale greyish orange, ochre-brown, flesh-coloured brown, pale brown (e.g., K. & W. 5B4, 5C4, 6C4, 6D5), rarely darker brown (5E6, 6E6) when water-soaked, translucently striate up to halfway the radius or more, on drying soon not striate and pallescent to cream-coloured, pale yellow or pale flesh-coloured (4A2,3, 5A3-B3), glabrous, not pubescent. Lamellae L = ± 16–22, l = 3, moderately crowded to subdistant, adnexed, slightly ventricose, at first pale yellow, remaining rather pale, yellow-brown to flesh-coloured brown (e.g., 5B3,4, 5-6C4), with slightly paler, minutely crenulate edge. Stipe 22–50 × 0.7–2(3) mm, subcylindrical, slightly thicker towards base, fistulose, whitish, pale yellow or pale brownish, only slightly darker at base with age, entirely pubescent-pruinose at first, soon appearing glabrous. Context concolorous with surface. Smell weak, not distinctive. Taste not recorded. Spore print not recorded.

Spores 9.0–13.0(14.5) × 5.0–7.5 µm, av. 10.0–11.8(12.1) × (5.3)5.8–6.6 µm, Q = 1.5–2.1, Qav. = 1.7–1.85, not flattened, in frontal view ellipsoid-oblong to fusiform, often more or less papillate, in side-view mainly amygdaliform, often with apical papilla, also ovoid- or ellipsoid-oblong, pale orange-brown (5C7-6C7) in ammonia, not or slightly thick-walled (up to 0.5 µm), with distinct apical germ pore, 1.2–1.8 µm wide. Basidia 14–27 × 7.5–10 µm, 2-spored, occasionally 2- and 1-spored in almost equal proportions. Lamella edge sterile or heterogeneous. Cheilocystidia 14–22 × 6.0–12 µm, lecythiform with subglobose to clavate basal part, short to moderately long neck (1.5–4.5 × 1.0–1.5 µm) and small capitulum, 3.0–5.0(5.5) µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 5.0–22 µm broad, with hyaline wall. Pileipellis an epithelioid hymeniderm, made up of clavate and pyriform elements, 15–39 × 8–22 µm, with thin, hyaline wall. Pileocystidia absent. Stipitipellis a cutis made up of hyaline hyphae, 2.0–6.0 µm broad, with clusters of caulocystidia. Caulocystidia mainly clavate, subcylindrical or utriform, 16–42 × 3.5–7.5 µm, intermixed with numerous subglobose and ellipsoid elements, 5.0–11 × 5.0–9.0 µm and scattered cylindrical hairs up to 80 × 1.0–2.0 µm; lecythiform cystidia absent. Clamp-connections present. Chemical reactions: Ammonia reaction negative.

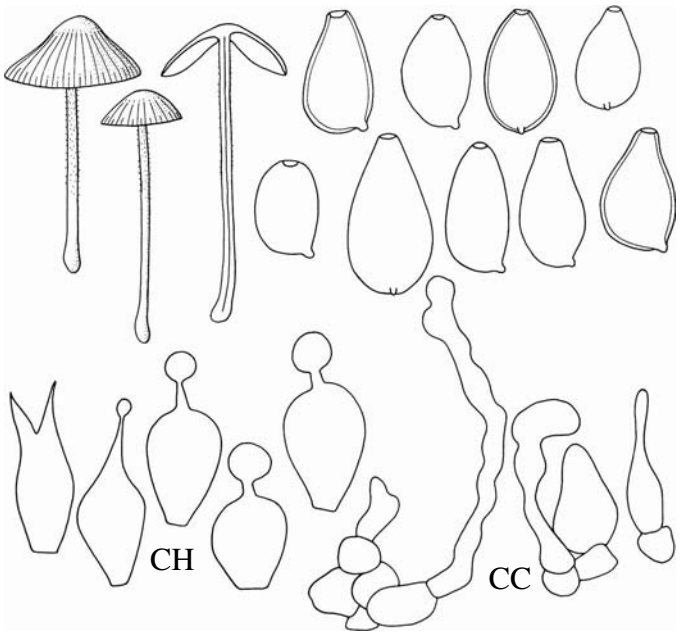


Fig. 178. *Conocybe bispora*

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on soil, in the Netherlands in scrub of *Ligustrum* and *Euonymus* on dry, calcareous sand in coastal dunes and in lawn treated with compost, elsewhere in nutrient-poor grasslands, roadside verges, ruderal places, and open deciduous forests on dry soils, in particular on slopes with southern exposure. In the Netherlands very rare (Deventer, Wijtenhorst, Noordwijk, Langevelderslag). (June) Aug.–Nov. Also recorded from Austria, Denmark, Germany, Italy, and Czech Republic.

Conocybe bispora is characterised in the first place by spores that are often amygdaliform with apical papilla in side-view, and often papillate in front-view, a rare feature in the genus. Similar spores are only found in *C. ambigua*. That species has also 2-spored basidia but differs in larger spores, darker colours of pileus and stipe, and the presence of lecythiform cystidia on the stipe, in particular at the apex. *C. ambigua* therefore belongs to sect. *Mixtae*.

51. Conocybe bisporigera (Hauskn. & Krisai) Arnolds in Persoonia 18: 227. 2003. – Fig. 179.

Conocybe moseri var. *bisporigera* Hauskn. & Krisai in Persoonia 14: 659. 1992. – *Conocybe siliginea* f. *typica*, 'récoltes bisporiques' Kühner in Genre Galera: 109. 1935 (invalid).

SEL. ICON. — Cetto, Funghi Vero 6: pl. 2220. 1989.

SEL. DESCR. & FIGS. — Hauskn. & Krisai in Persoonia 14: 659–660, figs 13–18. 1992; Kühner, Genre Galera: 109–112, fig. 32. 1935 (as *C. siliginea* f. *typica*, 'récoltes bisporiques').

VERN. NAME — Tweesporig breeksteeltje.

Pileus 5–18 mm broad, 3.5–10 mm high, campanulate to obtusely conical at first, then conico-convex to convex, often umbonate, hygrophanous, when moist and fresh at centre dark greyish brown to dull reddish brown or sepia (e.g., K. & W. 6F4,5, 6E6; Mu. 10 YR 3/4, 7.5 YR 3/2), to the margin paler brown, translucently striate up to two thirds of the radius, on drying pallescent to grey or brownish grey at centre (5F2, 6F2-3) and pale grey to ochraceous beige or whitish towards the margin (4C2, 5C2-3), glabrous, in exsiccata pale grey-brown with dark grey centre. Lamellae, L = 12–20, l = 3(7), moderately distant to rather crowded, adnexed, often ventricose, ochraceous at first, then orangey brown to rusty brown. Stipe 25–75 × 0.8–2 mm, cylindrical or subbulbous, fistulose, pale greyish brown to yellow-brown (e.g., 6D4) at first, gradually becoming red-brown to dark brown with age, entirely pubescent-striate, in exsiccata wine-pink to red-brown. Context pale grey-brown, fragile. Smell and taste weak, not distinctive. Spore print not recorded.

Spores (9.0)9.5–13.0 × 6.5–8.5 × 5.5–7.5 µm, av. 10.7–11.8 × 7.0–7.9 × 6.3–6.8 µm, weakly to strongly flattened, in frontal view ovoid to ovoid-oblong (Q = 1.3–1.65, Qav. = 1.45–1.55), in side-view ellipsoid-oblong to subamygdaliform (Q = 1.5–1.8, Qav. = 1.6–1.75), rusty brown or orange-brown (6C8, 7C8-D8) in ammonia, rather thick-walled (0.5–1.0 µm), with distinct apical germ pore, 1.5–2.5 µm wide. Basidia 13–18 × 8.0–11 µm, 2-(1-)spored. Lamella edge heterogeneous. Cheilocystidia 13–21 × 6.5–9.5 µm, lecythiform with globose to clavate basal part, short neck (1.0–2.0 × 1.0–1.5 µm) and small capitulum,

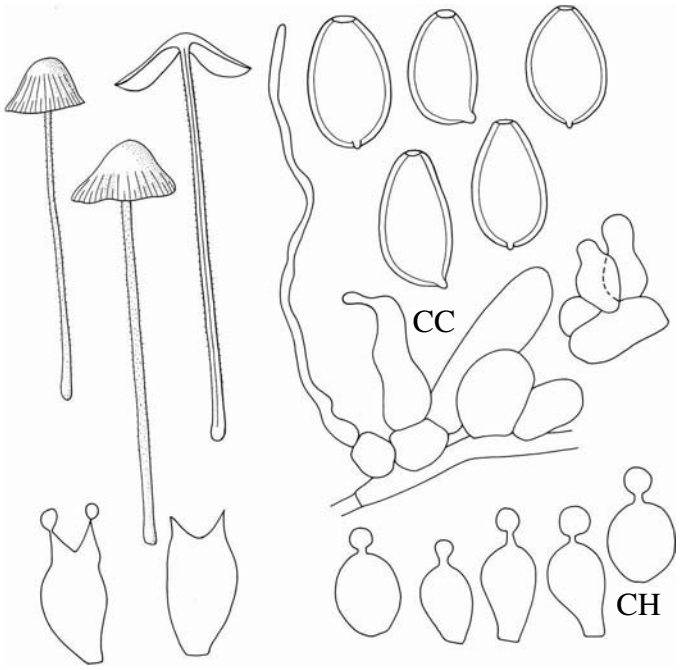


Fig. 179. *Conocybe bisporigera*

2.8–4.0(5.0) µm broad, hyaline or pale brown. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to inflated, globose elements, 4.0–28 µm broad, with hyaline walls. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 30–65 × 16–37 µm, often with slightly thick-walled, encrusted pedicel. Pileocystidia absent. Stipitipellis a cutis made up of cylindrical hyphae, 1.5–6.0 µm broad, with hyaline wall, with clusters of cystidia. Caulocystidia clavate, utriform to lageniform, 11–28 × 5.5–16 µm, intermixed with numerous small, globose elements, 6.0–12 × 5.5–10.5 µm and some narrow, tortuous hairs with refractive content, up to 150 × 1.5–2.5 µm. Clamp-connections absent. Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, in the Netherlands on nutrient-rich, loamy and humus-rich soils and on compost in deciduous forests, in roadside-verges, orchards, and lawns. In the Netherlands probably rare ('s-Graveland, Boekesteijn, Amsterdam-West, Oegstgeest, Oud-Poelgeest, Doetinchem, Slangenburg, Helmond, Coovelsbos). June–Sept. Also recorded from Austria, Great Britain, and France; indicated as common and widespread around Paris (Kühner, Genre Galera: 109. 1935).

Sect. **Singerella** Watling

Basidiocarps mycenoid; pileus not deliquescent; stipe slender, up to 5(7) mm thick, with marginate bulb, pubescent at least when young; veil present in young basidiocarps, thin, membranous, leaving volva-like remains at margin of bulb, occasionally also fugacious flocks at margin of pileus; caulocystidia lageniform to filiform; lecythiform caulocystidia absent or scarce near apex of stipe.

52. Conocybe hornana Sing. & Hauskn. in Beitr. Kenntn. Pilze Mitteleur. 5: 87. 1989. – Fig. 180.

SEL. ICON. — Cetto, Funghi Vero 7: pl. 2656. 1993; Hübner in Z. Mykol. 65: pl. 1. 1999; Mos. & Jül., Farbatl. Basidiomyc. III Conocybe 15 (lower fig.). 1996; Sing. & Hauskn. in Beitr. Kenntn. Pilze Mitteleur. 5: opposite 80 (upper fig.). 1989.

SEL. DESCR. & FIGS. — Enderle & Hübner in Z. Mykol. 65: 3–5, fig. 2. 1999; Sing. & Hauskn. in Beitr. Kenntn. Pilze Mitteleur. 5: 87–91, fig. 1. 1989.

VERN. NAME — Beursbreeksteeltje.

Pileus 10–50(60) mm broad, 7–25 mm high, obtusely conical to paraboloid at first, soon expanding to conico-convex or plano-convex with obtuse umbo, hygrophanous, when moist and fresh at centre vividly brownish orange to orange-brown or reddish brown (e.g., K. & W. 5C5, 5D7,8, 6D8, 7D8), towards the margin yellow-brown to pale orange, not translucently striate, on drying pallescent to pale ochre-brown or yellowish (e.g., 4A3, 4, B4), smooth, minutely pubescent at first, then often slightly wrinkled, often radially split (as in *Inocybe* species) or concentrically cracked in age, in very young basidiocarps at margin with small fugacious, submembranous flocks of veil. Lamellae, L = 35–45, l = 3–7, fairly crowded to crowded, adnexed to almost free, not or slightly ventricose, cream-coloured at first, then brownish orange to ochre-brown with slightly paler edge. Stipe 40–100(140) × 2–5 mm, cylindrical, at base suddenly enlarged into marginate bulb, 7–10(14) mm thick, fistulose, whitish at first, then pale yellow to ochre-yellow (e.g., 4A3,4), uniformly coloured, not darkening in age, striate-sulcate lengthwise, entirely pubescent, in very young basidiocarps with volva-like, membranous remains of veil at margin of bulb, occasionally also with

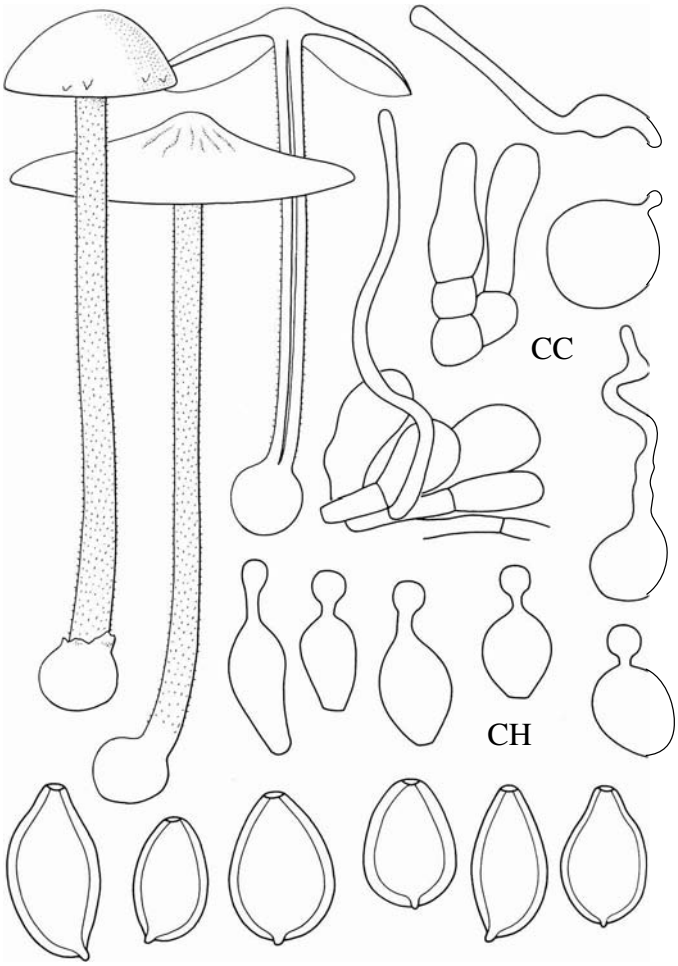


Fig. 180. *Conocybe hornana*

some white flocks of veil on lower half of stipe, soon veil completely disappearing. Context concolorous with surface, thin, fragile. Smell and taste weak, not distinctive. Spore print dark orangey brown (6E8, F8).

Spores (10.0)10.5–14.0(16.0) × 6.5–8.5(9.0) × 6.0–8.0 µm, av. 11.4–12.5 × 7.4–8.0 × 6.6–7.3 µm, clearly flattened, in frontal view ovoid, occasionally with apical papilla (Q = 1.4–1.7, Qav. = 1.5–1.6), in side-view ovoid-oblong to amygdaliform, occasionally with apical papilla (Q = 1.6–2.1, Qav. = 1.7–1.8), rusty brown to reddish brown (7D8, 8D8) in ammonia, rather thick-walled (up to 1.5 µm), with apical germ pore 1.5–2.3 µm wide. Basidia 20–34 × 10–13 µm, mostly 4-spored, occasionally intermixed with 3-, 2-, and 1-spored basidia. Lamella edge sterile. Cheilocystidia 16–25 × 7.0–12 µm, lecythiform with globose, ellipsoid or clavate basal part, short to moderately long neck (1.5–4.5 × 1.0–2.0 µm) and small capitulum, 3.5–4.5(5.0) µm broad, hyaline. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 4.0–30 µm broad, with hyaline or pale yellow wall. Pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate elements, 20–56 × 10–33 µm, hyaline or with slightly thick-walled, pale brown pedicel, intermixed with cylindrical hairs. Pileocystidia scattered, 24–70 × 3.5–7.5 µm, filiform to narrowly lageniform with long cylindrical neck, 2.0–3.5 µm broad, often tortuous. Stipitipellis a cutis of parallel, thin hyphae, 2.0–6.0 µm broad, with hyaline wall, with many clusters of cystidia. Caulocystidia predominantly lageniform to clavate, 16–38 × 5.0–9.0 µm, sometimes passing into long cylindrical neck, intermixed with numerous subglobose and ellipsoid elements, 5.0–18.5 × 5.0–16 µm, and long, cylindrical, straight to tortuous hairs, 30–180 × 1.5–3.5 µm, often swollen at base; lecythiform cystidia absent. Clamp-connections not observed, although present according to Singer & Hausknecht (in Beitr. Kenntn. Pilze Mitteleur. 5: 87. 1989). Chemical reactions: Ammonia reaction negative.

HABITAT & DISTR. — Saprotrophic, solitary or usually in groups, occasionally subfasciculate, in the Netherlands on humus-rich soil, rich in nutrients, and on rotten wood-chips, in ruderal site and young forest plantation; in Central Europe most often recorded from rotten straw or grass, also on compost. In the Netherlands very rare (Amsterdam, Osdorp, Moerdijk), but possibly overlooked or misidentified in the past. June–Sept. Also recorded from Austria and Germany.

Conocybe hornana is the only European representative of sect. *Singerella*, characterised by the combination of lecythiform cheilocystidia and the presence of a veil, leaving ephemerous flocks on the margin of the pileus and the lower part of the stipe. However, the veil remains are very fugacious, often only recognisable in young basidiocarps and even there they may be difficult to find. In the two collections from the Netherlands, consisting only of mature basidiocarps, no veil was observed. However, *C. hornana* can also be recognised by the relatively large basidiocarps with a strongly bulbous stipe base and the medium-sized to rather large, deeply coloured, distinctly flattened spores.

3. **Pholiotina** Fay.

Eef Arnolds

Pholiotina Fay. in Annls Sci. nat., Sér. VII, 9: 359. 1889; *Conocybe* subgen. *Pholiotina* (Fay.) Kühner, Genre Galera: 139. 1935; *Galerella* Earle in Bull. N.Y. bot. Gard. 5: 422. 1909.

Selected Literature — M. Bon in Doc. mycol. 21 (84): 76–81. 1992; M. Meusers in Österr. Z. Pilzk. 5: 245–251. 1996; Stridvall in Göteborgs Svampekl. Årsskr. 1981: 83–123. 1981; Watling in Br. Fung. Fl. 3: 84–102. 1982; Watl. & Gregory in Biblthеca mycol. 82: 88–224. 1981.

Basidiocarp mycenoid; pileus usually hygrophanous, dry or slightly greasy, glabrous or pruinose; lamellae narrowly adnate or adnexed, orange-brown to rusty brown when mature; stipe central, slender, often subbulbous, apex or entirely pruinose, often fibrillose striate downwards; partial veil absent or present and then leaving a membranaceous annulus at stipe apex or flocks adhering to margin of pileus; spore print orange-brown to rusty brown.

Spores smooth, rarely minutely verrucose, thin- to rather thick-walled, yellow-brown to orange-brown, usually with germ pore but pore lacking in some species; basidia clavate, 4- or 2-spored; cheilocystidia present, lageniform, subcylindrical or utriform, sometimes skittle-shaped with globose capitulum, never lecythiform; pleurocystidia absent; hymenophoral trama made up of a distinct central strand of cylindrical hyphae surrounded by inflated elements; pileipellis an epithelioid hymenoderm made up of pyriform to spheropedunculate elements, occasionally mixed with pileocystidia; stipitipellis a thin cutis, often entirely covered by caulocystidia or at apex only; clamp-connections present in most species. Development in most species paravelangiocarpic. — Lectotype species (conserved): *Pholiotina blattaria* (Fr. :Fr.) Fay.

Habitat & distr. — Saprotrophic on soil, litter, humus, dung, and small pieces of wood, solitary or gregarious, usually on subneutral to basic substrates rich in nutrients. Widespread, with world-wide distribution.

Pholiotina is often incorporated in the genus *Conocybe*, e.g., by Watling (in Br. Fung. Fl. 3. 1982) and Arnolds in Arnolds et al. (Overz. Paddest. Nederland. 1995). Among the European species, *Pholiotina brunnea* and *Conocybe hornana* combine morphological characteristics of *Conocybe* and *Pholiotina*. The former species has skittle-shaped cheilocystidia, resembling the lecythiform cystidia of *Conocybe. Conocybe hornana* has a veil like many species of *Pholiotina*. Nevertheless, the limits are sufficiently clear to distinguish the two genera without problems on the basis of morphological characteristics of basidiocarps. In addition, mycelia of *Pholiotina* and *Conocybe* species in culture are morphologically different (Hausknecht, unpublished observations). Recent molecular data seem to support the distinction on generic level (Moncalvo et al. in Mol. Phylogen. Evol. 23: 357–400. 2002).

The sections of *Pholiotina* seem to form natural groups and are easily recognisable on basidiocarp morphology. Within the sections many species are very similar in general appearance and macroscopic characters. Relatively few species can be recognised with certainty in the field. The presence and structure of veil remains are important diagnostic characters. Unfortunately the veil remains are fugacious and even in young basidiocarps the veil may get lost, e.g., by sticking to the surrounding vegetation. This may easily lead to misidentifications. Therefore, a key (key four) is added in which no characters of the veil are used.

Identification often depends on differences in size and/or shape of spores and cheilocystidia. The differences are in general rather subtle and often demand careful examination of tissues under an oil-immersion lens of good quality as well as measuring of a representative sample of at least 10 spores to determine average spore size.

The presence or absence of clamp-connections may be a useful additional character in species distinction. However, contradictory data have been given for some species by various authors (see notes on *Ph. utriformis*, *Ph. aberrans,* and *Ph. cyanopus*). Therefore, this character is hardly used in the keys below. The hyphae of the stipitepellis offer the best opportunity to observe clamp-connections in this genus.

The type species of *Pholiotina, Ph. blattaria*, is based on *Agaricus blattarius* Fr. :Fr. This name cannot be interpreted with certainty and has been used for almost any annulate species of *Pholiotina*. Therefore, this name has been rejected as nomen dubium.

Acknowledgments

A. Hausknecht (Maissau, Austria) is acknowledged for intensive correspondence over taxonomical and nomenclatural matters; R. Chrispijn and Ms. C. den Held provided interesting collections and descriptions, and Ms. Y. Dijkman assisted in preparing and editing this manuscript.

KEYS TO THE SPECIES

1. Veil present, leaving a membranaceous annulus on stipe or flocks adhering to the margin of pileus, at least in young basidiocarps
   2. Veil leaving a membranaceous annulus on stipe . . . . . KEY ONE
   2. Veil leaving flocks adhering to the margin of pileus . . . . . KEY TWO
1. Veil absent or presence of veil unknown
   3. Veil definitely absent (young basidiocarps available); stipe usually entirely pruinose, with numerous caulocystidia; pileocystidia often present. . . . . KEY THREE
   3. Presence of veil uncertain . . . . . KEY FOUR

KEY ONE

Veil leaving a membranaceous annulus on stipe. The annulus is loosely attached to the stipe and radially striate-sulcate on upper side. Cheilocystidia subcylindrical, lageniform or utriform (sect. *Pholiotina*)

N.B. The annulus may be ephemeral. Occasionally the annulus is broken in several parts, which may be adhering to the pileus margin. Such remains of the veil are usually striate at one side, thicker and less numerous than on the species keyed out in key two (sect. *Vestitae* and *Intermediae*). In other cases the annulus may have disappeared completely in mature basidiocarps or it is adhering to surrounding vegetation. Key four is available for identification of older basidiocarps.

1. Spores 9.0–15.0 × 5.0–7.5 µm, on the average longer than 10.0 µm
   2. Basidia 2-spored . . . . . **7. Ph. teneroides**
   2. Basidia 4-spored
      3. Cheilocystidia lageniform with long, cylindrical or tapering neck, 3.0–4.0 µm broad. . . . . **5. Ph. vexans**
      3. Cheilocystidia utriform with rounded apex, 7.0–12.0 µm broad . . . . . **6. Ph. utricystidiata**
1. Spores 6.5–10.0 × 4.0–5.5 µm, on the average less than 10.0 µm long
   4. Spores without germ pore; basidiocarps usually vernal. . . . . **3. Ph. aporos**
   4. Spores with germ pore; basidiocarps usually in summer and autumn.
      5. Cheilocystidia lanceolate to lageniform, gradually passing into a narrow, cylindrical or tapering neck, 1.5–3.5(4.0) µm wide, not capitate; spores with distinct germ pore, 1.0–1.5 µm wide . . . . . **4. Ph. rugosa**
      5. Cheilocystidia either predominantly subcylindrical to narrowly lageniform with flexuose, obtuse to subcapitate neck, 2.0–5.0 µm wide, or predominantly utriform to clavate; spores with small germ pore up to 1.0 µm wide.
         6. Cheilocystidia subcylindrical to narrowly lageniform with obtuse, often flexuose neck, apex 2.0–5.0 µm wide **1. Ph. arrhenii**
         6. Cheilocystidia intermixed lageniform, utriform and clavate, the latter with apex 5.0–15.0 µm wide **2. Ph. hadrocystis**

KEY TWO

Veil leaving flocks adhering to pileus margin, occasionally also on stipe. Cheilocystidia subcylindrical, lageniform, sublecythiform or utriform. (sect. *Vestitae* and *Intermediae*)

N.B. The flocks of the veil in this group are thin, fibrillose, and never sulcate-striate. They are loosely attached to the pileus surface and may be easily washed off by rain. Therefore, they are often lacking in older basidiocarps. Such basidiocarps may be identified with key four. See also remarks under key one.

1. Cheilocystidia lageniform to sublecythiform, tapering into a narrow neck with well-delimited capitulum, 4.0–6.0 µm wide; spores usually in part phaseoliform . . . . . **14. Ph. brunnea**
1. Cheilocystidia subcylindrical, utriform or lageniform, occasionally subcapitate but without well-delimited capitulum; spores not phaseoliform
   2. Spores without germ pore, sometimes with slightly paler apical spot (callus)
      3. Flocks of veil fibrillose and thin, usually large, fringing the entire margin of pileus; basidiocarps usually in summer and autumn . . . . . **8. Ph. vestita**
      3. Flocks of veil submembranaceous, thick, often striate-sulcate, in one or more irregular patches adhering to pileus margin; basidiocarps usually in spring . . . . . **3. Ph. aporos**
   2. Spores with distinct germ pore
      4. Cheilocystidia predominantly utriform to clavate. Spores minutely verruculose under oil-immersion lens, in some collections seemingly smooth (but verruculose under SEM). . . . . **13. Ph. utriformis**
      4. Cheilocystidia predominantly subcylindrical to lageniform, often subcapitate. Spores smooth. Insufficiently unravelled group of *C. velata*; see also notes under that species
         5. Spores on the average 7.0–8.3 µm long
            6. Cheilocystidia predominantly lageniform with slender, often subcapitate neck. Pileus centre usually rather pale when moist: yellow-brown, ochre-brown, orangey brown . . . . . **9. Ph. velata**
            6. Cheilocystidia more variable, lageniform, utriform, clavate and subcylindrical. Pileus centre usually rather dark when moist: reddish brown to rusty brown. . . . . **10. Ph. exannulata**
         5. Spores on the average (8.5)9.0–10.6 µm long
            7. Cheilocystidia lageniform with long cylindrical neck, 3.0–5.0(6.0) µm wide, often in part subcapitate **11. Ph. nemoralis**
            7. Cheilocystidia more variable, lageniform, utriform, clavate and subcylindrical . . . . . **12. Ph. mutabilis**

KEY THREE

Veil absent. Cheilocystidia subcylindrical, lageniform or utriform (sect. *Piliferae*).

N.B. The veil in species of *Pholiotina* is ephemerous and may be absent in older basidiocarps or under wet conditions. See notes under key one and two. One may try to identfy such specimens with the present key. When the presence of veil is doubtful it is better to use key four, which treats all species of this genus.

1. Basidiocarp with green or blue tinge on pileus and/or stipe
   2. Pileus greyish brown to reddish brown without blue colours; stipe whitish, at base becoming bluish grey to blue-green when bruised and in age; spores 7.0–9.0 × 4.0–5.5 µm. . . . . **22. Ph. cyanopus**
   2. Pileus blue-green, at least at centre; stipe whitish; spores 8.0–11.5 × 4.5–6.5 µm. . . . . **23. Ph. aeruginosa**
1. Basidiocarps without green or blue tinge
   3. Pileus strongly plicate-sulcate up to halfway the radius . . . . . **21. Ph. sulcata**
   3. Pileus not sulcate, often translucently striate or rugulose near centre
      4. Spores 11.0–14.0 × 6.5–8.0 µm; habitat on dung . . . . . **20. Ph. coprophila**
      4. Spores less than 10.5 µm long; habitat on soil
         5. Basidiocarps small: pileus 4–20 mm wide, stipe 10–45 × 0.5–2 mm; pileus strongly translucently stiate at least up to half of the radius when moist and fresh
            6. Cheilocystidia predominantly utriform and clavate; spores minutely verruculose under oil-immersion lens, in some collections seemingly smooth (but verruculose under SEM). . . . . **13. Ph. utriformis**
            6. Cheilocystidia predominantly lageniform or lanceolate to subcylindrial; spores smooth
               7. Stipe white fibrillose-striate, not pruinose; spores 7.0–9.0 × 4.5 –5.5 µm, on the average 7.8–8.5 µm long, with slightly eccentric germ pore; pileocystidia absent or scarce and obscure **22. Ph. cyanopus**

7. Stipe pruinose to minutely pubescent, not fibrillose-striate; spores with central germ pore; pileocystidia numerous and striking
   8. Spores 7.5–11.0 × 4.5–6.0 µm, on the average longer than 8.2 µm; clamp-connections present; pileocystidia 37–95 × 8.0–16 µm . . . . . **19. Ph. aberrans**
   8. Spores 6.0–9.0 × 3.5–5.5 µm, on the average less than 8.2 µm long; clamp-connections absent; pileocystidia, up to 45 µm long
      9. Cheilocystidia 17–45 × 5.0–8.0 µm, lageniform to lanceolate, gradually tapering into neck, 1.5–2.0(4.0) µm wide, with acute or subacute apex. . . . . **17. Ph. mairei**
      9. Cheilocystidia larger, 46–66(75) × 9.0–11 µm, subcylindrical to lageniform . . . **18. Ph. parvula**
5. Basidiocarps relatively stout: pileus 15–55 mm wide, stipe 25–75 × 2–7 mm; pileus not translucently striate or weakly striate at margin only
   10. Spores on the average 8.8–9.6 µm long . . . . . **15. Ph. pygmaeoaffinis**
   10. Spores on the average 7.3–8.0 µm long . . . . . **16. Ph. striipes**

KEY FOUR

Cheilocystidia subcylindrical, lageniform or utriform, sometimes skittle-shaped but not lecythiform. Veil present or not (all species of *Pholiotina*).

N.B. This key is an additional key to enable identification of basidiocarps in which the presence or absence of a veil is unclear. See also notes on keys one to three.

1. Basidiocarps with blue or green tinge on pileus and/or stipe
   2. Pileus greyish brown to reddish brown without blue colours. Stipe whitish, at base becoming blueish grey to blue-green when bruised and in age. Spores 7.0–9.0 × 4.0–5.5 µm . . . . . **22. Ph. cyanopus**
   2. Pileus blue-green, at least at centre; stipe whitish; spores 8.0–11.5 × 4.5–6.5 µm. . . . . **23. Ph. aeruginosa**
1. Basidiocarps without blue or green tinge
   3. Pileus plicate-sulcate up to at least halfway the radius . . . . . **21. Ph. sulcata**
   3. Pileus not plicate-sulcate, often translucently striate or slightly rugulose at centre
      4. Spores on the average longer than 10.0 µm
         5. Cheilocystidia predominantly utriform to clavate
            6. Basidia 4-spored; spores 9.0–11.5 × 5.5–6.5 µm . . . . . **6. Ph. utricystidiata**
            6. Basidia 2-spored; spores 10.5–14.5 × 5.5–7.5 µm . . . . . **7. Ph. teneroides**
         5. Cheilocystidia lageniform or subcylindrical
            7. Spores on the average longer than 12.0 µm; habitat on dung. . . . . **20. Ph. coprophila**
            7. Spores on the average less than 11.5 µm long; habitat on soil
               8. Cheilocystidia versiform, besides lageniform also many utriform, clavate and subcylindrical **12. Ph. mutabilis**
               8. Cheilocystidia predominantly lageniform with long cylindrical neck, 3.0–5.0(6.0) µm broad
                  9. Basidiocarps without distinctive smell; spores on the average 10.4–11.5 µm long; cheilocystidia with cylindrical or tapering neck, not subcapitate; caulocystidia small, 18–38 µm long, lageniform to clavate . . . . . **5. Ph. vexans**
                  9. Basidiocarps with acidulous smell resembling *Pelargonium* leaves; spores on the average 9.0–10.6 µm long; cheilocystidia usually in part subcapitate; caulocystidia large, 35–67 µm long, predominantly lageniform . . . . . **11. Ph. nemoralis**
      4. Spores on the average less than 10.0 µm long
         10. Spores without germ pore or only with pale apical spot (callus)
            11. Basidiocarps usually in spring, rarely in autumn; spores on the average 7.3–9.3 µm long; cheilocystidia often in part subcapitate. . . . . **3. Ph. aporos**
            11. Basidiocarps in summer and autumn; spores on the average 6.8–7.9 µm long; cheilocystidia not subcapitate . . . . . **8. Ph. vestita**

10. Spores with distinct, although often small, germ pore
    12. Cheilocystidia lageniform to sublecythiform, tapering into a narrow neck with well-delimitated globose capitulum, 4.0–6.0 µm wide . . . . . **14. Ph. brunnea**
    12. Cheilocystidia subcylindrical, utriform or lageniform, occasionally subcapitate but without well-delimitated capitulum
        13. Spores minutely verruculose under oil-immersion lens, in some collections seemingly smooth (but verruculose as observed with scanning electron microscope); cheilocystidia predominantly utriform to clavate, some subcylindrical . . . . . **13. Ph. utriformis**
        13. Spores completely smooth; cheilocystidia usually lageniform to lanceolate or subcylindrical, sometimes in part utriform
            14. Spores on the average less than 8.0 µm long
                15. Stipe pruinose over entire length, covered with caulocystidia; pileocystidia numerous and striking
                    16. Basidiocarps relatively stout: pileus 15–45 mm wide, stipe 35–76 × 2–7 mm **16. Ph. striipes**
                    16. Basidiocarps tiny: pileus up to 10 mm wide, stipe up to 1 mm thick
                        17. Cheilocystidia 13–45 × 5.0–8.0 µm . . . . . **17. Ph. mairei**
                        17. Cheilocystidia 46–66(75) × 9.0–11 µm . . . . . **18. Ph. parvula**
                15. Stipe only pruinose at apex, often fibrillose-striate below; pileocystidia absent or very scarce
                    18. Cheilocystidia predominantly subcylindrical to narrowly lageniform, 2.5–8.0 µm wide, with flexuose neck . . . . . **1. Ph. arrhenii**
                    18. Cheilocystidia predominantly lageniform to utriform, (4.0)6.0–17 µm wide
                        19. Cheilocystidia predominantly lageniform with slender, often subcapitate neck; pileus centre usually rather pale when moist: yellow-brown, ochre-brown, orangey brown . . . . . **9. Ph. velata**
                        19. Cheilocystidia variable, lageniform, utriform, clavate and subcylindrical; pileus centre reddish brown to rusty brown when moist **2. Ph. hadrocystis** (with annulate veil on stipe) or **10. Ph. exannulata** (with denticulate veil on pileus margin)
            14. Spores on the average longer than 8.0 µm
                20. Stipe entirely pruinose, covered by caulocystidia; pileocystidia numerous and striking
                    21. Basidiocarps relatively stout: pileus 15–55 mm, stipe 2–7 mm thick, lamellae, L = 34–45; cheilocystidia lanceolate to lageniform. . . . . **15. Ph. pygmaeoaffinis**
                    21. Basidiocarps smaller: pileus 7–18(24) mm, stipe 0.5–2 mm thick, lamellae, L = 16–22; cheilocystidia subcylindrical to lageniform with cylindrical, often tortuous neck and subacute to subcapitate apex . . . . . **19. Ph. aberrans**
                20. Stipe pruinose only at extreme apex, often fibrillose-striate below; pileocystidia absent or very scarce and obscure
                    22. Cheilocystidia lageniform to lanceolate, gradually tapering into thin neck with obtuse to subacute apex, 1.5–4.0 µm wide, not (sub)capitate . . . . . **4. Ph. rugosa**
                    22. Cheilocystidia lageniform with cylindrical, thicker neck, 3.0–5.0(6.0) µm wide, in part subcapitate, often intermixed with utriform and clavate cells
                        23. Cheilocystidia lageniform with long cylindrical neck, often in part subcapitate **11. Ph. nemoralis**
                        23. Cheilocystidia variable, besides lageniform also many utriform and clavate
                            24. Spores on the average less than 8.5 µm long. . . . . **10. Ph. exannulata**
                            24. Spores on the average longer than 9.0 µm. . . . . **12. Ph. mutabilis**

Sect. **Pholiotina**

SELECTED LITERATURE — Kits v. Wav. in Persoonia 6: 119–165. 1970.

Veil leaving a membranaceous, fugacious annulus on the stipe, accidentally sometimes in thick flocks adhering to pileus margin. Pileocystidia absent or scarce and obscure.

1. Pholiotina arrhenii (Fr.) Sing. in Beih. Sydowia 7: 77. 1973. – Fig. 181.

Agaricus arrhenii Fr., Epicrisis: 161. 1838; *Pholiota arrhenii* (Fr.) Quél. in Mém. Soc. Émul. Montbéliard, Sér. II, 5: 248. 1872 (Champ. Jura Vosges 1); *Conocybe arrhenii* (Fr.) Kits v. Wav. in Persoonia 6: 147. 1970.

MISAPPL. — *Agaricus togularis* sensu Fr., Hymenomyc. Eur.: 216. 1874; *Agaricus blattarius* sensu Cooke, Ill. Brit. Fungi: pl. 1172B, 1173B. 1891; *Pholiota blattaria* sensu Rick., Blätterpilze: 199. 1915; *Conocybe blattaria* sensu Kühner, Genre Galera: 150. 1935.

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 398. 1995; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1314. 1994; Olofsson in Jordstjärnan 9 (3), front cover. 1988.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 314, Figs. A–D. 1995; Enderle in Z. Mykol. 57: 96–98. 1991; Kits v. Wav. in Persoonia 6: 147–150, Figs. 5–10, 25–29, 32, 33. 1970; Kühner, Genre Galera: 150–151, Fig. 47. 1935 (as *C. blattaria* f. *typica*); Watling in Br. Fung. Fl. 3: 91–92, Figs. 219, 220. 1982.

VERN. NAME — Geringd breeksteeltje.

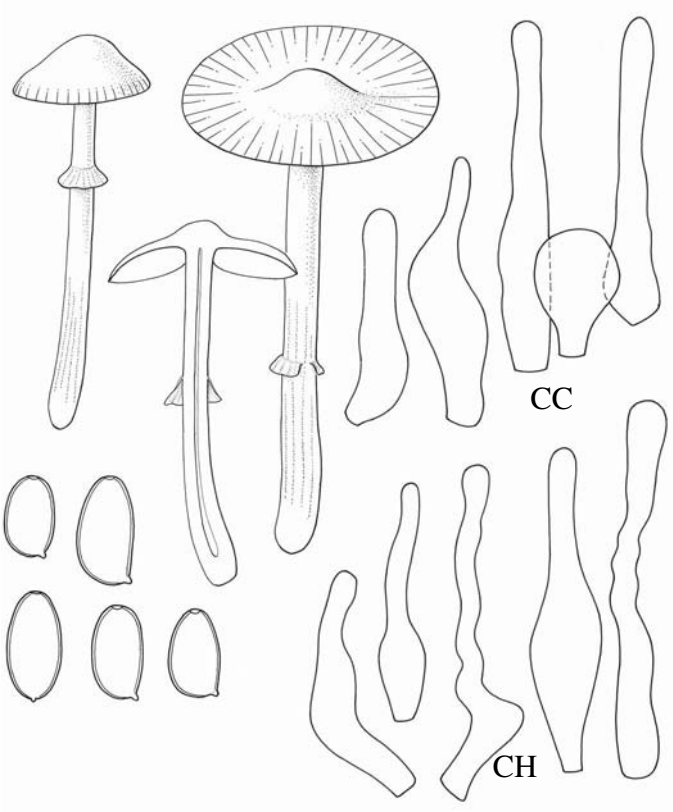


Fig. 181. *Pholiotina arrhenii*

Pileus 10–30 mm broad, campanulate to convex, then plano-convex to applanate, often subumbonate, hygrophanous, when moist at centre rather dark brown to reddish brown (K. & W. 7 E8–F8; Mu. 5YR 3/4, 4/3), towards margin paler brown (e.g., 6 D7–8), gradually discolouring orange-brown to dark yellow-brown with age, not striate or translucently striate up to three-fourths of the radius, pallescent to pale orange-brown or ochraceous on drying, smooth or more or less radially wrinkled, rarely with white appendiculate flocks of veil. Lamellae, L = 25–34, l = (1) 3–7, crowded, adnexed, ventricose, ochraceous at first then orange-brown, with white flocculose edge. Stipe 15–60(75) × 1.5–3(4.5) mm, cylindrical or slightly thickened downwards, first whitish, from the base becoming brown to dark brown under a white, silky striate covering, at apex pruinose, usually annulate; annulus 2–7 mm broad, cuff-like, whitish to cream-colour, occasionally with ochraceous margin, striate-sulcate above, downy below. Context in pileus up to 1.5 mm thick, concolorous, in stipe apex yellowish, towards the base brown. Smell weak, not distinctive or acidulous, resembling *Pelargonium* leaves. Taste mild.

Spores 6.5–8.5(9.0) × 4.0–5.0 µm, av. 7.2–7.7 × 4.2–4.5 µm, Q = 1.6–2.0, Qav = 1.7–1.8, ellipsoid-oblong, ovoid-oblong or slightly amygdaliform, not flattened, yellow-brown in ammonia, with small germ pore, about 1.0 µm broad. Basidia 17–30 × 5.0–8.5 µm, 4-spored. Lamella edge sterile or with scattered basidia. Cheilocystidia 22–50(60) × 2.5–8.0(9.0) µm, in majority subcylindrical or narrowly lageniform, often with long flexuose neck; apex obtuse, rarely subcapitate, 2.0–4.0(5.0) µm wide. Hymenophoral trama made up of cylindrical and inflated elements, 3.0–25 µm wide. Pileipellis an epithelioid hymeniderm, made up of spheropedunculate and pyriform cells, 27–85 × 8.0–43 µm, at base often with thickened, brown wall. Pileocystidia absent. Stipitipellis a cutis of cylindrical, hyaline hyphae, 2.0–6.0 µm thick. Caulocystidia mostly in clusters, 17–44 × 4.5–7.5(10.5) µm, subcylindrical or narrowly lageniform as cheilocystidia, mixed with more thick-set utriform, clavate and spheropedunculate cells. Clamp-connections present, at least in stipitipellis.

HABITAT & DISTR. — Saprotrophic, in groups or solitary, on humus in deciduous forests and parks on calcareous sand and clay, often in disturbed places along trails and roadsides. Fairly common in Holocene areas (e.g., polders, dunes, in the river area), rare elsewhere. Aug.–Nov. Widespread in Europe.

Pholiotina arrhenii is recognised by the combination of small spores with small germ pore and slender, subcylindrical cystidia. See also notes on *Ph. hadrocystis*.

2. Pholiotina hadrocystis (Kits v. Wav.) Courtecuisse in Doc. mycol. 16 (61): 48. 1985. – Fig. 182.

Conocybe arrhenii var. *hadrocystis* Kits v. Wav. in Persoonia 6: 150. 1970; *Conocybe hadrocystis* (Kits v. Wav.) Watling in Notes R. bot. Gdn Edinb. 38: 354. 1980.

MISAPPL. — *Pholiota blattaria* sensu Bres., Iconogr. mycol. 14: pl. 688. 1930.

SEL. ICON. — Bres., Iconogr. mycol. 14: pl. 688. 1930 (as Ph. blattaria); Enderle in Z. Mykol. 62: pl. 10. 1996.

SEL. DESCR. & FIGS. — M. Bon in Doc. mycol. 21 (84): 80. 1992; Enderle in Z. Mykol. 62: 33–35, Fig. 11. 1996; Kits v. Wav. in Persoonia 6: 150–152, Figs. 11, 34–37. 1970; Watling in Br. Fung. Fl. 3: 93–94, Figs. 223, 224. 1982.

VERN. NAME — Knotscelbreeksteeltje.

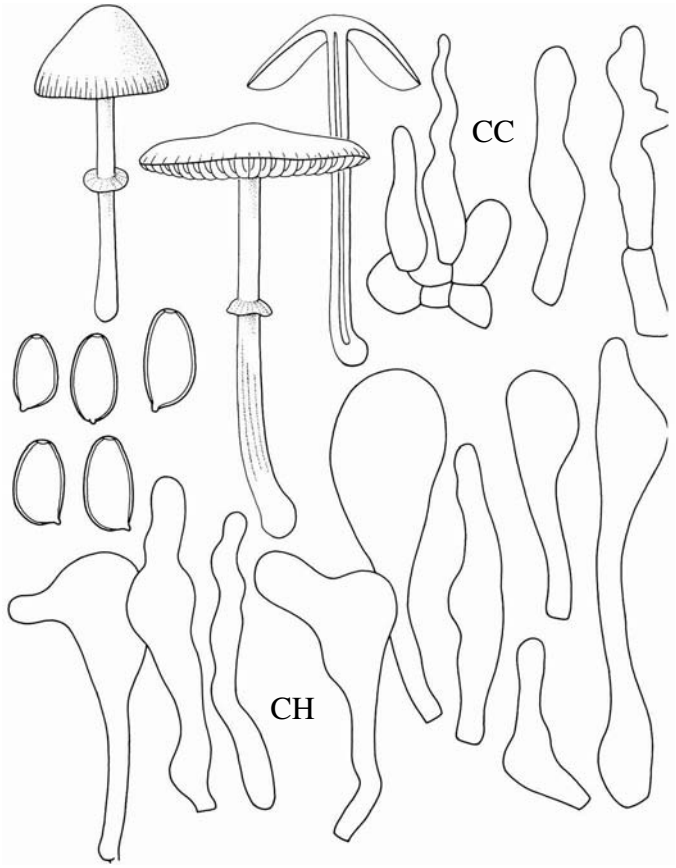


Fig. 182. *Pholiotina hadrocystis*

Pileus 12–30(40) mm broad, campanulate, soon convex or conico-convex, finally applanate, hygrophanous, when moist at centre red-brown to orange-brown (e.g., Mu. 2.5 YR 2/4, 5 YR 3/4, 3/6), towards the margin paler brown to yellow-brown (e.g., 7.5 YR 5/6), not striate or translucently striate up to one-fourth of the radius, on drying ochre-yellow with orangey brown centre, smooth or slightly wrinkled near centre. Lamellae, L = 26–34, l = 1–7, crowded, adnexed, ventricose, pale ochraceous then orange-brown (7.5 YR 5/6, 5/8), with white flocculose edge. Stipe 20–60 × 1.5–3 mm, subcylindrical with slightly thickened base, fistulose, whitish at first, entirely white fibrillose striate lengthwise, from the base becoming brown to dark brown under loosening silky covering, at apex pruinose. Annulus cuff-like, whitish or cream-coloured, 3–6 mm broad, upper surface sulcate-striate, flocculose below. Context in pileus up to 1.5 mm thick, concolorous; in stipe dark brown in lower half. Smell weak, not distinctive or acidulous, resembling Pelargonium leaves. Taste mild. Spore print not recorded.

Spores 6.5–8.5(9.0) × 3.5–5.0 µm, av. 7.3–7.8 × 4.0–4.5 µm, Q = 1.6–2.0, Qav. = 1.75–1.85, ellipsoid-oblong, ovoid-oblong to subamygdaliform in side-view, not flattened, yellow-brown in ammonia, slightly thick-walled with small, sometimes indistinct germ pore, 1.0–1.3 µm wide. Basidia 25–29 × 7.0–8.5 µm, 4-spored. Lamella edge sterile. Cheilocystidia closely packed, 20–65 × 4.0–17 µm, variable, predominantly irregularly lageniform with neck, 3.0–5.0 µm wide, apex obtuse or subcapitate, also utriform, clavate, and subcylindrical, intermixed with some spheropedunculate cells. Hymenophoral trama made up of cylindrical to strongly inflated elements, 4.0–26 µm wide. Pileipellis an epitheloid hymeniderm, made up of pyriform and spheropedunculate cells, 17–33 × 9.0–19 µm, at base often with brown, slightly thickened wall. Pileocystidia absent. Stipitipellis a cutis of rather loose, cylindrical hyphae, 2.0–5.0 µm wide. Caulocystidia in clusters or scattered, 20–36 × 4.5–7.0 µm, similar to cheilocystidia. Clamp-connections present.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on humus or bare soil, in the same habitats as *Ph. arrhenii*. Rare in the Netherlands, mainly in Holocene areas. Sept.–Nov. Also recorded from Belgium, Germany, France, and Great Britain, but distribution insufficiently known.

Pholiotina hadrocystis differs from *Ph. arrhenii* only in the shape of the cheilocystidia, which are in majority markedly broader and in part clavate to utriform. However, such cystidia are mixed with cystidia similar to those of *Ph. arrhenii. Pholiotina hadrocystis* may be therefore only a variety of the latter species, as proposed by Kits van Waveren (in Persoonia 6: 150. 1970).

3. Pholiotina aporos (Kits v. Wav.) Clémençon in Schweiz. Z. Pilzk. 54: 151. 1976. – Fig. 183.

Conocybe aporos Kits v. Wav. in Persoonia 6: 144. 1970.

MISAPPL. — *Pholiota togularis* sensu J. Lange in Dansk bot. Ark. 2 (11): 7. 1921; Fl. agar. dan. 3: 63. 1938.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 396. 1995; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1315. 1994; Gerhardt, Grote Paddestoelengids: 389 (upper Fig.). 1999; J. Lange, Fl. agar. dan. 3: pl. 106A, A1. 1938 (as *Ph. togularis*); Mos. & Jül., Farbatl. Basidiomyc. III Pholiotina 1 (upper Fig.). 1993.

SEL. DESCR. & FIGS. — M. Bon in Bull. semestr. Soc. mycol. Nord 65: 14–15. ('1999') 2000; Breitenb. & Kränzl., Pilze Schweiz 4: 312, Figs. A–D. 1995; Enderle in Z. Mykol. 57: 95–96. 1991; Enderle in

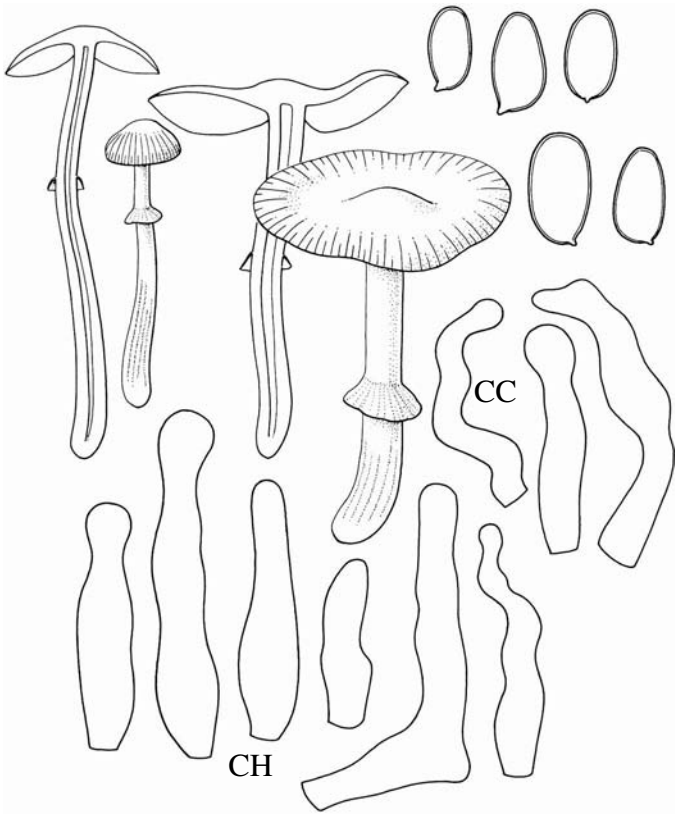


Fig. 183. *Pholiotina aporos*

Z. Mykol. 59: 38–40. 1993; Kits v. Wav. in Persoonia 6: 144–147, Figs. 1–4, 21–24, 30, 31. 1970; Watling in Br. Fung. Fl. 3: 97–98, Figs. 74, 81, 206, 207, 211. 1982.

VERN. NAME — Voorjaarsbreeksteeltje.

Pileus 10–40 mm broad, hemispherical or obtusely conical, then convex to plano-convex, occasionally applanate to slightly depressed, often with weak umbo, hygrophanous, when moist at centre reddish brown to rather dark brown (e.g., Mu. 5YR 3/4, 4/3, 4/4; 7.5 YR 4/2), to the margin paler brown or ochre-brown (e.g., 7.5 YR 4/4, 5/4, 6/6), translucently striate up to two thirds of the radius, on drying ochraceous with slightly darker centre, dull, not striate, usually smooth, sometimes partial veil adhering to margin as small white flocks. Lamellae, L = 27–38, l = 3–7, crowded, adnexed, ventricose, up to 4 mm broad, ochraceous, then orange-brown to rusty brown with white flocculose edge. Stipe 20–55 × 1.5–5 mm, cylindrical with slightly thickened base, fistulose, yellowish at first, becoming yellow-brown then dark brown from the base upwards under a white, fibrillose striate covering, at apex pruinose, usually annulate; annulus 4–12 mm broad, cuff-like, often moveable and sometimes slipping from stipe, white or pale yellow, striate-sulcate above, slightly velvety below. Context in pileus up to 3 mm thick, concolorous, in base of stipe becoming blackish brown. Smell absent or acidulous, resembling *Pelargonium* leaves. Taste not distinctive. Spore print rusty brown.

Spores 6.5–10.0(12.0) × 4.0–5.0(6.5) µm, av. 7.3–8.4(9.3) × 4.2–4.8(5.0) µm, Q = (1.5)1.6–2.0(2.1), Qav. = 1.7–1.85, ellipsoid-oblong to slightly amygdaliform or occasionally slightly phaseoliform in side-view, brownish yellow in water, more orange in ammonia, slightly thick-walled, without germ pore. Basidia 19–32 × 6.0–8.5 µm, usually 4-spored, rarely 4- and 2-(1-)spored intermixed. Lamella edge sterile or almost so. Cheilocystidia closely packed, 22–62 × 5.0–11 µm, subcylindrical to narrowly clavate or narrowly lageniform with cylindrical, often flexuose neck, 3.0–5.0 µm wide, often in part subcapitate; apex 4.5–7.0(9.5) µm wide. Pleurocystidia absent. Hymenophoral trama made up of subcylindrical to inflated, subglobose elements, 5.0–25 µm broad. Pileipellis an epithelioid hymeniderm, made up of spheropedunculate and pyriform cells, 18–62 × 10–25 µm, hyaline or with brown stalks. Pileocystidia absent. Stipitipellis a cutis of repent hyphae, 2.0–6.0 µm broad, at apex with cystidioid elements. Caulocystidia 27–71 × 4.0–10 µm, subcylindrical to narrowly clavate, often tortuous, occasionally subcapitate (apex up to 7.0 µm) or septate. Clamp-connections present, often scarce.

HABITAT & DISTR. — Saprotrophic, solitary or in groups, terrestrial, usually in deciduous forests and parks on rich, often calcareous, neutral to basic, humus-rich sand, loam and clay, often in disturbed places along paths, also outside forests in roadside verges and ruderal sites. Rather common in Holocene areas, e.g., in coastal dunes, IJsselmeerpolders and in valleys of big rivers, also in southern Limburg, rare elsewhere. Usually April–May (June), rarely Oct.–Nov. (see notes). Widespread in Europe.

Pholiotina aporos is the only annulate species producing spores without germ pore. Occasionally veil remains are adhering to the margin of the pileus and such sporocarps might be confused with *Ph. vestita*, also having spores without pore. However, the latter species has a more cottony veil, fruits usually in autumn, the spores are in most collections slightly smaller and the cheilocystidia are not capitate.

Pholiotina aporos is the only species with a definite optimum of fruiting in spring. However, it has been collected twice in the Netherlands in late autumn. Autumnal records were also described from France (Bon in Bull. semestr. Soc. mycol. Nord 65: 14–15. ('1999') 2000) and Germany (Enderle in Z. Mykol. 59: 38–40. 1993), with some reservation concerning the identity of these collections. No reliable morphological differences with vernal basidiocarps were found. Therefore, it is considered an autumnal variant without taxonomic status. It should be noticed that other annulate *Pholiotina* species are occasionally found in spring, e.g., *Ph. rugosa.*

Very rarely collections with mixed 4- and 2-spored basidia are found, with much larger spores than usual. These values are included in the above description (in brackets).

4. Pholiotina rugosa (Peck) Sing. in Papers Mich. Acad. Sci., Arts Letters 30: 148. 1946. – Fig. 184.

Pholiota rugosa Peck in Rep. N.Y. St. Mus. Nat. Hist. 50: 102. 1898; *Conocybe rugosa* (Peck) Watling in Beih. Nova Hedwigia 82: 133. 1981. — *Agaricus togularis* var. *filaris* Fr., Ic. sel. Hymenomyc. 2: 2. 1884; *Pholiota filaris* (Fr.) Peck in Bull. N.Y. St. Mus. 122: 144. 1908; *Conocybe filaris* (Fr.) Kühner, Genre Galera: 159. 1935; *Pholiotina filaris* (Fr.) Sing. in Beih. bot. Zbl. 56B: 170. 1936. — *Galera vestita* var. *pusilla* Quél., Enchir. Fung.: 81. 1886; *Conocybe pusilla* (Quél.) Romagn. in Rev. Mycol. 2: 183. 1937.

MISAPPL. — *Pholiota togularis* sensu Konr. & M., Ic. sel. Fung. 1: pl. 69, Fig. 1. 1924.

SEL. ICON. — M. Bon in Doc. mycol. 24 (93): pl. 1B. 1994; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 401. 1995; Chrispijn, Champ. Jordaan: 71. 1999; Enderle in Z. Mykol. 62: pl. 8. 1996; Fr., Ic. sel. Hymenomyc. 2: pl. 104, Fig. 4. 1884; J. Lange, Fl. agar. dan. 3: pl. 106C, C1. 1938; Lonati in Micol. Veget. medit. 9: 119. 1994; R. Phillips, Paddest. Schimm.: 155. 1981 (all as *Ph.* or *C. filaris*).

SEL. DESCR. & FIGS. — M. Bon in Doc. mycol. 24 (93): 76–77. 1994; Breitenb. & Kränzl., Pilze Schweiz 4: 316, Figs. A–D. 1995; Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 110–112. 1986; Enderle in Z. Mykol. 62: 30–33, Fig. 9. 1996; Kits v. Wav. in Persoonia 6: 156–160, Figs. 14–19, 44–48. 1970; Kühner, Genre Galera: 159–161, Fig. 52.

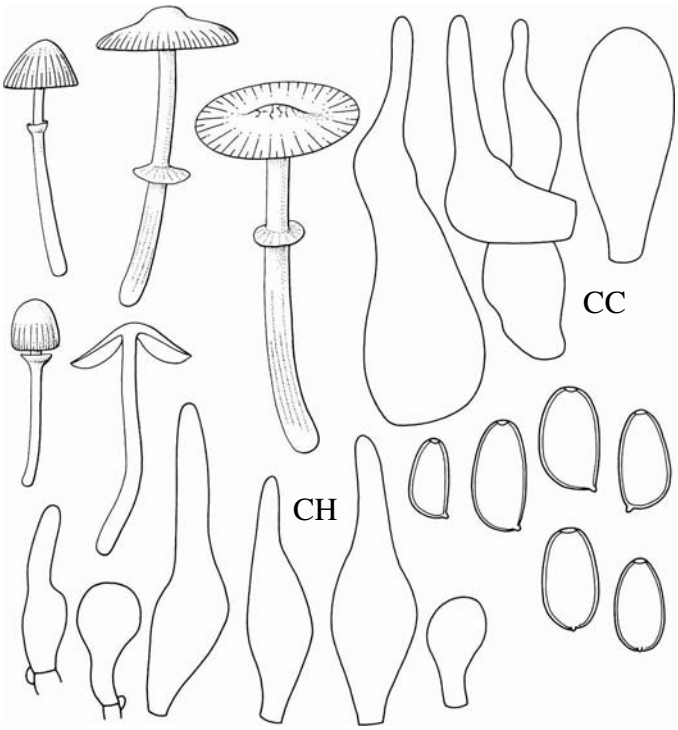


Fig. 184. *Pholiotina rugosa*

1935; Lonati in Micol. Veget. medit. 9: 118–120. 1994 (all as *Ph.* or *C. filaris*); Watling in Br. Fung. Fl. 3: 92–93, Figs. 221, 222; 95–96. 1982.

VERN. NAME — Klein breeksteeltje.

Pileus 6–20(25) mm broad, obtusely conical or conico-campanulate, then conico-convex to plano-convex, often with obtuse umbo, strongly hygrophanous, colour quite variable, when moist dark reddish brown, orange-brown to yellow-brown (e.g., Mu. 5 YR 3/3, 3/4; 7.5 YR 5/6, 10 YR 5/6, 6/6, 6/8), translucently striate up to one-third to seven-eighths of the radius, quickly drying and fading to ochre-yellow or cream-colour with slightly darker centre, smooth or often faintly rugulose around centre, sometimes strongly wrinkled. Lamellae, L = 12–28, l = 3–7, crowded to moderately distant, adnate or adnexed, ventricose, ochraceous, then ochre- to orange-brown with white flocculose edge. Stipe (10)15–40 × 0.7–3 mm, cylindrical or slightly thickened at base, solid or narrowly fistulose, apex pale yellow, downwards pale orange at first, strongly white fibrillose striate lengthwise, darkening from the base upwards to dark brown under white fibrillose covering, apex pruinose, annulate; annulus easily detached from the stipe, 2–7 mm wide, horizontal, ascending or descending, membranous, thin, white, yellowish or pale brown, upper side striate-sulcate, downy below. Context concolorous, in stipe base pale to dark (reddish) brown. Smell absent or weak, not distinctive, sometimes acidulous, resembling Pelargonium leaves. Taste mild, not distinctive, sometimes slightly adstringent. Spore print rusty-brown.

Spores (7.0)7.5–11.0 × 4.0–6.0 µm, av. 8.5–10.0 × 4.7–5.3 µm, Q = 1.6–2.0(2.2), Qav = 1.75–1.9, ellipsoid-oblong to slightly amygdaliform or subcylindrical in side-view, not broader in face-view, in ammonia brownish orange, slighly thick-walled, smooth, with apical germ pore 1.0–1.6 µm wide. Basidia 17–30 × 6.5–9.5 µm, 4-spored, rarely mixed 4- and 2-spored. Lamella edge sterile or with scattered basidia. Cheilocystidia 20–55 × 6.0–13 µm, closely packed, lageniform, gradually passing into a cylindrical or tapering neck with obtuse to subacute apices, 1.8–3.5(4.0) µm broad, never (sub)capitate, in addition some spheropedunculate cells, 12–17 × 6.0–10 µm. Hymenophoral trama made up of cylindrical to strongly inflated, subglobose elements, 3.0–27 µm wide. Pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate cells, 30–73 × 11–40(50) µm broad, with slightly thick-walled, brown base. Pileocystidia absent. Stipitipellis a cutis, made up of cylindrical hyphae, 1.5–5.0 µm wide, often with yellow-brown wall. Caulocystidia 33–54 × 9.0–18 µm, in clusters or scattered, similar to cheilocystidia but often larger and more irregular, neck 2.5–4.0 µm broad; in addition clavate cells, c. 25–34 × 11–16 µm. Clamp-connections present.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on humus or bare soil in deciduous forests and parks, on subneutral to basic, often calcareous, clayey and sandy soils. Not uncommon in the Netherlands, mainly in Holocene areas and southern Limburg. (April) Aug.–Nov. Widespread in Europe, also recorded from North America.

Following Watling (in Br. Fung. Fl. 3: 92, 95. 1982) several authors distinguish two species: *Pholiotina rugosa* sensu stricto with somewhat stouter basidiocarps with a rugose pileus and larger spores (8.0–10.0 × 4.5–5.5(6.0) µm) and *Ph. filaris* with small basidiocarps and small spores (according to Watling (6.5)7.0–8.5 (9.5) x (4.0)4.5–5.0 µm). In the studied collections no correlation between spore size and size of sporocarps was found. Many intermediate collections exist with regard to the stature of sporocarps and rugosity of the pileus. Therefore, Kits van Waveren (in Persoonia 6: 156. 1970) is followed in synonymizing the two species, except for his nomenclature since the name *Pholiota rugosa* has priority over *Pholiota filaris*.

5. Pholiotina vexans (P.D. Orton) M. Bon in Doc. mycol. 21 (83): 38. 1991. – Fig. 185.

Conocybe vexans P.D. Orton in Trans. Br. mycol. Soc. 43: 197. 1960.

MISAPPL. — *Conocybe blattaria* sensu Breitenb. & Kränzl., Pilze Schweiz 4: 314. 1995; sensu Kits v. Wav. in Persoonia 6: 152. 1970; *Pholiotina blattaria* sensu Mos., Röhrlinge Blätterpilze 3. Aufl.: 284. 1978; sensu M. Meusers in Österr. Z. Pilzk. 5: 247. 1996; *Conocybe togularis* sensu Kühner, Genre Galera: 161. 1935.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 399. 1995 (as *C. blattaria*); Gerhardt, Grote Paddestoelengids: 389 (centre). 1999 (as *C. blattaria*); Lonati in Micol. Veget. medit. 10: 5. 1995 (as *Ph. blattaria*); Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 215. 1985 (as *C. blattaria*).

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 314, Figs. A–D. 1995 (as *C. blattaria*); Enderle in Z. Mykol. 63: 23–25, Fig. 14. 1997 (as *Ph. blattaria*); Kits v. Wav. in Persoonia 6: 152–156, Figs. 12, 13, 38–43. 1970 (as *C. blattaria*); Kühner, Genre Galera: 161–162, Fig. 53. 1935 (as *C. togularis*); Watling in Br. Fung. Fl. 3: 96–97, Figs. 203, 208, 209. 1982.

VERN. NAME — Manchetbreeksteeltje.

Pileus 8–25 mm broad, campanulate to obtusely conical, then conico-convex, hygrophanous, when moist ochre-brown to orange-brown (Mu. 10 YR 5/8, 6/8; K. & W. 6D7), with paler margin, translucently striate at margin or up to centre, drying ochraceous to cream-coloured, smooth or slightly wrinkled at centre. Lamellae, L = 19–29, l = 1–5, rather crowded, narrowly adnate, ventricose, pale ochre when young, then yellow-brown to rusty brown, with white, flocculose edge. Stipe 30–70 × 1–3(5) mm, cylindrical or base subbulbous, fistulose, cream to pale ochraceous at first, becoming yellow-brown to brown from the base upwards, first white fibrillose-striate lengthwise, above annulus

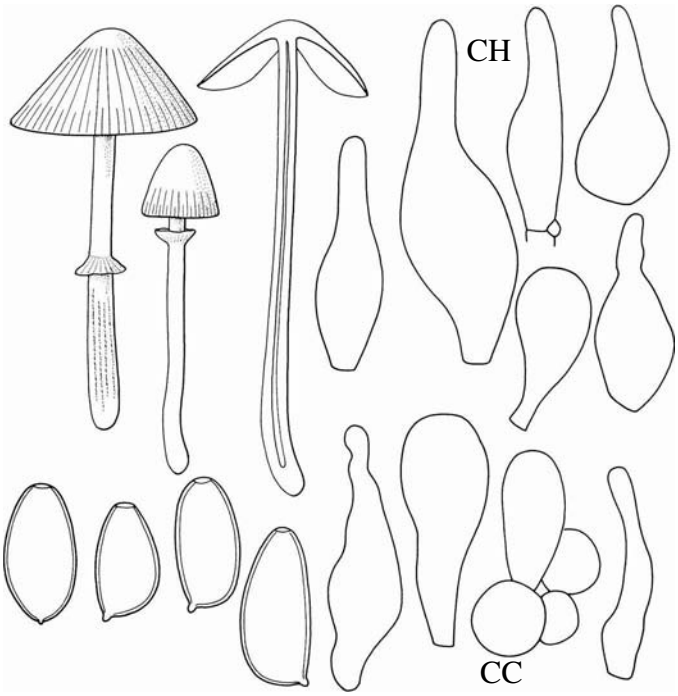


Fig. 185. *Pholiotina vexans*

pruinose. Annulus distinct but easily becoming detached, 2.5–6 mm broad, 0.5–1 mm thick, pendant, membranous, whitish or yellowish, striate-sulcate above, smooth below. Context concolorous, up to 1 mm thick in pileus. Smell weak, not distinctive. Taste weak or slightly rancid. Spore print rusty brown.

Spores 9.5–12.5 × 5.0–6.5(7.0) µm, av. 10.4–11.5 × 5.4–6.0 µm, Q = 1.7–2.1, Qav. = 1.8–1.95, ellipsoid-oblong or slightly amygdaliform, yellow-brown to orange, moderately thick-walled, with large apical germ pore, 1.5–2.2 µm wide. Basidia 22–35 × 7.0–10 µm, 4-spored. Lamella edge sterile. Cheilocystidia 25–55 × 7.0–15(25) µm, lageniform with cylindrical or tapering neck, 3.0–4.0 µm wide at apex, intermixed with some clavate cells. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to inflated, globose elements, 4.0–22 µm broad, hyaline or with pale yellow wall. Pileipellis an epithelioid hymeniderm, made up of spheropedunculate and clavate elements, 20–50 × 10–26 µm, basal part often thick-walled, brown. Pileocystidia absent. Stipitipellis a cutis of repent, hyaline hyphae, 2.0–5.0 µm broad, at apex with clusters of caulocystidia. Caulocystidia 18–38 × 4.0–11 µm, quite variable, mostly more or less lageniform with non-capitate neck, 3.0–4.5 µm broad, also subcylindrical and broadly clavate; in addition many smaller, globose cells, up to 13 µm broad. Clamp-connections present.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on humus-rich soil in various forests on wet to dry, sandy and clayey soils rich in minerals, often in disturbed places among *Urtica dioica* and other large herbs, for instance in young plantations and along roadsides. Distribution in the Netherlands insufficiently known due to confusion with related species, probably very rare and mainly in Holocene areas. May–Oct. Widespread in Europe, in the Alps up into *Alnus viridis* scrub in the subalpine zone.

Pholiotina vexans is readily recognised by the combination of large spores, 4-spored basidia and lageniform cheilocystidia. However, it is impossible to distinguish it from related species in the field. It has often been described under the name *C. blattaria*, but this name has been rejected as a nomen ambiguum (see notes on *Pholiotina*).

6. Pholiotina utricystidiata Enderle & Hübner in Z. Mykol. 65: 17. 1999.

SEL. ICON. — Enderle in Z. Mykol. 63: 30. 1997 (as *Pholiotina* spec.).

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 63: 30–32. 1997 (as *Pholiotina* spec.); Enderle & Hübner in Z. Mykol. 65: 17–20, Fig. 9. 1999.

CHARACTERISTICS — Pileus up to 40 mm broad, hemispherical then convex to flattened, hygrophanous, when moist orange at first, gradually becoming cinnamon brown, at margin translucently striate, on drying pale ochre-yellow, without veil remains; lamellae adnexed, moderately crowded, ventricose, cinnamon brown when mature, with whitish flocculose edge; stipe up to 60 × 2–5 mm, cylindrical, fistulose, at first apex pale ochre-yellow, downwards darker brown, becoming dark brown with blackish brown base with age, apex pruinose, downwards fibrillose-striate, annulate; annulus removable, radially striate above; context concolorous; smell weak, not distinctive; spore print not recorded.

Spores 9.0–11.5 × 5.5–6.5 µm, av. c. 10.4 × 6.0 µm, ellipsoid-oblong to subamygdaliform in side-view, slightly broader in face-view, ochre-brown in ammonia, rather thick-walled with apical germ pore up to 2.0 µm wide; basidia 25–30 × 8.0–10 µm, 4-(2-)spored; cheilocystidia 24–42 × 9.0–17 µm, utriform, intermixed with some broadly clavate elements; pleurocystidia absent; pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate elements, 13–27(35) µm broad; pileocystidia absent; caulocystidia 23–70 × 8.0–15 µm, similar to cheilocystidia but often longer; clamp-connections present but scarce.

HABITAT & DISTR. — Saprotrophic, solitary or gregarious, in semi-ruderal grasslands, lawns and gardens on fertile soil, or soil mixed with wood-chips. May–Sept. Not yet recorded from the Netherlands. Described from several localities in east and south Germany.

Pholiotina utricystidiata was recently described from Germany and may very well be found in the Netherlands in near future. It is close to *Pholiotina teneroides* and differs mainly in predominantly 4-spored basidia and smaller, relatively slightly broader spores.

7. Pholiotina teneroides (J. Lange) Sing. in Beih. bot. Zbl. 56B: 170. 1936. – Fig. 186.

Pholiota teneroides J. Lange in Dansk bot. Ark. 2 (11): 7. 1921; *Conocybe teneroides* (J. Lange) Kits v. Wav. in Persoonia 6: 160. 1970. — *Conocybe percincta* P.D. Orton in Trans. Br. mycol. Soc. 43: 194. 1960; *Pholiotina percincta* (P.D. Orton) M. Bon in Doc. mycol. 21 (83): 38. 1991.

MISAPPL. — *Pholiota blattaria* sensu Konr. & M., Ic. sel. Fung. 1: pl. 69, Fig. 2. 1929; *Conocybe blattaria* sensu P.D. Orton in Trans. Br. mycol. Soc. 43: 192. 1960; sensu Watling in Br. Fung. Fl. 3: 92. 1982; sensu Arnolds in Arnolds et al., Overz. Paddest. Ned.: 104. 1995; *Pholiotina blattaria* sensu M. Bon in Doc. mycol. 21 (84): 80. 1992; *Conocybe togularis* 'f. bisporique' sensu Kühner, Genre Galera: 162. 1935.

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 403. 1995; Cetto, Funghi Vero 6: pl. 2231. 1989; Dähncke, 1200 Pilze: 583. 1993; Gerhardt, Grote Paddestoelengids: 389 (lower Fig.). 1999; J. Lange,

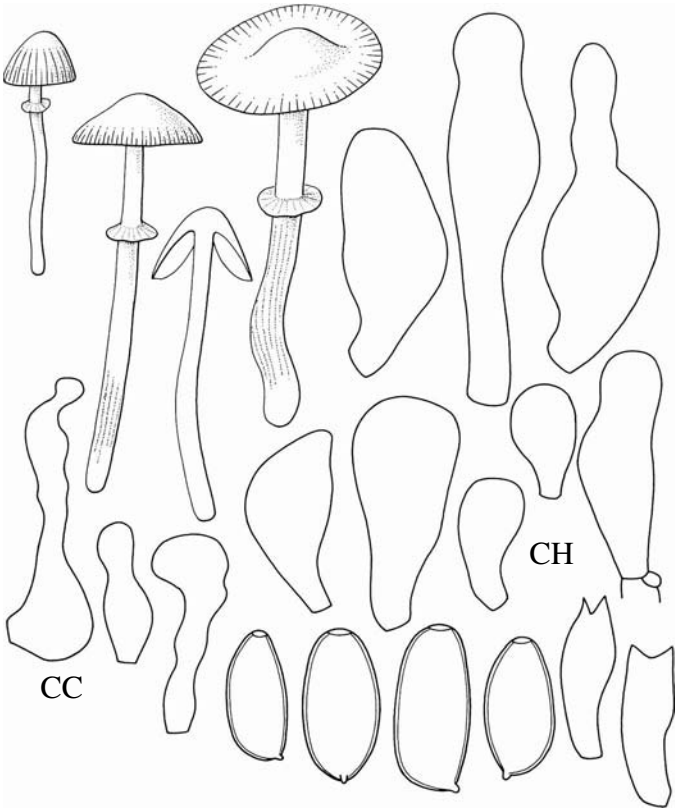


Fig. 186. *Pholiotina teneroides*

Fl. agar. dan. 3: pl. 106B. 1938; R. Phillips, Paddest. Schimm.: 155. 1981 (as *C. percincta*).

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 318, Figs. A–D. 1995; Enderle in Z. Mykol. 59: 40–41. 1993; Kits v. Wav. in Persoonia 6: 160–162, Figs. 20, 49–54. 1970; Kühner, Genre Galera: 162–165, Fig. 154. 1935; P.D. Orton in Trans. Br. mycol. Soc. 43: 194. 1960 (as *C. percincta*); Watling in Br. Fung. Fl. 3: 92, Figs. 213, 214 (as *C. blattaria*), 94–95, Figs. 204, 205, 210, 212 (as *C. percincta*). 1982.

VERN. NAME — Gekraagd breeksteeltje.

Pileus 6–25(40) mm broad, campanulate or conico-convex, then convex, hygrophanous, when moist reddish brown at centre, to the margin orange-brown (K. & W. 6D8) to yellow-brown, then entirely ochre-brown to yellow-brown (Mu. 10 YR 5/6, 6/6), not striate or translucently striate up to three-fourths of radius, on drying pale yellow to ochraceous orange, smooth or slightly radially wrinkled, without remains of veil. Lamellae, L = 17–32(40), l = 3–7, crowded, narrowly adnate or adnexed, brownish yellow, then orange-brown, with white flocculose edge. Stipe 20–60 × 1–3(5) mm, cylindrical or slightly thicker towards base, solid or fistulose, first pale ochre-yellow, becoming yellow-brown to dark brown from the base upwards under white fibrillose covering, which gradually disappears, annulate; annulus 2–7(10) mm broad, thick, membranous, white to pale yellow, striate-sulcate above, downy below. Context concolorous, in pileus up to 3 mm thick, in stipe brown to dark brown in mature basisiocarps. Smell weak, not distinctive. Taste mild. Spore print rusty brown.

Spores 10.5–14.5(15.5) × (5.0)5.5–7.5 µm, av. 11.5–12.3 × 5.7–6.3 µm, Q = 1.7–2.2, Qav. = 1.85–2.1, ellipsoid-oblong to subcylindrical or slightly amygdaliform, not broader in face-view, brownish yellow in water, brownish orange in ammonia, slightly thick-walled, smooth, with large, central germ pore, 1.3–2.0 µm wide. Basidia 17–25 × 6.5–8.0 µm, 2-spored. Lamella edge sterile. Cheilocystidia (15)22–53 × 8.0–16(20) µm, densely packed, variable, predominantly utriform to clavate, also fusiform to lageniform with broad rounded neck, 4.0–7.0 µm wide, intermixed with spheropedunculate cells, ± 12–20 × 8.0–14 µm. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 4.0–32 µm broad. Pileipellis an epitheloid hymeniderm, made up of clavate and spheropedunculate cells, 20–45 × 11–25 µm; pedicel often with slightly thickened, yellowish wall. Pileocystidia absent. Stipitipellis a cutis of repent, hyaline hyphae, 2.0–5.0 µm broad, at apex with scattered cystidia. Caulocystidia 16–36 × 4.0–10.5 µm, variable in size and shape, clavate, cylindrical and lageniform with cylindrical, tortuous neck, 3.0–4.0 µm broad, in addition smaller subglobose cells, 6.0–10 × 4.0–9.0 µm. Clamp-connections present.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on humus or bare soil in deciduous forests on eutrophic, neutral to basic, sandy and clayey soils, often among *Urtica dioica* and other tall herbs, sometimes in grassland. Rare, mainly in Holocene areas such as coastal dunes, river area, IJsselmeerpolders and the western provinces. Sept.–Nov.(Dec.). Widespread in Europe but distribution insufficiently known.

Many modern authors distinguish two species: *Pholiotina teneroides* sensu stricto with small basidiocarps (pileus 6–12 mm, stipe 40–50 × 1–1.5 mm) and a small, white annulus, and *Ph. percincta* P.D. Orton with more robust basidiocarps (pileus 12–38 mm, stipe 24–45 × 1.5–5 mm) and a broad yellowish annulus, 6–10 mm broad (e.g., Watling in Br. Fung. Fl. 3: 92, 94. 1982). Most collections from the Netherlands are more or less intermediate in these characters. Such basidiocarps are depicted for instance by R. Phillips (*Paddest. Schimm.*: 155. 1981) under the name *Ph. percincta*. Therefore, the two taxa are considered conspecific, as suggested by Kits van Waveren (in Persoonia 6: 137–142. 1970).

Sect. **Vestitae** Watling

Veil present, leaving flocks along margin of pileus. Cheilocystidia lageniform, subcylindrical or utriform without well-delimitated capitulum. Pileocystidia absent or scarce and indistinct.

Subsect. **Vestitinae**

Spores smooth, also as observed with scanning electron microscope.

8. Pholiotina vestita (Fr.) Sing. in Beih. bot. Zbl. 56B: 170. 1936. – Fig. 187.

Galera vestita Fr. in Quél. in Mém. Soc. Émul. Montbéliard, Sér. II, 5: 248. 1872 (Champ. Jura Vosges 1); *Conocybe vestita* (Fr.) Kühner, Genre Galera: 155. 1935.

SEL. ICON. — M. Bon, Champ. Eur. occ.: 261. 1987; M. Bon in Doc. mycol. 21 (84): pl. 2F. 1992; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 404. 1995; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1316. 1994; Enderle in Mykol. Mittbl. 35 (1): 14. 1992; J. Lange, Fl. agar. dan. 4: pl. 129F. 1939; Mos. & Jül., Farbatl. Basidiomyc. III Pholiotina 2 (lower Fig.). 1993.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 318, Figs. A–E. 1995; Enderle in Mykol. Mittbl. 35(1): 11–13, 1992; Kühner, Genre Galera: 155–157, Fig. 50. 1935; Watl. in Br. Fung. Fl. 3: 99–100, Figs. 79, 198–200. 1982.

VERN. NAME — Kleibosbreeksteeltje.

Pileus 8–24(30) mm broad, campanulate or hemispherical at first then convex to plano-convex or applanate, with or without slight umbo,

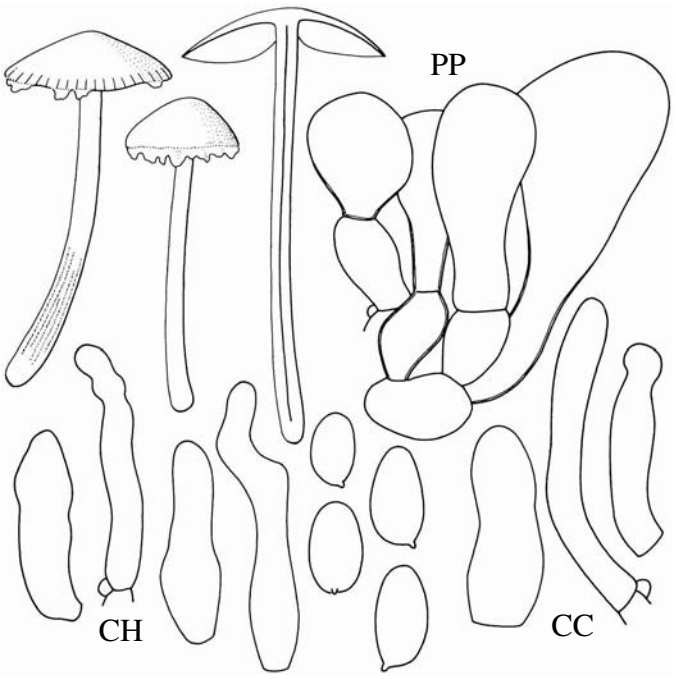


Fig. 187. *Pholiotina vestita*

hygrophanous, when moist and young dark reddish to orange-brown (Mu. 2.5 YR 2/4, 4/6) then orangey to yellowish brown (e.g., 5 YR 5/6, 7.5 YR 5/6), not striate or faintly translucent-striate up to halfway the radius, drying pale yellow-brown; margin usually with strongly developed, white, appendiculate veil at first then with distinct triangular velar flocks; sometimes veil thin, leaving only small, fugacious flocks. Lamellae, L =18–30, l = 3–7, crowded, adnexed, ventricose, pale ochre-brown, then dark yellow-brown to orange-brown, with white flocculose edge. Stipe 20–65 × 1.5–3(4) mm, cylindrical or slightly bulbous at base, becoming fistulose, whitish when young, becoming brown from the base upwards under white fibrillose covering; apex pruinose, usually without veil, but sometimes with poorly developed, incomplete annulus of fibrillose veil remains. Context concolorous with surface or in stipe darker, brown. Smell weak, not distinctive or resembling *Pelargonium* leaves. Taste mild, not distinctive. Spore print rusty brown.

Spores 6.0–8.5 × 3.5–5.0(5.5) µm, av. 6.8–7.9 × 4.1–4.9 µm, Q = 1.5–1.8, Qav. = 1.6–1.7, ellipsoid-oblong, ovoid-oblong to amygdaliform in side-view, not flattened, yellow-brown to brownish orange in ammonia, smooth, slightly thick-walled, without germ pore or germ pore weakly developed and hardly visible. Basidia 17–27 × 6.0–8.0 µm, 4-spored, clavate. Lamella edge sterile. Cheilocystidia 23–60 × 4.0–10 µm, predominantly subcylindrical, often slightly tortuous, also lageniform; apex obtuse, 3.5–6.5 µm broad, not capitate. Pleurocystidia absent. Hymenophoral trama subregular, made up of cylindrical to strongly inflated, subglobose elements, 22–55 × 4.0–20 µm. Pileipellis an epitheloid hymeniderm, made up of pyriform and spheropedunculate cells, 17–52 × 9.0–29 µm, slightly thick-walled and often with orange-brown pedicel. Pileocystidia absent. Stipitipellis a cutis of smooth, hyaline hyphae, 2.0–5.0 µm wide. Caulocystidia in clusters and scattered, 12–43 × 5.0–10 µm, predominantly clavate and subglobose, intermixed with cylindrical cells similar to cheilocystidia. Clamp-connections present. Chemical reactions: No crystals formed on fragments of lamellae in ammonia.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on bare soil and humus in various forest types on moist, sandy or clayey, eutrophic soils, often in disturbed places along roadsides and in young plantations. Rare in the Netherlands but possibly confused in the field with *C. velata*, mainly in Holocene areas. Aug.–Oct. Widespread in Europe, but rare.

In the field typical *Pholiotina vestita* can often be recognised by the thick, well-developed appendiculate veil, but the flocks are small in some collections. This species comes close to *Pholiotina velata*, but the latter differs in spores with a distinct germ pore and the presence of many subcapitate cheilocystidia. In addition, young basidiocarps of *Ph. vestita* usually have a much darker and more reddish brown pileus than *Ph. velata*.

9. Pholiotina velata (Velen.) A. Hauskn. in Czech Mycol. 51: 66. 1999. – Fig. 188.

Galera velata Velen., České Houby: 547. ('1920') 1921; *Conocybe velata* (Velen.) Watling in Kew Bull. 59: 168. 2004. – *Conocybe appendiculata* J. Lange & Kühn. in Kühner, Genre Galera: 146. 1935 (invalid); *Conocybe appendiculata* Watling in Persoonia 6: 329. 1971; *Pholiotina appendiculata* (Watling) Sing. in Beih. Sydowia 7: 79. 1973.

EXCL. — *Pholiotina appendiculata* sensu Dähncke, 1200 Pilze: 584. 1993 (= *Ph. nemoralis*).

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 397. 1995; Cetto, Funghi Vero 6: pl. 2232. 1989; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1317. 1994; Gerhardt, Grote Paddestoelengids: 387 (bottom). 1999; J. Lange, Fl. agar. dan. 4: pl. 129A. 1939; Lonati in Micol. Veget. medit. 10: 7. 1995 (all as *Ph.* or *C. appendiculata*).

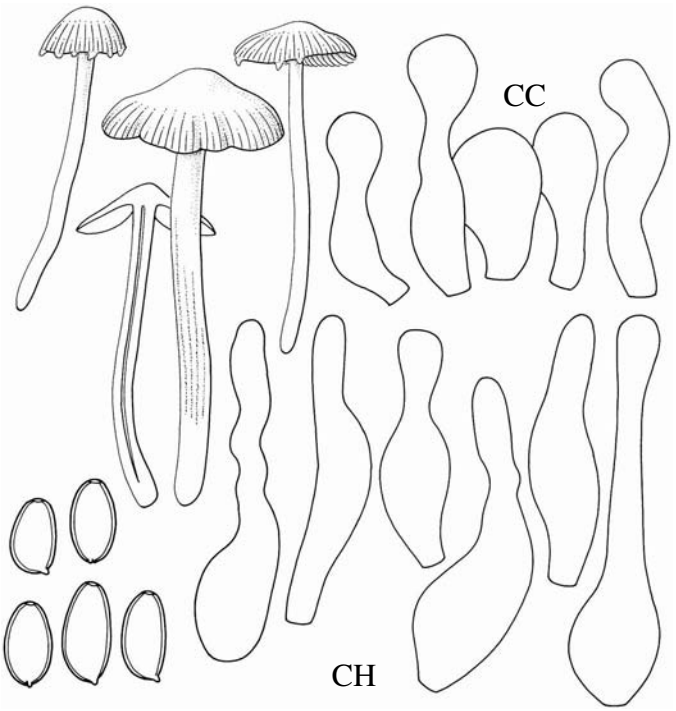


Fig. 188. *Pholiotina velata*

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 314, Figs. A–E. 1995; Kühner, Genre Galera: 146–149, Fig. 46 (excl. M). 1935; Watling in Persoonia 6: 329–334, Figs. 53–63. 1971; Watling in Br. Fung. Fl. 3: 100–101, Figs. 78, 215, 216. 1982; Zschieschang in Z. Mykol. 56: 13–14, Figs. 1–7. 1990 (all as *Ph.* or *C. appendiculata*).

VERN. NAME — Franjebreeksteeltje.

Pileus (5)8–25 mm broad, obtusely conical then conico-convex to plano-convex, often with obtuse umbo, hygrophanous, when moist orangey brown, yellow-brown to ochre-brown (e.g., K. & W. 6D8, 5C5; Mu. 7.5 YR 5/8, 5/6, 10 YR 5/4, 6/6), slightly paler to the margin, often slightly darker when old, translucently striate up to one-third to three-fourths of the radius, on drying pale ochre-yellow (4A4), margin first with small, fugacious, appendiculate flocks of white veil. Lamellae, L = (16)20–35, l = (1)3–5(7), rather crowded to moderately distant, adnexed, pale ochraceous then orange-brown (7.5 YR 4/6; 6D8), with paler, flocculose edge. Stipe 15–55 × 1–3.5 mm, cylindrical or slightly thicker at base, whitish at first, gradually becoming rusty brown to dark brown from base upwards under white, silky striation; apex flocculose, occasionally with some scattered patches of thin, membranaceous veil, rarely forming an incomplete annulus. Context concolorous with surface, in base of stipe becoming brown below pale cortex. Smell weak, fungoid or often distinctly acidulous, resembling *Pelargonium* leaves. Taste weak, mild. Spore print rusty brown.

Spores 6.5–8.5(9.0) × 3.5–5.0(5.5) µm, av. 7.2–7.8 × 4.2–4.7 µm, Q = 1.6–1.9(2.0), Qav. = 1.7–1.8, ellipsoid-oblong to ovoid-oblong, in side-view sometimes some slightly amygdaliform, rather thick-walled, orange-brown in ammonia, with small, apical to slightly eccentric germ pore, 0.8–1.0 µm wide. Basidia 17–25 × 5.5–7.5 µm, clavate, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia 24–56 × 5.5–11(13) µm, predominantly lageniform with cylindrical, often tortuous neck, 3.0–4.5(5.0) µm broad, not or slightly broader at apex to

subcapitate, apex 3.5–6.5 µm broad, occasionally subcylindrical, hyaline. Pleurocystidia absent. Hymenophoral trama made up of cylindrical, inflated and globose elements, 4.0–27 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate cells, 21–42 × 9.0–18(24) µm, in part with brown walls. Pileocystidia absent. Stipitipellis a cutis, made up of repent, hyaline hyphae 2.0–8.0 µm broad, at apex with clusters of caulocystidia. Caulocystidia 20–37 × 5.0–13 µm, thick-set, predominantly irregularly lageniform with (3.0)3.5–5.5 µm broad neck, usually strongly swollen at apex (4.5)5.5–9.5 µm broad; also utriform, subcylindrical and clavate cystidia up to 13 µm broad; in addition numerous small globose and ellipsoid elements up to 12 × 9.0 µm. Clamp-connections present.

HABITAT & DISTR. — Saprotrophic, solitary or in groups on soil or wood-chips, on moist to dry, base-rich, sandy to clayey soils, mainly in deciduous forests, along forest edges, in parks and gardens, often amongst tall herbs, also in open places along roadsides and in grasslands. Distribution in the Netherlands insufficiently known due to confusion with related species; probably rather common in Holocene areas, rare elsewhere. May–Nov. Widespread in Europe.

Pholiotina velata is recognised by the combination of appendiculate veil, relatively small spores and rather slender and regular, lageniform, often subcapitate, cheilocystidia. *Pholiotina exannulata* has similar or slightly larger spores, and in general a darker, more reddish brown pileus. The main difference are the more variable cheilocystidia in the latter species, including many clavate and utriform cystidia. The caulocystidia in the two species do not differ significantly. See also notes on the related *Ph. nemoralis* and *Ph. mutabilis*.

Some collections in this group of four species combine characters of various species and are therefore difficult to identify. Molecular and interfertility studies may be necessary to unravel taxonomic concepts in this species complex.

10. Pholiotina exannulata (Kühn. & Watl.) Courtecuisse in Doc. mycol. 16 (61): 47. 1985. – Fig. 189.

Conocybe blattaria f. *exannulata* Kühner, Genre Galera: 153. 1935 (invalid); *Conocybe exannulata* (Kühner) Kühn. & Romagn., Fl. anal. Champ. sup.: 343. 1953 (invalid); *Pholiotina exannulata* (Kühner) Mos., Blätter-Bauchpilze, 2. Aufl.: 222. 1955 (invalid); *Conocybe exannulata* Kühn & Watl. in Notes R. bot. Gdn Edinb. 38: 334. 1980.

SEL. ICON. — Lonati in Micol. Veget. medit. 9: 121. 1994.

SEL. DESCR. & FIGS. — Kühner, Genre Galera: 153–155, Fig. 49. 1935; Lonati in Micol. Veget. medit. 9: 120–122. 1994; Watling in Notes R. bot. Gdn Edinb. 38: 334–335, Fig. 1D. 1980; Watling in Br. Fung. Fl. 3: 102, Figs. 201, 202. 1982.

VERN. NAME — Rafelig breeksteeltje.

Pileus 10–32 mm broad, conico-convex to campanulate then convex to plano-convex, with or without weak umbo, hygrophanous, when moist at centre reddish brown to rusty brown, paler orange- to ochre-brown towards the margin, translucently striate up to 1/3 to 3/4 of the radius, on drying pale ochraceous to cream-coloured, smooth or slightly rugulose at centre, near margin with small, white flocks of appendiculate veil at first, often soon disappearing. Lamellae, L = 18–30, l = (1)3–7, rather crowded to crowded, adnexed, pale ochre at first, then dark ochre-brown to rusty brown with pale, flocculose edge. Stipe 20–45(50) × 1–3 mm, cylindrical or slightly broader at base, fistulose, whitish at first then ochraceous, gradually turning brown from base upwards under a silky white striation, at apex remaining pale, flocculose, usually without veil, sometimes with a few patches of thin, submembranaceous veil. Context concolorous with surface, in stipe becoming brown below whitish cortex. Smell weak, not distinctive. Taste mild. Spore print rusty brown.

Spores 6.5–9.5 × 3.5–5.0(5.5) µm, av. 7.5–8.3 × 4.2–4.6 µm, Q = 1.7–2.0, Qav. = 1.8–1.85, ellipsoid-oblong, ovoid-oblong to subamygdaliform in side-view, not broader in frontal view, brownish orange to yellow-brown in ammonia, slightly thick-walled with small germ pore, 1–1.2 µm wide. Basidia 18–25 × 6.5–8.0 µm, clavate, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia 20–45 × (5.0)7.0–10 µm, predominantly lageniform with rather short neck, 3.0–5.0 µm broad, often subcapitate, apex 3.5–6.5 µm broad, in addition utriform, subcylindrical and clavate cells, 8.0–17 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 4.0–23 µm broad. Pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate cells, 11–40 × 8.0–24 µm, some slightly thick-walled with brown parietal pigment. Pileocystidia absent. Stipitipellis a cutis of repent, cylindrical, hyaline hyphae, 2.0–6.0 µm broad, at apex with solitary and clustered caulocystidia. Caulocystidia 20.5–37.5 × 5.5–9.5 µm, versiform similar to cheilocystidia, predominantly thick-set, lageniform, utriform and clavate cells intermixed; the lageniform cystidia with neck 3.0–5.5 µm broad, usually broader towards apex or subcapitate, at apex 3.5–7.5 µm broad; in addition small globose to ellipsoid cells, up to 13 × 10 µm. Clamp-connections present.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on moist to dry, humus-rich and clayey soils rich in minerals, often amongst tall herbs (e.g., *Urtica dioica*) in frondose forests, parks, and gardens. Distribution in the Netherlands insufficiently known due to confusion with related species; probably rare, mainly in Holocene areas. Aug.–Oct. Widespread in west and central Europe.

Pholiotina exannulata is very close to *Ph. velata*. The differences between the two species are subtle. Spores tend to be slightly larger in *Ph. exannulata* but there is a large overlap. The pileus of young basidiocarps in that species is often darker than in *Ph. velata*. The only reliable difference seems to be the larger variation in shape of cheilocystidia in *Ph. exannulata*, comprising besides lageniform cystidia also

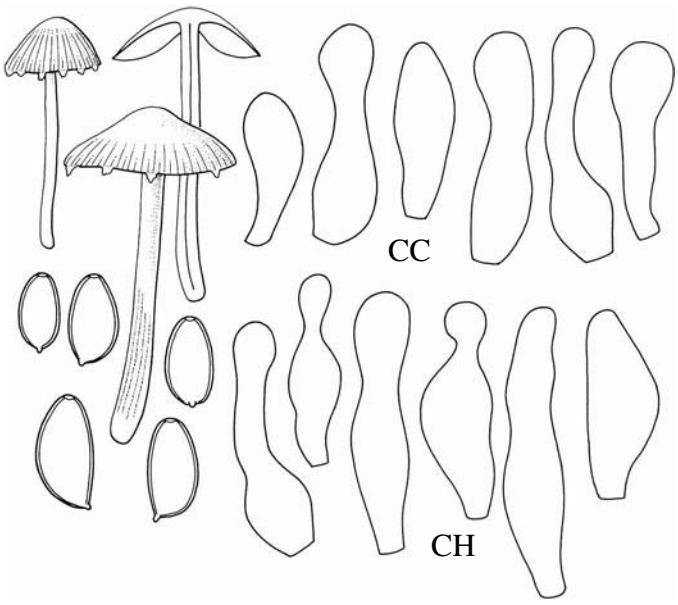


Fig. 189. *Pholiotina exannulata*

utriform and clavate cells. The cheilocystidia in *Ph. velata* are only lageniform. This difference is more or less comparable with the species pair *Ph. arrhenii–Ph. hadrocystis*. It is questionable whether it warrants a distinction on species level. See also notes on *Ph. mutabilis*.

11. Pholiotina nemoralis (Harmaja) M. Bon in Doc. mycol. 21(83): 38. 1991. – Fig. 190.

Conocybe nemoralis Harmaja in Beih. Sydowia 8: 182. 1979. – *Conocybe dentatomarginata* Watling in Notes R. bot. Gdn Edinb. 38: 333. 1980; *Pholiotina dentatomarginata* (Watling) Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 142. 1986. — *Conocybe appendiculata* f. *macrospora* Kühner, Genre Galera: 149. 1935 (invalid).

MISAPPL. — *Pholiotina appendiculata* sensu Dähncke, 1200 Pilze: 584. 1993.

SEL. ICON. — Dähncke, 1200 Pilze: 584. 1993 (as *Ph. appendiculata*).

SEL. DESCR. & FIGS. — Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 142–144. 1986 (as *Ph. dentatomarginata*); Kühner, Genre Galera: 149, Fig. 46M. 1935 (as *C. appendiculata* f. *macrospora*); Watling in Notes R. bot. Gdn Edinb. 38: 333–334, Fig. 1C. 1980 (as *C. dentatomarginata*); Watling in Br. Fung. Fl. 3: 101–102, Figs. 217, 218. 1982 (as *C. dentatomarginata*); Zschieschang in Z. Mykol. 56: 14–15, Figs. 9–13. 1990 (as *C. dentatomarginata*).

VERN. NAME — Pelargoniumbreeksteeltje.

Pileus 7–25 mm broad, conico-convex to campanulate then plano-convex to almost applanate, often umbonate, hygrophanous, when moist and young red-brown, soon rusty brown, ochre-brown to yellow-brown, slightly paler towards the margin, translucently striate up to three-fourths of the radius, on drying pale ochraceous to cream-coloured, smooth; margin first dentate with small or very small, fugacious triangular flocks of white to yellowish appendiculate veil, in age often without veil. Lamellae, L = 19–25, l = 3, rather crowded, adnate to adnexed, ventricose, yellow-brown to orange-brown, with white flocculose edge. Stipe 23–60 × 1–2.5(4) mm, cylindrical, whitish at first, soon ochre-yellow, becoming red-brown from the base upwards below fugacious silky, white fibrils, at apex white pruinose, without veil remains. Context concolorous. Smell usually rather strong, acidulous, resembling Pelargonium leaves, sometimes weak and not distinctive. Taste not distinctive. Spore print orange-brown.

Spores (7.5)8.5–11.5(12) × 4.5–6.0(6.5) µm, av. (8.5)9.0–10.6 × (4.8)5.0–5.7 µm, Q = 1.6–2.0(2.1), Qav. = 1.7–1.95, ellipsoid-oblong to subamygdaliform in side-view, not broader in face-view, brownish orange in ammonia, fairly thick-walled with distinct germ pore, 1.2–2.0 µm wide. Basidia 17–28 × 7.5–10 µm, clavate, 4-spored. Lamella edge sterile, cheilocystidia (20)28–55(60) × (5.0)6.5–12 µm, predominantly lageniform with long cylindrical neck 3.0–5.0(6.0) µm broad, often in part subcapitate, with up to 6.5 µm broad apex, occasionally in addition some clavate or spheropedunculate elements, 15–20 × 10–13 µm. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and inflated to globose elements, 4.0–27 µm broad. Pileipellis an epithelioid hymeniderm, made up of densely packed clavate and spheropedunculate cells, 22–53 × 11–25 µm, in part with thickened, brown walls. Pileocystidia absent. Stipitipellis a cutis of thin, hyaline hyphae, 2.0–5.0 µm broad, at apex with clusters of caulocystidia. Caulocystidia 35–67 × 7.0–15 µm, similar to cheilocystidia, predominantly lageniform, often larger and more irregular with neck 4.0–6.0 µm broad, occasionally subcapitate, at apex up to 8.5 µm broad, intermixed with numerous ovate to clavate cells, 12–32 × 7–14 µm. Clamp-connections present.

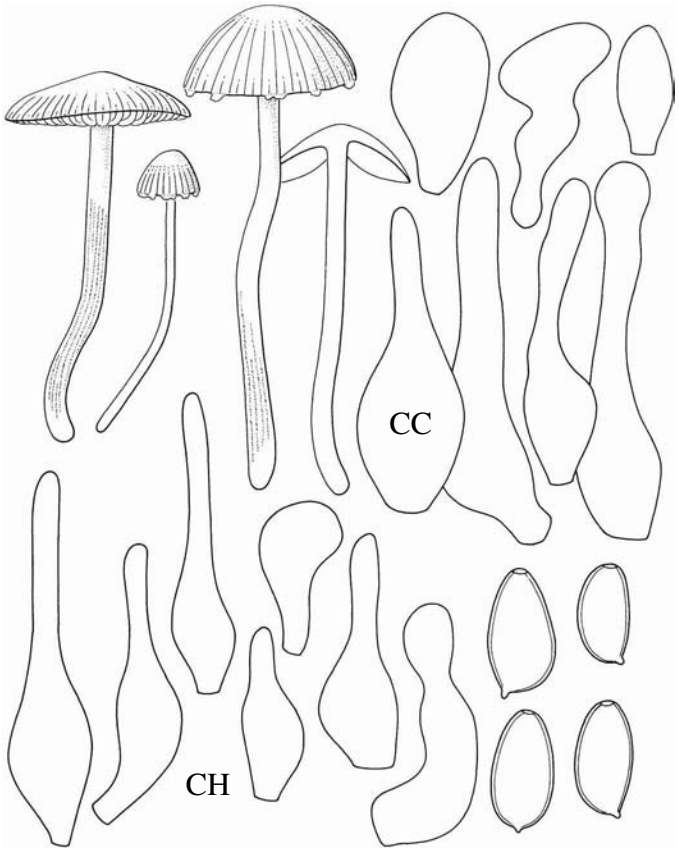


Fig. 190. *Pholiotina nemoralis*

HABITAT & DISTR. — Saprotrophic on humus and soil, solitary or in small groups, in deciduous forests, grasslands, lawns and ruderal places on eutrophic, subneutral, often calcareous sand and clay, occasionally peat. In the Netherlands probably rather common, mainly in Holocene areas, but distribution insufficiently known due to confusion with related taxa. (June) Aug.–Nov. Widespread in Europe, but distribution insufficiently known.

Pholiotina nemoralis has been distinguished only since 1980, usually under the name *Ph. dentatomarginata*. Before it was often recorded as *Ph. velata* (= *Ph. appendiculata*). It is impossible to distinguish *Ph. nemoralis* in the field from the latter species and from *Ph. exannulata* and *Ph. mutabilis* as well. The *Pelargonium*-like smell of basidiocarps is often mentioned as a distinctive character for *Ph. nemoralis*, but this smell is sometimes absent, whereas it is present in many collections of the other species in the *Ph. velata* group. Microscopically, *Ph. nemoralis* is usually well characterised by relatively large spores and predominantly slender, lageniform cystidia with cylindrical necks. However, some collections were found with spore size intermediate between *Ph. nemoralis* and *Ph. velata*. Other collections possess a few broadly lageniform to utriform cystidia and are more or less intermediate with *Ph. mutabilis*. The species concepts in this group need to be more thoroughly studied (see also notes on *Ph. velata*).

According to Hausknecht (in letter) the type collection of *Conocybe nemoralis* fits into the variability of *Ph. dentatomarginata*. This synonymy is accepted here, and consequently the name *C. nemoralis* is used here, since it has priority.

12. Pholiotina mutabilis (Watling) M. Bon in Doc. mycol. 21 (83): 38. 1991. – Fig. 191.

Conocybe mutabilis Watling in Notes R. bot. Gdn Edinb. 40: 556. 1983. – *Conocybe blattaria* f. *exannulata* 'forme par les spores plus grandes' Kühner, Genre Galera: 155. 1935 (invalid).

SEL. ICON. — Enderle in Beitr. Kenntn. Pilze Mitteleur. 12: 81A (lower Fig.). 1999; Hübner in Z. Mykol. 63: pl. 16. 1997.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 63: 25–30, Figs. 15–18. 1997; Enderle in Beitr. Kenntn. Pilze Mitteleur. 12: 82–83, Figs. 1999; Stridvall in Göteborgs Svampekl. Årsskr. 1981: 118–119, Fig. 12. 1981 (as *Ph. exannulata* aff.); Watling in Notes R. bot. Gdn Edinb. 40: 556. 1983.

VERN. NAME — Kerkhofbreeksteeltje**.**

Pileus 10–45 mm broad, convex or conico-convex, first with involute margin then expanding, often with broad umbo, hygrophanous, when moist at centre reddish brown to brown e.g., (Mu. 7.5 YR 4/6, 10 YR 4/6; K. & W. 7E7), sometimes yellow-brown, to the margin orangey to yellowish brown (5D6), not or weakly translucent-striate up to halfway the radius, on drying pale ochraceous orange at centre (10 YR 6/8, 7/8), pale ochre-yellow at margin, at margin first with small, fugacious, appendiculate flocks of white veil. Lamellae, L = 20–36, l = (1)3–5(7), moderately distant to rather crowded, ventricose, up to 5 mm broad, orangey brown with pale, flocculose edge. Stipe 20–52 × 2–7 mm, subcylindrical, sometimes slightly thickened at base, fistulose, first white, apex flocculose, downwards fibrillose striate, gradually darkening with age to yellow-brown or blackish brown from the base upwards, often with some thin adpressed patches of white veil, rarely forming an incomplete annulus. Context in pileus up to 4 mm thick concolorous with surface, in stipe apex whitish, downwards ochre-brown to blackish brown. Smell weak to rather strong, acidulous, resembling *Pelargonium* leaves, in one collection described as iodoform-like. Taste weak, not distinctive or somewhat raphanaceous. Spore print rusty brown.

Spores (7.5)8.0–12(14) × (4.5)5.0–6.0(6.5) µm, av. 9.0–10.4 × 5.0–5.6 µm, Q = 1.6–2.1, Qav. = 1.7–1.9, predominantly ellipsoid- to ovoid-oblong, occasionally some subamygdaliform in side-view, not broader in face-view, smooth, slightly thick-walled with small germ pore, 1.0–1.3 µm wide, yellow-brown in ammonia. Basidia 21–27 × 7.5–9.0 µm, 4-spored. Lamella edge sterile. Cheilocystidia 22–63 × 6.5–14(17) µm, variable, many lageniform, often with broad, subcapitate neck (3.5–7.5 µm), also utriform, subcylindrical and clavate, relatively few narrowly lageniform with narrow, cylindrical neck. Pleurocystidia absent. Hymenophoral trama made up of hyaline hyphae with cylindrical to globose elements, 6.0–25 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate cells, 18–53 × 9.0–25 µm, with hyaline or pale yellow walls. Pileocystidia absent. Stipitipellis a cutis, made up of repent, hyaline hyphae, 2.0–6.0 µm broad, at apex with clusters of caulocystidia. Caulocystidia 20–35 × 5.5–10 µm, similar to cheilocystidia, thick-set, lageniform, subcylindrical, utriform and clavate intermixed; lageniform cystidia with neck 4.5–6.0 µm broad, often broader to apex or subcapitate, up to 7.5 µm broad; in addition small ellipsoid to globose elements, 6.0–12 × 6.0–11 µm. Clamp-connections frequent.

HABITAT & DISTR. — Saprotrophic, solitary, in small groups or subgregarious on soil or wood-chips, on moist to dry, weakly acidic to basic loamy and clayey soils rich in minerals, often in disturbed places along forest edges, in gardens, parks and churchyards. Distribution in the Netherlands insufficiently known due to confusion with related species, probably rare and mainly in Holocene areas. April–Nov. Also recorded from Great Britain, Germany, France and Sweden.

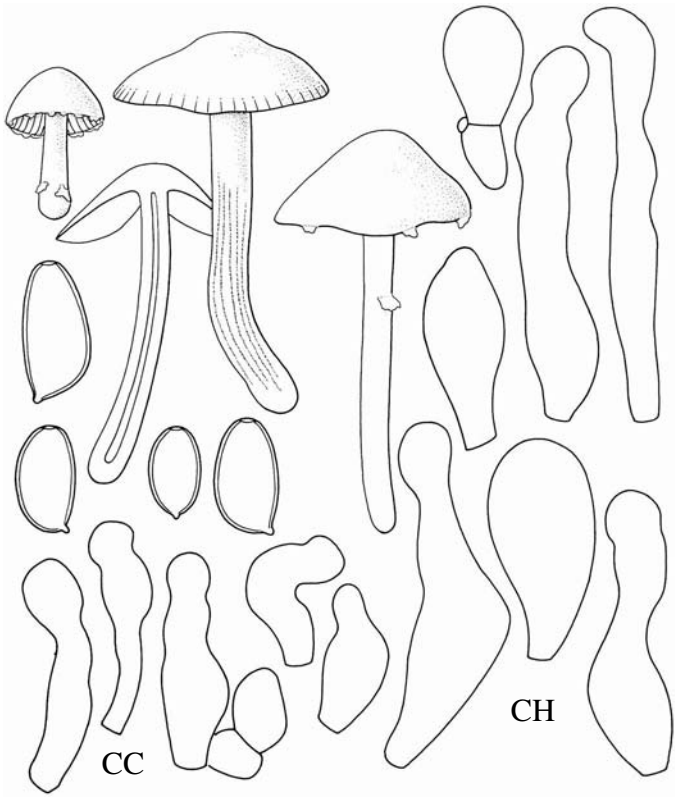


Fig. 191. *Pholiotina mutabilis*

Pholiotina mutabilis was initially regarded as a form of *Ph. exannulata* with slightly larger spores (Kühner, Genre Galera: 155. 1935), and some authors still treat it as a synonym (e.g., Meusers in Österr. Z. Pilzk. 5: 250. 1996). Following Watling and Enderle, this taxon is accepted as a distinct species, different in considerably larger spores. It may be more problematic to separate *Ph. mutabilis* from *Ph. nemoralis*, which has similar spores. The main difference is the much more variable, more thick-set shape of cheilocystidia in *Ph. mutabilis*. In addition, this species has in general a darker, more reddish brown pileus. The spores in *Ph. nemoralis* tend to be stronger amygdaliform than in *Ph. mutabilis*. However, some collections are difficult to identify. Among the species in sect. *Vestitae*, *Ph. mutabilis* seems to be the one in which the partial veil is relatively often leaving traces on the stipe, but never forming a distinct annulus as in sect. *Pholiotina*.

Subsect. **Verrucisporae** (Sing.) Arnolds

Spores minutely verrucose, occasionally only visible as observed with scanning electron microscope.

13. Pholiotina utriformis (P.D. Orton) M. Bon in Doc. mycol. 21 (83): 39. 1991. – Fig. 192.

Conocybe utriformis P.D. Orton in Trans. Br. mycol. Soc. 43:196. 1960. — *Conocybe subnuda* Kühner, Genre Galera: 140. 1935 (invalid); *Conocybe subnuda* Kühn. & Watl. in Watling in Notes R. bot. Gdn. Edinb. 40: 553. 1983; *Pholiotina subnuda* (Kühn. & Watl.) M. Bon in Doc. mycol. 21 (83): 39. 1991. — *Conocybe subverrucispora* Veselský & Watling in Česká Mykol. 26: 201. 1972; *Pholiotina subverrucispora* (Veselský & Watling) Mos., Röhrlinge Blätterpilze, 4. Aufl.: 283. 1978.

SEL. ICON. — Enderle in Z. Mykol. 51: pl. 16A. 1985; Zuccherelli in Boll. Gruppo micol. G. Bres. 36: 53. 1993 (as *C. subnuda*).

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 51: 13–15. 1985; A. Hauskn. in Österr. Z. Pilzk. 2: 33–39, Figs. 1–9. 1993 (as *Ph. subnuda*); Kühner, Genre Galera: 140–143, Fig. 33. 1935 (as *C. subnuda*); P.D. Orton in Trans. Br. mycol. Soc. 43: 196–197, Figs. 377, 401. 1960; Veselský & Watling in Česká Mykol. 26: 201–209, Figs. 1–6. 1972 (as *C. subverrucispora*); Watling in Br. Fung. Fl. 3: 89–90. 1982.

VERN. NAME — Vlokkig breeksteeltje.

Pileus 10–25(40) mm broad, convex to plano-convex, then applanate, sometimes with reflexed margin, hygrophanous, when moist rusty brown, dull orange-brown to yellow-brown (e.g., K. & W. 6 D5, 5–6 D4), slightly paler towards margin, translucently striate to three-fourths of radius, subviscid to dry, drying pale yellow to whitish; in young basidiocarps margin with some white fibrils or small flocks of poorly developed veil, vanishing completely on expanding. Lamellae, L = 18–28, l = 1–3, moderately crowded to crowded, narrowly adnate, ventricose, yellow-brown to rusty brown with white floccose edge. Stipe 25–70 × 1–3 mm, cylindrical or with subbulbous base, fistulose, whitish to pale yellow (4 A2–4) at first, then from the base becoming yellow-brown to rusty brown, first entirely pruinose then only at apex. Context thin, concolorous with surface. Smell weak, not distinctive. Taste mild, not distinctive.

Spores 6.5–10.5(11.5) × (4.0)4.5–5.5 µm, av. 7.5–9.8 × 4.7–5.4 µm, Q = (1.4)1.5–2.1(2.2), Qav. = 1.55–1.85, ellipsoid-oblong, some ellipsoid, ovoid-oblong or occasionally weakly phaseoliform or subamygdaliform, not flattened, under oil immersion at least in part minutely punctate, with small, central germ pore 1.0–1.3 µm wide or with callus, yellow-brown in ammonia. Basidia 17–27 × 7.0–9.0 µm, 4–spored. Lamella edge sterile. Cheilocystidia (13)17–41 × 4.5–8.5 µm, predominantly utriform, but also clavate or subcylindrical, sometimes septate, with 3.0–7.0 µm broad base, hyaline, thin-walled. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 3.0–20 µm broad. Pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate cells, 10–23 µm wide. Pileocystidia not seen, but according to Hausknecht (in Österr. Z. Pilzk. 2: 33. 1993) occasionally present, similar to cheilocystidia. Stipitipellis a cutis of cylindrical hyphae, 3.0–7.0 µm wide, with clusters of caulocystidia. Caulocystidia 23–41(60) × 6.0–11 µm, similar to cheilocystidia, but more irregular, sometimes branched and usually more thick-set. Clamp-connections numerous. Chemical reactions: No crystals formed on fragments of lamellae in ammonia.

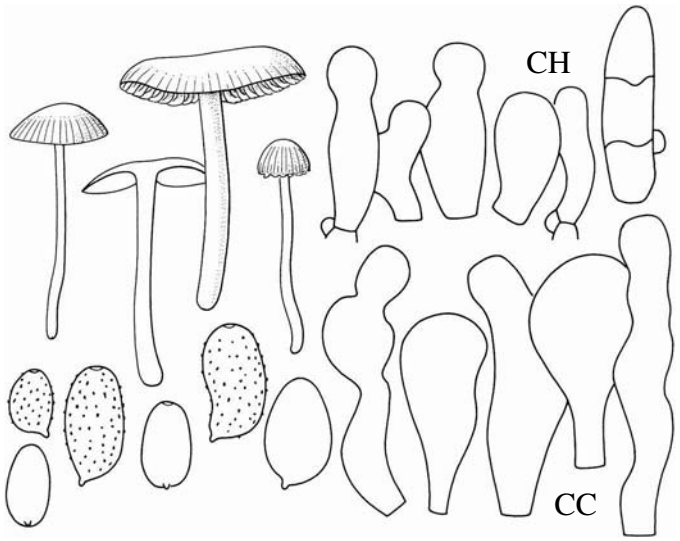


Fig. 192. *Pholiotina utriformis*

HABITAT & DISTR. — Saprotrophic, usually in small groups on humus, litter and twigs in deciduous forests, *Salix* scrub and grassy places, often in young or disturbed habitats, on wet to dry, eutrophic, usually calcareous, clayey and sandy soils. In the Netherlands rather rare, mainly in Holocene areas. July–Oct. Widespread in Europe and North Africa, also recorded from Mexico.

Pholiotina utriformis is unique within the genus *Pholiotina* by its ornamented spores. However, the ornamentation is visible only under oil-immersion with a good quality microscope. Hausknecht (in Österr. Z. Pilzk. 2: 33–39. 1993) demonstrated convincingly that *Ph. subnuda* and *Ph. subverrucispora* are synonyms of *Ph. utriformis*.

Pholiotina utriformis is quite variable in many characters, such as size of basidiocarps and spores, visibility of germ pore, and size and shape of cheilocystidia. It is usually found in the field without any veil remnants, although a veil is present in young basidiocarps. These features may hamper a correct identification. Clamp-connections were found to be numerous and distinct in all collections studied, as observed also by Kühner (Genre Galera: 142. 1935) and Hausknecht (in Österr. Z. Pilzk. 2: 36. 1993). It is remarkable that Watling (in Br. Fung. Fl. 3: 90. 1982) and Bon (in Doc. mycol. 21[84]: 77. 1992) reported that clamp-connections are absent in this species.

Subsect. **Intermediae** (Watling) Arnolds

Veil present, leaving small flocks along margin of pileus. Cheilocysidia lageniform to almost lecythiform, gradually tapering into a thin neck, with a globose capitulum. Pileocystidia absent or scarce and indistinct.

14. Pholiotina brunnea (Watling) Sing. in Beih. Sydowia 7: 79. 1973. – Fig. 193.

Conocybe intermedia var. *brunnea* J. Lange & Kühner in Kühner, Genre Galera: 143. 1935 (invalid); *Galera brunnea* (J. Lange & Kühner) J. Lange in Dansk bot. Ark. 9 (6): 39. 1938 (invalid); *Conocybe brunnea* Watling in Persoonia 6: 319. 1971.

SEL. ICON. — Bender in Z. Mykol. 62: pl. 7. 1996; Courtec. & Duhem, Guide Champ. Fr. Eur.: pl. 1318. 1994; Cetto, Funghi Vero 6: pl. 2229. 1989; J. Lange, Fl. agar. dan. 4: pl. 129E. 1939.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 57: 98–99, Figs. 1991; Joss. in Bull. trimest. Soc. mycol. Fr. 90: 252–254, Fig. 11. 1974; Krieglst. in Z. Mykol. 51: 116. 1985; Kühner, Genre Galera: 143–146, Fig. 45. 1935; Watling in Persoonia 6: 318–325, Figs. 8–12, 17–19. 1971; Watling in Br. Fung. Fl. 3: 98–99, Figs. 195–197. 1982.

VERN. NAME — Getand breeksteeltje.

Pileus 10–20(23) mm broad, obtusely conical to convex then plano-convex to flattened, with or without umbo, hygrophanous, when moist first rather dark brown, reddish brown or orange-brown (e.g., Mu. 7.5 YR 4/4, 4/6; K. & W. 6E8), with slightly paler margin, then orange- to ochre-brown, translucently striate up to 3/4 of the radius, on drying fading to ochraceous; margin with small, adhering or appendiculate, fugacious flocks of cream to ochre-yellow veil, often disappearing in age. Lamellae, L = 17–26, l = 3(7), rather crowded to moderately distant, adnate to adnexed, ventricose, ochre- to rusty brown, with

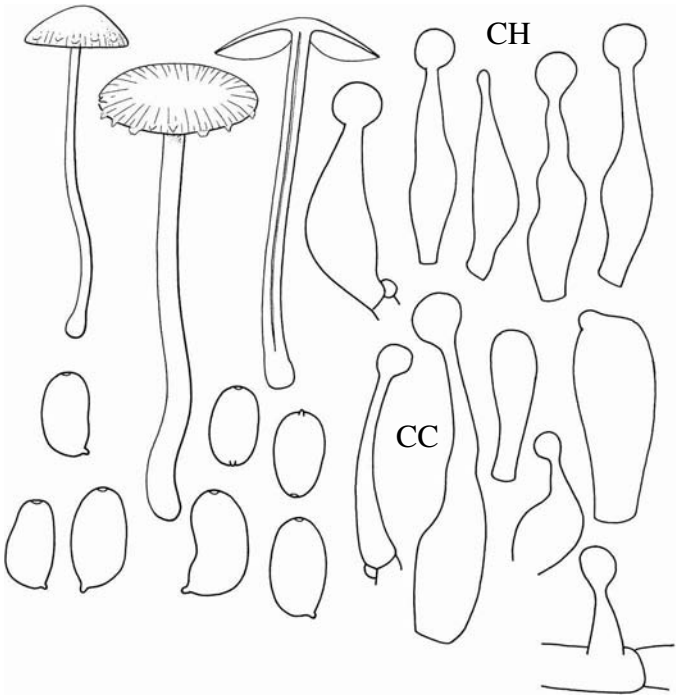


Fig. 193. *Pholiotina brunnea*

slightly flocculose, concolorous or whitish edge. Stipe 25–50 × 1–2.5 mm, cylindrical or subbulbous at base, solid or narrowly fistulose, first pale ochre or honey-yellow, gradually becoming dark red-brown in lower half, slightly striate lengthwise, pruinose at apex, without remnants of veil. Context concolorous. Smell weak, not distinctive. Taste mild. Spore print orange-brown.

Spores 6.5–8.0 × 3.5–5.0 µm, av. 7.1–7.4 × 4.1–4.5 µm, Q = 1.6–1.8, Qav. = 1.65–1.75, ellipsoid-oblong, in side-view usually (but not always) a minor to major proportion phaseoliform, yellow-brown in water, brownish orange in ammonia, thin-walled with small, sometimes indistinct germ pore, 0.5–1.0 µm wide. Basidia 17–25 × 6–8 µm, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia 25–37(45) × 5.0–8.0(10) µm, lageniform to almost lecythiform, to the apex gradually passing into a long tapering neck, up to 10 µm long and 1.5–2.5 µm wide near apex, usually with globose or ellipsoid capitulum, 4.0–6.0 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated, sometimes globose elements, 2.0–16 µm broad, often with brown walls. Pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate cells, 33–60 × 12–28 µm; basal part with slightly thickened, orange-brown wall. Pileocystidia absent. Stipitipellis a cutis of repent, pale brown hyphae, 2.0–5.0 µm broad, with clusters of cystidia. Caulocystidia at stipe apex in part cheilocystidioid, skittle-shaped, 20–51 × 3.0–6.5 µm, with long tapering neck and globose capitulum, 3.0–5.5 µm broad; also cylindrical to clavate, 18–26 × 6.0–9.5 µm and numerous small globose elements, 6.0–12 × 5.0–12 µm; in addition hyphae of stipitipellis with scattered, stalked capituli without cystidial body. Clamp-connections present.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, on soil and humus, in deciduous forests on neutral to basic, eutrophic, sandy and clayey, often calcareous soils, often along paths and roadsides. Rather rare in the Netherlands, mainly in holocene areas and in southern Limburg. July–Oct. Widespread in Europe but uncommon, also reported from North America.

In the field *Pholiotina brunnea* might be confused with *Ph. velata* and related taxa. Under the microscope it is easily recognised by the characteristic, sublecythiform cheilocystidia and usually the presence of some phaseoliform spores. The shape of the cystidia is intermediate between *Pholiotina* and *Conocybe*, but the presence of a veil makes it a typical *Pholiotina*.

Pholiotina intermedia (A.H. Smith) Sing. from North America may be different in paler, ochraceous lamellae and the veil often leaving an annulus on the stipe. According to Watling (in Persoonia 6: 318. 1971) it is closely related to or possibly identical with *Ph. brunnea*.

Sect. **Piliferae** (Kühner) Sing.

Basidiocarps without veil. Cheilocystidia lageniform, subcylindrical or utriform without well-delimitated capitulum. Pileocystidia usually present and well-developed.

Subsect. **Piliferinae**

Basidiocarps without blue or green colours.

15. Pholiotina pygmaeoaffinis (Fr.) Sing. in Trudy bot. Inst. Akad. Nauk SSSR 2(6): 435. 1950. – Fig. 194.

Agaricus pygmaeoaffinis Fr., Monogr. Hymenomyc. Sueciae 1: 389. 1857; *Conocybe pygmaeoaffinis* (Fr.) Kühner, Genre Galera: 135. 1935. — *Conocybe friesii* Lundell in Lund. & Nannf. in Fungi exs. suec. 41–42: 29. 1953; *Pholiotina friesii* (Lundell) Enderle in Z. Mykol. 60: 46. 1994.

EXCL. — *Galera pygmaeoaffinis* sensu Rick., Blätterpilze: 225. 1915 (= *Conocybe silignea* f. *rickenii*); sensu Kühner, Genre Galera: 133. 1935 ('description personelle') (= *Ph. striipes*); sensu J. Lange, Fl. agar. dan. 4: 37. 1939 (= *Ph. striipes*).

SEL. ICON. — Mos. & Jül., Farbatl. Basidiomyc. III Pholiotina 5 (lower Fig.). 1995.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 57: 100–104, Figs. 1991; Enderle in Z. Mykol. 60: 46. 1994 (as *Ph. friesii*); Lundell in Lund. & Nannf. in Fungi exs. suec. 41–42: 29. 1953 (as *C. friesii*); Watling in Br. Fung. Fl. 3: 88–89, Figs. 189, 190. 1982.

VERN. NAME — Gedrongen breeksteeltje.

Pileus 15–55 mm broad, campanulate to conico-convex at first then plano-convex to applanate, often with umbo, hygrophanous, when moist pale ochre to ochraceous brown (e.g., K. & W. 5C5, Mu. 7.5 YR 5/4), often with greyish tinge at centre, not or weakly translucent-striate up to one-fourth of radius, on drying pale ochraceous, often at centre with orange tinge; surface smooth or rugulose near centre, dry, without veil. Lamellae, L = 34–45, l = 3–7, moderately distant to crowded, adnexed, slightly ventricose, up to 7 mm broad, pale ochraceous then warm ochre-brown to orange-brown (e.g., 5C6; 7.5 YR 5–6/8) with flocculose, white edge. Stipe 25–75 × 2.5–7 mm, cylindrical or slightly swollen towards base, fistulose, white, entirely pruinose, often pruinose-striate lenghtwise, without any remains of veil. Context concolorous with surface, inside stipe often pale orange. Smell weak, fungoid to acidulous, resembling Pelargonium leaves. Taste mild, not distinctive. Spore print rusty brown.

Spores 7.5–10.5 × 4.5–6.0 µm, av. 8.8–9.6 × 4.7–5.4 µm, Q = 1.6–2.1, Qav. = 1.7–1.85, ellipsoid-oblong to amygdaliform in side-view, not flattened, thin-walled, pale brownish orange (6C7) in ammonia, with distinct apical germ pore, 0.7–1.2 µm wide. Basidia 18–25 × 6.5–9.0 µm, 4-spored, occasionally a few 2-spored. Lamella edge ster-

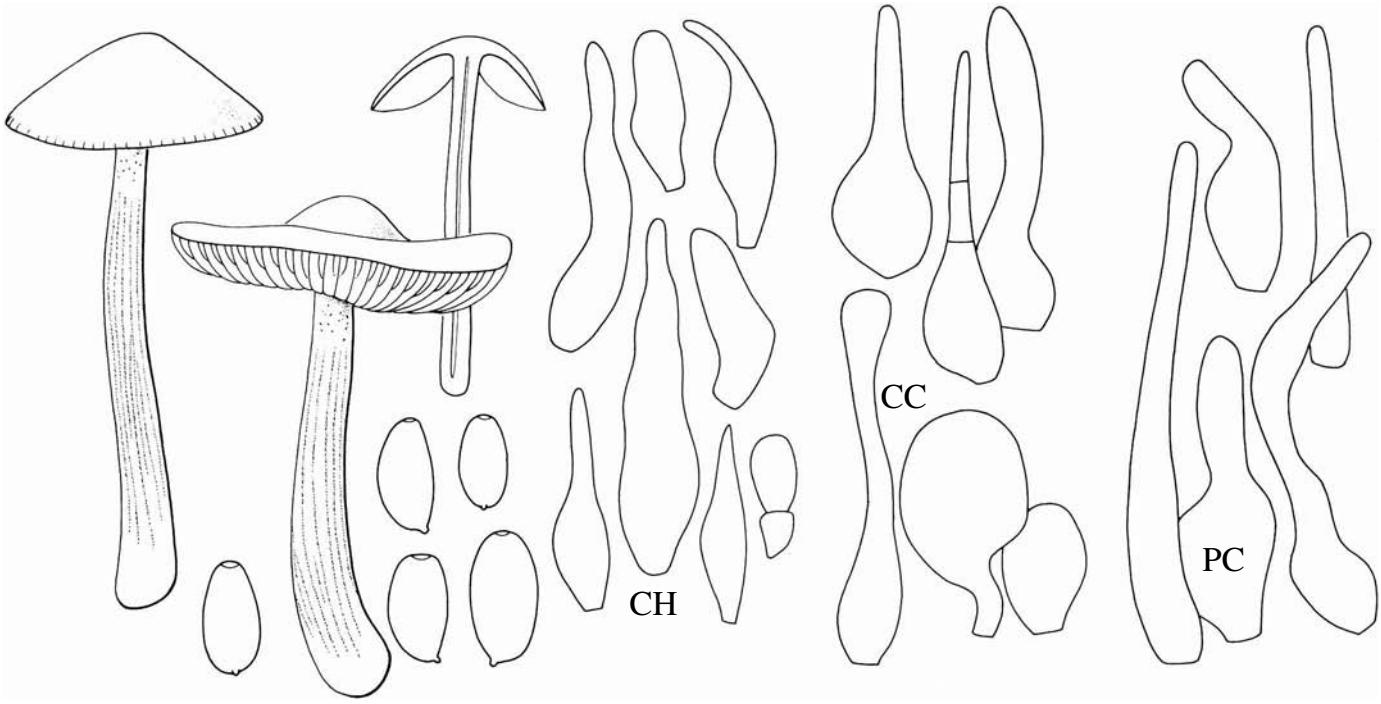


Fig. 194. *Pholiotina pygmaeoaffinis*

ile. Cheilocystidia 22.5–50(70) × (5.0)6.0–11 µm, predominantly lanceolate to lageniform, gradually tapering into a pointed to obtuse apex, 1.5–4.0 µm wide, intermixed with utriform, clavate and spheropedunculate cells, 9.0–25 × 5.0–17 µm. Pleurocystidia absent. Hymenophoral trama made up of cylindrical, inflated and globose elements, 4.0–30 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate cells, 14–47 × 9.0–25 µm, with hyaline, sometimes slightly thickened walls, intermixed with numerous pileocystidia. Pileocystidia 33–75(90) × 5.0–14 µm, similar to cheilocystidia, lageniform, lageniform or subuliform, gradually tapering into an acute to obtuse apex, near apex 3.0–6.5 µm broad, occasionally slightly thick-walled or with refractive content. Stipitipellis a cutis made up of slender, hyaline hyphae 2–6 µm broad. Caulocystidia in part similar to cheilocystidia, lageniform to lanceolate, 25–48 × 6.0–13 µm, tapering into an acute to obtuse neck, 2.5–4.0(5.5) µm broad, sometimes subcapitate with up to 6.5 µm wide apex, occasionally septate, mixed with numerous globose to clavate cells, 12–32 × 8.5–17 µm. Clamp-connections absent.

HABITAT & DISTR. — Saprotrophic, solitary or in small groups on soil in grasslands, grassy roadsides, lawns and on dikes, more rarely in parks and woodland, on eutrophic, subneutral to basic soils, by preference on clay, also on calcareous sand. Rather rare in the Netherlands, mainly in Holocene areas. Sept.–Nov. Widespread in Europe but often confused with *Ph. striipes*.

Pholiotina pygmaeoaffinis can be recognised in the field by relatively stout basidiocarps with pale pileus and white, pruinose, striate stipe. However, it can usually not be distinguished from *Ph. striipes* on macroscopic characters only. See notes on that species.

Lundell (in Lundell & Nannfelt in Fungi exs. suec. 41–42: 29. 1953) rejected the epithet *pygmaeoaffinis* and introduced the new name, *Conocybe friesii,* in view of some misapplications of *pygmaeoaffinis* in the past. This name has been accepted by several modern authors. However, at the same time Lundell stressed that his *C. friesii* is the true *Agaricus pygmaeoaffinis* Fr. Consequently, *C. friesii* is a superfluous, illegitimate name.

16. Pholiotina striipes (Cooke) Mos., Röhrlinge Blätterpilze, 3. Aufl.: 230. 1967. – Fig. 195.

Agaricus striipes Cooke in Grevillea 13: 60. 1885; *Conocybe striipes* (Cooke) Lundell in Lund. & Nannf. in Fungi exs. suec. 41–42: 30. 1953.

MISAPPL. — *Galera pygmaeoaffinis* sensu J. Lange, Fl. agar. dan. 4: 37. 1939; *Conocybe pygmaeoaffinis* sensu Breitenb. & Kränzl., Pilze Schweiz 4: 316. 1995; sensu Kühner, Genre Galera: 133. 1935 (description personelle).

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 402. 1995 (as *C. pygmaeoaffinis*); Cooke, Ill. Brit. Fungi 4: pl. 478 (502). 1885; Enderle in Z. Mykol. 50: 48a (lower Fig.). 1984; Gerhardt, Grote Paddestoelengids: 387 (centre). 1999; J. Lange, Fl. agar. dan. 4: pl. 130F. 1939 (as *G. pygmaeoaffinis*); Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 218. 1985.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 316, Figs. A–E. 1995 (as *C. pygmaeoaffinis*); Krieglst. et al. in Z. Mykol. 50: 55–58, Figs. A–D. 1984; Lundell in Lund. & Nannf. in Fungi exs. suec. 41–42: 30. 1953; Watling in Br. Fung. Fl. 3: 89, Figs. 187, 188, 191. 1982.

VERN. NAME — Bundelbreeksteeltje.

Pileus (10)15–45 mm broad, campanulate-convex to obtusely conical, then convex to applanate, often with umbo, hygrophanous, when moist ochraceous to orangey brown or hazel-brown (e.g., Mu. 10 YR 4/6, 5/6), weakly translucent-striate up to 1/3 of radius, on drying paler ochraceous, at centre with orange tinge, smooth or radially wrinkled around centre, dry, without veil. Lamellae, L = 35–48, l = 3(7), rather crowded to crowded, adnexed, slightly ventricose, up to 6 mm broad, pale ochraceous then ochre- to orange-brown (e.g., 7.5YR5/6) with white flocculose edge. Stipe 35–75 × 2–7 mm, cylindrical, towards base

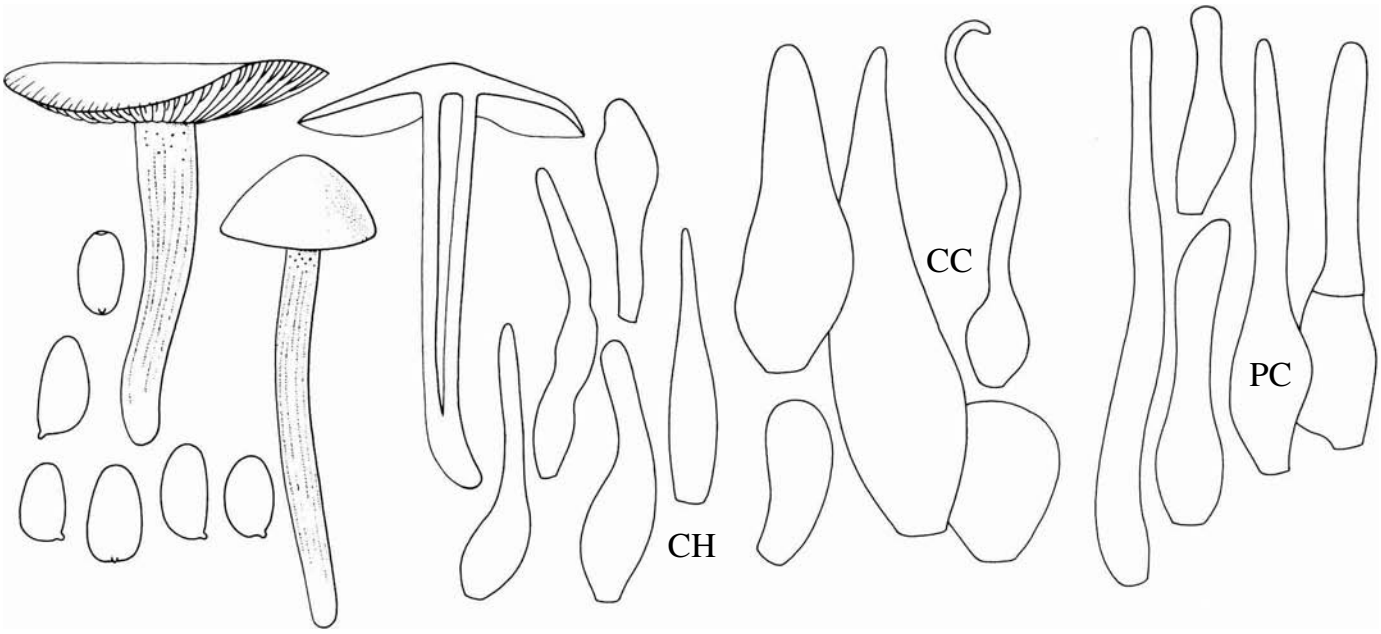


Fig. 195. *Pholiotina striipes*

occasionally slightly tapering or attenuate, fistulose, white, discolouring ochraceous when bruised, entirely pruinose-striate lengthwise, without any remains of veil. Context in pileus up to 2 mm thick, concolorous with surface. Smell weak, fungoid, sweetish to acidulous, resembling *Pelargonium* leaves. Taste mild, not distinctive. Spore print rusty brown.

Spores 6.5–8.5(9.5) × 4.0–5.0 µm, av. 7.3–7.7 × 4.3–4.7 µm, Q = 1.5–1.9, Qav. = 1.6–1.8, ellipsoid-oblong, ovoid-oblong to amygdaliform in side-view, not flattened, brownish orange in ammonia, with distinct apical germ pore, 0.8–1.0 µm wide. Basidia 15–24 × 6.5–8.0 µm, 4-spored. Lamella edge sterile. Cheilocystidia 18–47 × 5.0–9.0 µm, predominantly lanceolate to lageniform, gradually tapering into a mostly pointed, but sometimes obtuse apex, 1.5–4.0 µm wide, intermixed with utriform and spheropedunculate cells, 11–26 × 6.0–11 µm. Pleurocystidia absent. Hymenophoral trama made up of cylindrical, inflated and globose elements, 4.0–34 µm broad. Pileipellis an epithelioid hymeniderm, made up of clavate and spheropedunculate cells, 12–37 × 9.0–20 µm, with hyaline walls, intermixed with numerous pileocystidia. Pileocystidia 32–121 × 6.5–10.5 µm, similar to cheilocystidia but often much longer, also subcylindrical, gradually tapering into an acute to obtuse apex, near apex 2.5–5.5 µm broad, occasionally septate or furcate. Stipitipellis a cutis, made up of thin, repent hyaline hyphae, 2.0–7.0 µm broad, near apex with abundant caulocystidia. Caulocystidia 35–65 × 9.0–17 µm, predominantly with same shape as cheilocystidia, lageniform or lanceolate, but often larger and more thick-set, tapering into an acute to obtuse apex, (2.0)3.0–8.5 µm broad, sometimes utriform, in addition with globose and clavate cells up to 25 × 16 µm. Clamp-connections absent. Chemical reactions: No crystals formed on fragments of lamellae in ammonia.

HABITAT & DISTR. — Saprotrophic, solitary, gregarious or rather often fasciculate on soil in grasslands, grassy roadsides, gardens, lawns, churchyards and along dikes, also in parks and woodlands, on eutrophic, often calcareous, subneutral to basic soils, by preference on clay. Rather rare in the Netherlands, mainly in Holocene areas. (May) Sept.–Nov. Widespread in Europe but often confused with *Ph. pygmaeoaffinis*.

Pholiotina striipes and *Ph. pygmaeoaffinis* can only be distinguished on the basis of spore size. Other differences mentioned in literature, such as differently shaped cheilocystidia (more pointed in *Ph. striipes*) and pileus colour (darker in *Ph. striipes*), appear not to be correlated with spore size in the studied collections and are often variable within a single population. It is still questionable whether the difference in spore size warrants the distinction of two species. However, no intermediate collections were seen so far.

17. Pholiotina mairei (Watling) Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 113. 1986. – Fig. 196.

Conocybe mairei Kühner, Genre Galera: 131. 1935 (invalid); *Galera mairei* (Kühner) J. Lange in Dansk bot. Ark. 9: 40. 1938 (invalid); *Conocybe mairei* Watling in Watl. & Gregory in Biblthеca mycol. 82: 41. 1977.

SEL. ICON. — Enderle in Mykol. Mittbl. 35(1): 15. 1992; J. Lange, Fl. agar. dan. 4: pl. 130G. 1939; Mos. & Jül., Farbatl. Basidiomyc. III Pholiotina 5 (upper Fig.). 1995.

SEL. DESCR. & FIGS. — Einh. in Ber. bayer. bot. Ges. 44: 37. 1973; Enderle in Beitr. Kenntn. Pilze Mitteleur. 2: 113–114. 1986; Enderle in Mykol. Mittbl. 35(1): 13–16. 1992; Kühner, Genre Galera: 131–133, Fig. 41. 1935; Watling in Br. Fung. Fl. 3: 87–88, Figs. 181–183. 1982; Svrček in Česká Mykol. 20: 142–143, Fig. 2A. 1966.

VERN. NAME — Kleibreeksteeltje.

Pileus 3–10 mm broad, conico-convex at first then plano-convex, hygrophanous, when moist honey-yellow or ochre-yellow with slightly darker, brownish orange centre (K. & W. 6C6), translucently striate up to centre, drying from the centre to pale pinkish grey, surface minutely pruinose to pubescent under a hand-lens. Lamellae, L = 16–20, l = 3, moderately crowded to subdistant, adnexed to almost free, ventricose, ochraceous then orange-brown, with white, flocculose edge. Stipe 10–35 × 0.5–1 mm, cylindrical or slightly swollen at base, cream-coloured to whitish, from the base becoming pale yellow-brown, entirely pruinose to minutely pubescent. Context concolorous, in pileus

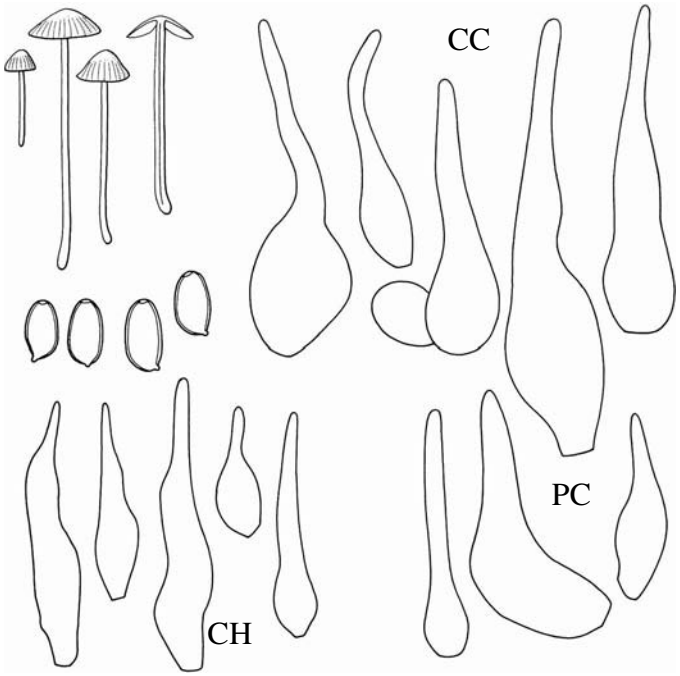


Fig. 196. *Pholiotina mairei*

very thin, less than 0.5 mm. Smell weak, not distinctive or as *Pelargonium* leaves. Taste mild, not distinctive. Spore print ochraceous to rusty brown.

Spores 6.0–8.5(9.5) × 3.5–4.5(5.5) µm, av. 6.7–7.8 × 3.6–4.3 µm, Q = 1.6–2.0, Qav. = 1.75–1.85, ellipsoid- to ovoid-oblong or subamygdaliform in side-view, not broader in face-view, thin-walled to slightly thick-walled, ochraceous in water, brownish orange in ammonia, with small but distinct, occasionally slightly eccentric germ pore, c. 1.0 µm wide. Basidia 15–20 × 6.5–7.5 µm, clavate, 4-spored. Lamella edge sterile with densely packed cheilocystidia, 17–45(60) × 5.0–8.0 µm, narrowly lageniform to lanceolate, often flexuose, gradually tapering into an acute to subacute apex, 1.4–2.5(4.0) µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and strongly inflated elements, 3.0–28 µm wide. Pileipellis an epithelioid hymeniderm, made up of pyriform and spheropedunculate cells, 14–33 × 9.0–21 µm, with hyaline or pale yellow walls. Pileocystidia scattered to numerous, similar to cheilocystidia but more variable and larger, 28–65 × 4.5–10(14) µm, tapering into a long neck with acute to obtuse apex, 1.8–4.5 µm broad. Stipitipellis a cutis, made up of repent, slender, hyaline hyphae, 2.0–7.0 µm broad. Caulocystidia numerous, scattered and in clusters, 28–56 × 5.0–12 µm, similar to cheilocystidia but often larger and with thicker neck, 1.8–3.5 µm broad. Clamp-connections absent.

HABITAT & DISTR. — Saprotrophic, solitary or gregarious on soil in parks, deciduous forests and along shady roadsides, often on bare, base-rich clay, less frequent on calcareous, humus-rich sand. In the Netherlands rather rare, mainly in Holocene areas. (June) Aug.–Nov. Widespread in Europe.

Pholiotina mairei may be recognised in the field by the very small, pale basidiocarps with pruinose-pubescent pileus and stipe. The small cheilocystidia, tapering into an acute apex, form the most important microscopic characteristic. See also notes on *Ph. parvula*.

18. Pholiotina parvula (Døssing & Watl.) M. Bon in Doc. mycol. 21 (83): 38. 1991.

Conocybe parvula Døssing & Watl. in Nord. J. Bot. 3: 264. 1983.

SEL. ICON. — Watl. & Knudsen in Svampe 4: pl. 1.2. 1981.

SEL. DESCR. & FIGS. — Watling in Nord. J. Bot. 3: 264–265. 1983; Watl. & Knudsen in Svampe 4: pl. 1.2. 1981.

CHARACTERISTICS — Pileus 4–5 mm broad, conical, not expanding, ochre-brown ('cinnamon-buff') at centre, paler ('clay-buff') towards margin, pruinose, without veil remains; lamellae adnexed, ochraceous yellow ('buff'), with whitish edge; stipe 20–25 × 0.5–1 mm, whitish or pale ochraceous ('pale cinnamon-buff'), entirely pruinose, without veil; smell and taste unknown; spore print colour unknown.

Spores 6.0–7.5 × 3.5–4.0 µm, ellipsoid or very slightly amygdaliform in side-view, not broader in face-view, brownish orange (pale sienna), slightly thick-walled with germ pore c. 1.0 µm broad; basidia 20–22 × 7.0–7.5 µm, 4-spored; cheilocystidia 46–66 × 9.0–11(15) µm, lageniform, some with rather elongated, tapering neck; pleurocystidia absent; pileipellis a hymeniderm, made up of pyriform to spheropedunculate cells 12–17.5 µm wide; pileocystidia 50–70 × 9.0–12.5 µm lageniform or cylindrical, similar to cheilocystidia.

HABITAT & DISTR. — Saprotrophic, on sandy, rich and basic soil among mosses in scrub of *Sambucus nigra* with undergrowth of tall, ruderal herbs, e.g., *Urtica dioica*. Not recorded from the Netherlands. So far only reported from the east coast of Denmark. August.

The characteristics are based on the description by Watling (in Nordic J. Bot. 3: 264–265. 1983). *Pholiotina parvula* is closely related to *Ph. mairei* and agrees in small-sized basidiocarps and small spores. However, it seems to be readily distinguished by much larger cheilocystidia. The not expanding pileus might be an additional characteristic of *Ph. parvula*.

Pholiotina galerinoides Contu (in Cryptog. Mycol. 18: 351–352, Figs. 4–6. 1997) is similar in tiny basidiocarps (pileus 2–6 mm) and small spores (5.0–7.5 × 3.5–4.5 µm), and may be a synonym of *Ph. parvula*. It was described from mountains in Sardinia, Italy.

19. Pholiotina aberrans (Kühner) Sing. in Trudy bot. Inst. Akad. Nauk SSSR 2(6): 436. 1950. – Fig. 197.

Galera aberrans Kühner in Botaniste 17: 168. 1926; *Conocybe aberrans* (Kühner) Kühner, Genre Galera: 126. 1935. — *Galera rimosa* Velen., Novit. mycol.: 129. ('1939') 1940; *Pholiotina rimosa* (Velen.) Hauskn. & Svrček in Czech Mycol. 51: 61. 1999.

MISAPPL. — *Conocybe sulcatipes* sensu Watling in Br. Fung. Fl. 3: 86. 1982; sensu A. Hauskn. in Czech Mycol. 52: 302. 2001; sensu auct. eur.

SEL. ICON. — Chrispijn, Champ. Jordaan: 71. 1999 (as *C. sulcatipes*); Enderle in Z. Mykol. 51: opposite p. 16. 1985; Enderle in Z. Mykol. 63: pl. 12. 1997; Mos. & Jül., Farbatl. Basidiomyc. III Pholiotina 4 (lower Fig.). 1995.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 51: 22–24, Figs. A–G. 1985; Enderle in Z. Mykol. 63: 20–22, Fig. 13. 1997; A. Hauskn. in Czech Mycol. 52: 302–305. 2001 (as *Ph. sulcatipes*); Kühner in Botaniste 17: 168–169. 1926; Kühner, Genre Galera: 126–128, Fig. 39. 1935; Watling in Br. Fung. Fl. 3: 86–87, Figs. 192–194. 1982 (as *C. sulcatipes*).

VERN. NAME — Bepoederd breeksteeltje.

Pileus (3)4–18(24) mm broad, conico-campanulate to conico-convex at first then convex, not readily expanding, hygrophanous, when moist

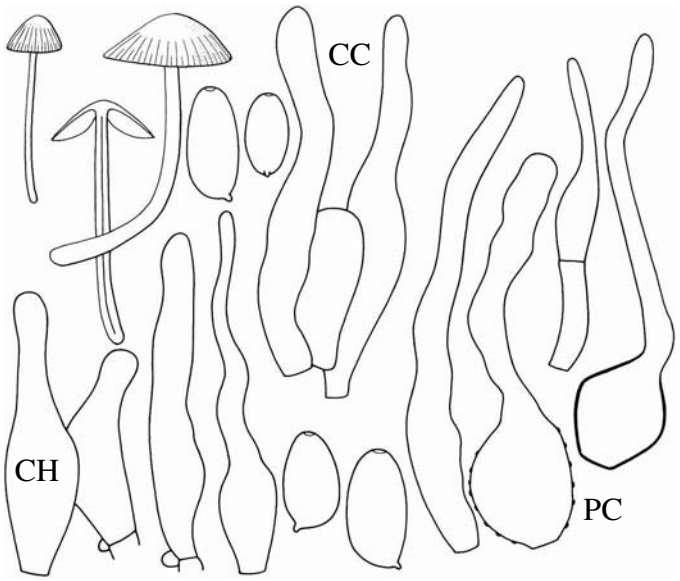


Fig. 197. *Pholiotina aberrans*

reddish brown, orange-brown to yellow-brown (e.g., K. & W. 7D8/E8, 6D7/E7, 6D6), translucently striate up to half of the radius or almost up to centre, on drying ochraceous buff or pale greyish orange, dull, pubescent (hand-lens), often glabrous in age. Lamellae, L = 16–22, l = 3(5), rather crowded to crowded, adnexed, ventricose, ochre-yellow then pale brown to rusty brown with paler flocculose edge. Stipe (15)20–45 × 0.7–2 mm, cylindrical or at base slightly swollen to subbulbous, fistulose, whitish at first, becoming pale yellow in age, base turning pale brown or orange-brown, entirely pruinose to flocculose, downwards slightly fibrillose striate. Context concolorous with surface, in base of stipe becoming brown. Smell weak, not distinctive. Taste weak, mild. Spore print rusty brown.

Spores (7.0)7.5–11.0 × (4.0)4.5–6.0(6.5) µm, av. 8.2–9.5(9.7) × (3.5)4.0–5.5 µm, Q = 1.5–2.2, Qav. = 1.7–2.0, ellipsoid-oblong to ovoid-oblong, in some collections in part subamygdaliform in side-view, yellow-brown to brownish orange in ammonia, thin-walled or slightly thick-walled, smooth, with apical germ pore, 0.8–1.8 µm wide. Basidia 16–26 × 7.5–10 µm, clavate, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia (20)28–62(75) × 6.0–14 µm, rather variable, subcylindrical to lageniform with slender to rather thick neck, 1.5–5.0 µm broad with rather acute, obtuse or subcapitate apex up to 6.0 µm broad. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to globose elements, 4.0–38 µm broad, with hyaline walls. Pileipellis an epithelioid hymeniderm, made up of pyriform to spheropedunculate cells, 25–55 × 8.0–25 µm, intermixed with numerous pileocystidia. Pileocystidia 37–95(115) × 8.0–16(20) µm, similar to cheilocystidia but larger, subcylindrical to lageniform, often brown or yellowish at base. Stipitipellis a cutis, made up of slender, hyaline hyphae, 2.0–8.0 µm broad, with clusters of caulocystidia. Caulocystidia 40–100 × 7.0–17 µm, similar to cheilocystidia but larger, subcylindrical to lageniform. Clamp-connections present, often frequent in the entire basidiocarp. Chemical reactions: No crystals formed on fragments of lamellae in ammonia.

HABITAT & DISTR. — Saprotrophic, usually solitary, sometimes in small groups on soil, litter or attached to small wood fragments in deciduous forests, parks, churchyards and along roadsides on moist to mesic, subneutral to basic soils rich in nutrients, on clay and humus-rich sand, often among tall herbs, e.g., *Urtica dioica*. In central Europe by preference in moist, herb-rich coniferous forests. In the Netherlands apparently rare but probably often overlooked. Aug.–Nov. Widespread in Europe and in some regions rather common.

Pholiotina aberrans is a rather variable species, for instance in size of basidiocarps and spores. It is recognised by the spore size, that is on the average larger than in related species, and the long and slender cheilo- and caulocystidia. Watling (Br. Fung. Fl. 3: 87. 1982) did not find clamp-connections in this species.

Pholiotina aberrans is synonymized by some authors (e.g., Hausknecht in Czech Mycol. 52: 302. 2001) with *Ph. sulcatipes* (Peck) M. Bon. *Agaricus sulcatipes* has been originally described from North America by Peck (in Rep. N.Y. St. Mus. Nat. Hist. 35: 132. 1884) with a white stipe, "often tinged with blue or green at the base." This feature was never reported from European collections of *Ph. aberrans*. A blue discolouration is considered an important diagnostic character, and therefore the proposed synonymy is not accepted. *Pholiotina. sulcatipes* probably belongs to subsect. *Cyanopodinae* close to *Ph. cyanopus*.

20. Pholiotina coprophila (Kühner) Sing. in Trudy bot. Inst. Akad. Nauk SSSR 2 (6): 434. 1950. – Fig. 198.

Galera coprophila Kühner in Botaniste 17: 169. 1926; *Conocybe coprophila* (Kühner) Kühner, Genre Galera: 125.1935.

EXCL. — *Conocybe coprophila* sensu Lundell in Lund. & Nannf. in Fungi exs. suec. 49-50: 906. 195 (= *Conocybe siliginea*).

SEL. ICON. — Breitenb. & Kränzl., Pilze Schweiz 4: pl. 400. 1995; Consiglio in Boll. Gruppo micol. G. Bres. 42: 74. 1999; Mos. & Jül., Farbatl. Basidiomyc. III Pholiotina 4 (upper Fig.). 1995.

SEL. DESCR. & FIGS. — Breitenb. & Kränzl., Pilze Schweiz 4: 316, Figs. A-D. 1995; Cacialli et al. in Funghi Amb. 72: 6–8. 1996; Dennis in Kew Bull. 1955: 125. 1955; Kühner in Botaniste 17: 169. 1926;

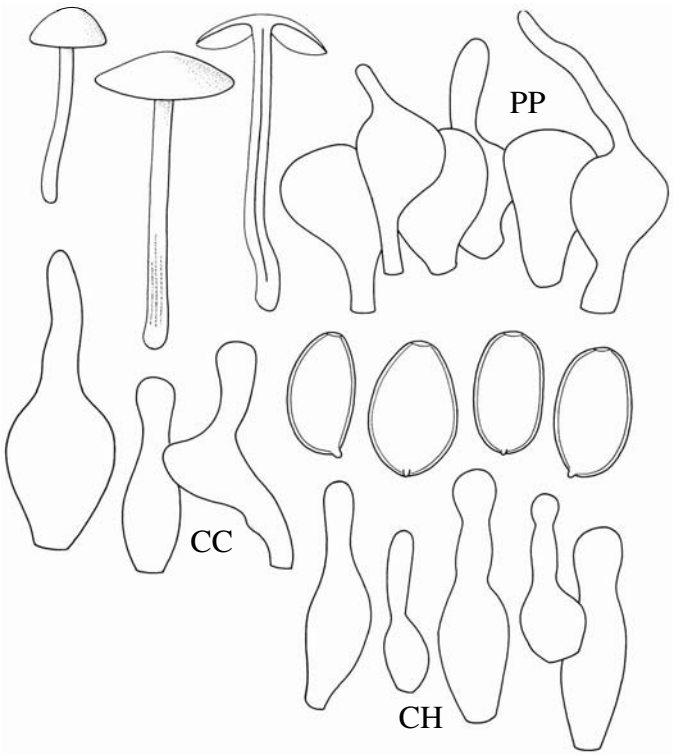


Fig. 198. *Pholiotina coprophila*

Kühner, Genre Galera: 125–126, Fig. 38. 1935; Watling in Br. Fung. Fl. 3: 86, Figs. 180, 184–186. 1982.

VERN. NAME — Mestbreeksteeltje.

Pileus (7)10–25 mm broad, hemispherical to conico-convex at first, then convex to plano-convex, not or weakly hygrophanous, when moist cream-coloured to pale ochraceous, becoming yellow-brown spotted with age, not translucently striate or sometimes slightly striate with age, greasy to slightly viscid, on drying only slightly paler; surface smooth or faintly pruinose under a hand-lens, without veil remains. Lamellae, L = 18–26, l = 3–7, rather crowded, adnexed, segmentiform, pale ochraceous at first, then rusty brown with pale, flocculose edge. Stipe (10)22–40 × (1)2–3 mm, cylindrical or slightly swollen towards base, fistulose, white at first, becoming ochraceous from the base upwards with age, without veil remains, pruinose at apex, silky fibrillose striate in lower half, at base white tomentose. Context concolorous with surface. Smell weak, not distinctive. Taste mild, not distinctive or slightly mealy. Spore print rusty to umber brown.

Spores 11.0–14.0 × 6.5–8.0 µm, av. 12.4–13.0 × 7.2–7.6 µm, Q = 1.6–1.9, Qav. = 1.7–1.8, ellipsoid-oblong, often some spores slightly flattened and slightly broader in frontal view, rather thick-walled, yellow- to orange-brown in ammonia, with prominent central to slightly eccentric germ pore, 1.4–2.0 µm wide. Basidia 18–28 × 8.0–12 µm, clavate, 4-spored. Lamella edge sterile or heterogeneous. Cheilocystidia 17–35(45) × 5.5–12 µm, lageniform with rather short neck, 3.0–5.0 µm broad, in part swollen towards the apex or subcapitate, up to 7.5 µm broad. Hymenophoral trama made up of cylindrical, inflated and globose elements, 3.0–22 µm broad. Pileipellis an epithelioid hymeniderm, made up of hyaline pyriform and spheropedunculate cells, 18–37(45) × 9.0–21(30) µm, intermixed with some pileocystidia, covered with thin gelatinous matrix. Pileocystidia 30–45 × 10–14 µm, lageniform with short to long, often tortuous neck, 3.0–4.5 µm broad. Stipitipellis a cutis of repent, hyaline hyphae, 2.0–6.0 µm broad with scattered and clustered caulocystidia. Caulocystidia 23–42 × 6.5–15 µm, like the cheilocystidia but shape more variable, more or less lageniform, apex 3.5–5.5 µm broad, intermixed with smaller ovate to subglobose cells. Clamp-connections absent. Chemical reactions: No crystals formed on fragments of lamellae in ammonia.

HABITAT & DISTR. — Saprotrophic, usually in groups, on old, straw-rich excrements of cow and horse, in extensively grazed pastures, often on base-rich soils. In the Netherlands very rare (Bakkum; Schagen; Oudemirdum; O. Flevoland; Sint-Geertruid). July–Oct. Widespread in Europe and in some regions not uncommon, mainly in mountains; also reported from Asia.

Pholiotina coprophila is easily recognised within the genus *Pholiotina* by the coprophilous habitat, large spores, greasy pileus, and lack of veil. Some species of *Conocybe* inhabit the same habitat, but they have lecythiform cheilocystidia.

A related coprophilous species was recently described from Italy (Sardinia), viz. *Pholiotina veregregia* Contu (in Cryptog. Mycol. 18: 352–353, Figs. 7–9. 1997). It is said to differ in the hygrophanous, translucently striate pileus, slightly smaller spores (9.0–12.0 × 6.0–8.0 µm) and the presence of numerous clamp-connections.

21. Pholiotina sulcata Arnolds & Hauskn. in Persoonia 18: 248. 2003. – Fig. 199.

MISAPPL. — *Bolbitius luteolus* sensu Rick., Blätterpilze: 69. 1915; *Conocybe plicatella* sensu Kühner, Genre Galera: 137. 1935; Watling in Br. Fung. Fl. 3: 84, Figs. 174–176. 1982; sensu auct. eur.

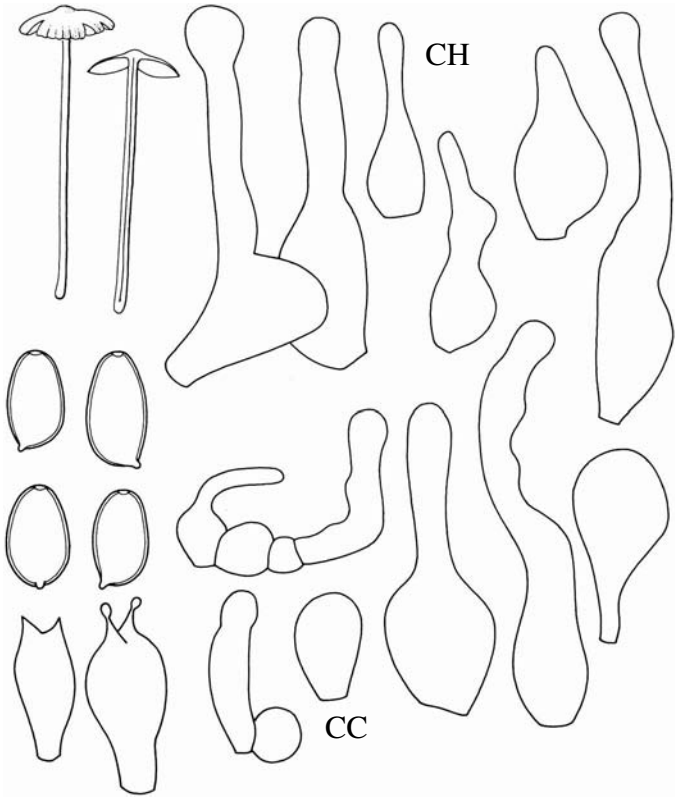


Fig. 199. *Pholiotina sulcata*

SEL. DESCR. & FIGS. — Kühner, Genre Galera: 137–139, Fig. 43. 1935; Svrček in Česká Mykol. 20: 143–145, Fig. 2B. 1966; Watling in Br. Fung. Fl. 3: 84, Figs. 174–176. 1982 (all as *C. plicatella*).

VERN. NAME — Geplooid breeksteeltje.

Pileus 10–14 mm broad, convex to plano-convex with weak, obtuse umbo; margin irregularly plicate-sulcate up to halfway the radius or more, splitting in places; hygrophanous, when moist orangey brown or pale reddish brown (K. & W. 7D6, 8D5) with red-brown centre (8E8, 9E6), on drying ochraceous to flesh-coloured brown. Lamellae, L = 16–25, l = 1–3, moderately crowded, adnexed, slightly ventricose, rusty brown with paler, flocculose edge. Stipe 33–37 × 1–1.5 mm, cylindrical with slightly swollen base, fistulose, pale flesh-coloured, minutely white striate lengthwise, minutely pruinose, in particular at apex. Context concolorous. Smell weak, not distinctive or like *Pelargonium* leaves. Taste not recorded. Spore print not recorded.

Spores 7.5–10.0(10.5) × 4.5–5.5 µm, av. 8.2–8.9 × 4.7–4.9 µm, Q = 1.5–2.0, Qav. = 1.7–1.85, occasionally slightly flattened, ellipsoid-oblong to subamygdaliform or sometimes slightly phaseoliform in side-view, ellipsoid- or ovoid-oblong in frontal view, brownish orange to orange-brown (5C7, 6D8) in ammonia, slightly thick-walled with small, central to slightly eccentric germ pore, 1.0–1.3 µm wide. Basidia 16–24 × 7.0–10.5 µm, clavate, 2-(1-)spored or 4- and 2-(1-)spored intermixed. Lamella edge almost sterile. Cheilocystidia 24–56 × 6.5–14 µm, lageniform, strongly variable in shape and size, mostly with long, cylindrical neck, 2.5–4.0 µm broad, often subcapitate, apex up to 7.0 µm broad, also with short thick neck, intermixed with some pyriform and spheropedunculate cells, 14–25 × 8.0–12 µm and scattered basidia. Pleurocystidia absent. Hymenophoral trama made up of cylindrical and inflated elements, 3.0–30 µm broad, with hyaline to yellow-brown encrusted wall. Pileipellis an epithelioid hymeniderm made up

of pyriform and spheropedunculate cells, 17–42 × 10–26 µm with pale brown walls; stalk often with brown encrusted pigment. Pileocystidia absent. Stipitipellis a cutis of hyaline or pale yellow, repent hyphae, 2.0–6.0 µm broad with scattered to clustered caulocystidia. Caulocystidia 17–53 × 5.0–14 µm, quite variable in size and shape, mainly lageniform with short to long neck, 3.0–6.5 µm broad, not capitate, also subcylindrical and clavate; in addition many small, subglobose cells up to 10 µm broad. Clamp-connections absent.

HABITAT & DISTR. — Saprotrophic, solitary in unfertilised pastures on dry, weakly acid to basic, often calcareous loam. In the Netherlands very rare in southern Limburg (Wittem, Nijswiller; Epen, Cottessen). Oct. Widespread in Europe but rare.

Pholiotina sulcata is a characteristic species by the expanding pileus that is irregularly sulcate and split at the margin. In microscopic characters it is close to *Ph. aberrans*. The latter species differs microscopically in the presence of pileocystidia and clamp-connections.

Because of the sulcate pileus *Pholiotina sulcata* has sometimes been placed in a separate genus, *Galerella*, and synonymized with the North American species *Galerella plicatella* (Peck) Sing. However, the species of that genus have a much more delicate, submembranous pileus, radially sulcate-plicate up to the centre, as in *Coprinus plicatilis* and allies.

Pholiotina sulcata is rarely recorded, probably also because the small, brown basidiocarps do not draw much attention. The collections from the Netherlands differ from most earlier descriptions in the presence of exclusively 2-spored or mixed 4- and 2-spored basidia. Also Kühner (Genre Galera: 139. 1935) described under the name of *C. plicatella* a collection with partially 2-spored basidia.

Ricken (Blätterpilze: 69, pl. 23, Fig. 7. 1915) described *Bolbitius conocephalus* (Bull. :Fr.) Rick., which according to some authors would be related to *Ph. sulcata* (e.g., Watling in Br. Fung. Fl. 3: 84. 1982; Bon in Doc. mycol. 21 (84): 59. 1992). It has a conical, red-brown, sulcate pileus, a long white stipe (70–120 × 2 mm) and spores, measuring 10.0–11.0 × 7.0–8.0 µm. This taxon is in need of a modern description.

Subsect. **Cyanopodinae** (Sing.) Arnolds

Basidiocarps with blue or green tinges, occasionally only at base of stipe when bruised (psilocybin present).

22. Pholiotina cyanopus (Atk.) Sing. in Trudy bot. Inst. Akad. Nauk SSSR 2 (6): 425. 1950. – Fig. 200.

Galerula cyanopus Atk. in Proc. Amer. Phil. Soc. 57: 367. 1918; *Conocybe cyanopus* (Atk.) Kühner, Genre Galera: 128. 1935.

SEL. ICON. — Mos. & Jül., Farbatl. Basidiomyc. III Pholiotina 3 (upper Fig.). 1995; Stamets, Psilocybin Mushr. World: 177 (left). 1996.

SEL. DESCR. & FIGS. — Kühner, Genre Galera: 128–131, Fig. 40. 1935; Watling in Br. Fung. Fl. 3: 85. 1982.

VERN. NAME — Blauwvoetbreeksteeltje.

Pileus 6–15 mm broad, conico-convex to plano-convex, hygrophanous, when moist greyish to reddish brown (e.g., K. & W. 7E7), translucently striate up to centre, on drying orangey brown to ochre-yellow, without veil remains. Lamellae, L = 18–24, l = 1–3, adnexed, rather crowded, up to 2.5 mm wide, orange-brown to rusty brown with white flocculose edge. Stipe 13–32 × 1 mm, cylindrical or slightly swollen at base, white or greyish white at first then near base often with bluish grey hue or pale blue-green, when bruised greenish colour sometimes more prominent,

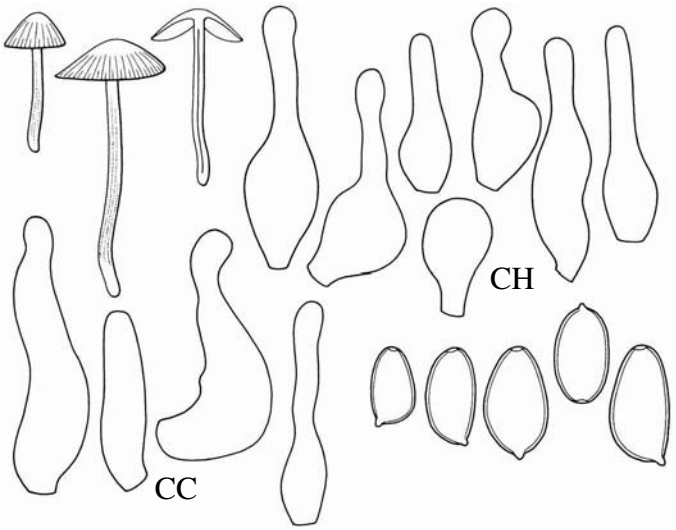


Fig. 200. *Pholiotina cyanopus*

entirely white fibrillose striate lengthwise; apex pruinose. Context in pileus pale brown, in stipe whitish. Smell absent or acidulous, reminiscent of Pelargonium leaves. Taste not recorded. Spore print not recorded.

Spores 7.0–9.0(10.0) × 4.5–5.5 µm, av. 7.8–8.5 × 4.7–5.0 µm, Q = 1.5–1.9, Qav. = 1.6–1.75, not or slightly flattened, in side-view ellipsoid-oblong to subamygdaliform, in frontal view often ovoid, slightly thick-walled, orange-brown in ammonia, with distinct, usually slightly eccentric germ pore, 1.0–1.5 µm wide. Basidia 15–22 × 7.0–9.5 µm, 4-spored. Lamella edge sterile. Cheilocystidia 20–39 × 6.5–11 µm, lageniform, often slightly broader to blunt apex but not capitate, with neck 3.0–4.5 µm broad, thin-walled, hyaline; in addition scattered spheropedunculate cells, 16–25 × 9.5–12 µm. Pleurocystidia absent. Hymenophoral trama made up of cylindrical to strongly inflated elements, 6.0–20 µm broad. Pileipellis an epitheloid hymeniderm, made up of clavate and spheropedunculate cells, 9.0–28 µm broad, with hyaline or pale yellow walls. Pileocystidia absent. Stipitipellis a cutis of parallel, cylindric, hyaline hyphae, 2.0–5.0 µm wide, with clusters of caulocystidia. Caulocystidia 24–39 × 5.5–10.5 µm, predominantly lageniform like cheilocystidia, but more irregular and also cylindrical or utriform. Clamp-connections absent.

HABITAT & DISTR. — Saprotrophic, single or in small groups, among moss and grasses in grasslands and forests on moist to dry, often calcareous soil. Very rare (Ankeveen; Domburg; Moerdijk). Sept.–Oct. Rare, but widespread in west and central Europe; also in North America.

Watling (in Br. Fung. Fl. 3: 85. 1982) stated that *Pholiotina cyanopus* is "easily recognised by the dark bluish green to greenish grey base of the stem … ." In our collections the greenish tinge was often weak or even hardly visible. Kühner (Genre Galera: 128. 1935) also noticed variation in this character. If the blue tinge is indistinct, *Ph. cyanopus* can be recognised by the whitish, fibrillose-striate stipe and rather small spores with slightly eccentric germ pore.

Watling (in Br. Fung. Fl. 3: 85. 1982) and Stamets (Psilocybin Mushr. World: 176. 1996) mentioned the presence of fugacious, filamentous veil fragments on the pileus margin in young basidiocarps. Veil remnants were not observed in Dutch collections. Kühner (Genre Galera: 131. 1935) reported the presence of clamp-connections in this species, contrary to the descriptions by other authors.

23. Pholiotina aeruginosa (Romagn.) Mos., Röhrlinge Blätterpilze, 4. Aufl.: 283. 1978. – Fig. 201.

Conocybe aeruginosa Romagn. in Bull. trimest. Soc. mycol. Fr. 84: 365. ('1968') 1969.

SEL. ICON. — M. Bon in Doc. mycol. 21 (84): pl. 2D. 1992; Breitenb. & Kränzl., Pilze Schweiz 4: pl. 395. 1995; Enderle in Z. Mykol. 62: Fig. 5. 1996; Romagn. in Bull. trimest. Soc. mycol. Fr. 84: opposite 366 ('1968') 1969.

SEL. DESCR. & FIGS. — M. Bon in Doc. mycol. 21 (84): 89. 1992; Breitenb. & Kränzl., Pilze Schweiz 4: 312, Figs. A–E. 1995; Enderle in Z. Mykol. 62: 27–29, Fig. 6. 1996; Romagn. in Bull. trimest. Soc. mycol. Fr. 84: 365–368, Fig. 1. ('1968') 1969.

VERN. NAME — Blauwgroen breeksteeltje.

Pileus 10–35 mm broad, campanulate or obtusely conical at first then conico-convex to plano-convex with large umbo, occasionally with revolute margin, hygrophanous, when moist at first blue-green (resembling pileus of *Psilocybe aeruginosa*) with dark blue-green centre, soon discolouring in marginal zone to olivaceous grey, finally ochraceous, at centre retaining blue-green to greenish grey colour for a long time, translucently striate up to three-fourths of the radius, on drying pale greenish at centre, to the margin pale ochraceous; surface smooth or slightly wrinkled around centre. Lamellae, L = 23–33, l = 1 (3), moderately distant, adnexed, ventricose, up to 4 mm broad, pale ochraceous then ochre- to orange-brown. Stipe 25–50 × 1.5–5 mm, cylindrical or slightly thicker towards base, fistulose, whitish, minutely pruinose-striate lengthwise. Context thin, concolorous. Smell weak, indistinctive to sweetish-fruity. Taste unknown. Spore print not recorded.

Spores 8.0–11.0(11.5) × 4.5–6.0 µm, av. ± 9.0–9.5 × 5.0–5.5 µm, Q = 1.6–2.0, Qav. = 1.75–1.85, not flattened, ellipsoid- to ovoid-oblong in frontal view, often subamygdaliform in face-view, ochraceous in water, brownish orange in ammonia, thin-walled with small, although distinct, central germ pore, c. 1.0 µm wide. Basidia 17–30 × 8.0–9.5 µm, clavate, 4-spored. Lamella edge almost sterile with scattered basidia. Cheilocystidia (21)24–42(50) × 6.0–10 µm, lageniform to fusiform, rarely utriform, tapering into a short to long, obtuse neck, 3.5–4.5 µm wide, not capitate. Hymenophoral trama made up of cylindrical to strongly inflated elements, 3.5–37 µm broad. Pileipellis an epitheloid hymeniderm, made up of spheropedunculate and clavate cells, 30–65 × 8.0–18(30) µm, hyaline or pale yellow-brown. Pileocystidia scattered, 23–42 × 6.0–12 µm, similar to cheilocystidia with neck 3.3–4.0 µm broad. Stipitipellis a cutis made up of cylindrical hyphae, 3.0–6.0 µm wide. Caulocystidia at stipe apex usually in clusters, 20–55(80) × 5.0–12 µm, like cheilocystidia varying from cylindrical to lageniform or clavate. Clamp-connections present.

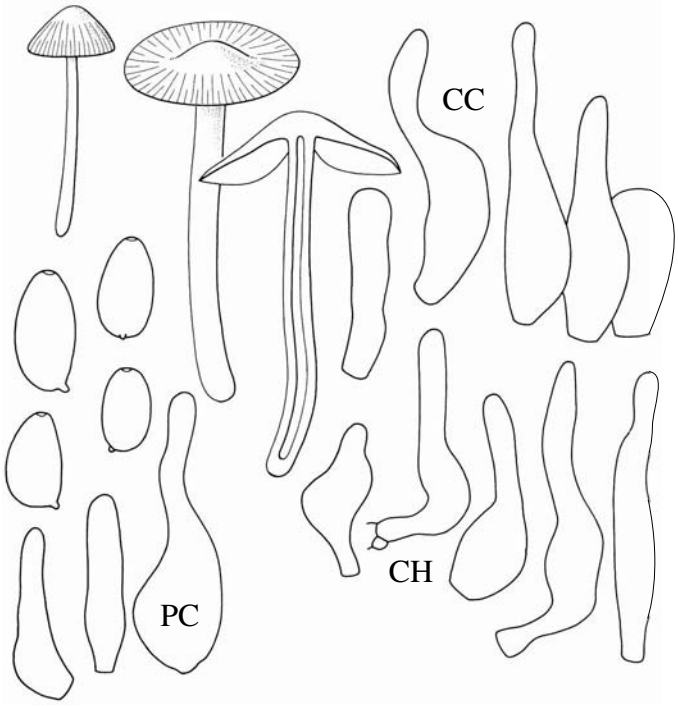


Fig. 201. *Pholiotina aeruginosa*

HABITAT & DISTR. — Saprotrophic, solitary or in small groups, terrestrial, on a path through *Fagus* forest on moist, humus-rich, sandy soil among *Urtica dioica* and *Glechoma hederacea*; elsewhere recorded from a roadside and near burnt wood under *Fagus* and on a forest clearing. Aug.–Oct. Very rare in the Netherlands (Ede, Hullenberg), also known from Belgium, France, Germany, and Switzerland but very rare everywhere.

The only collection of *Pholiotina aeruginosa* from the Netherlands is poorly annotated. Therefore, the macroscopic characters are mainly based on the quoted descriptions. Microscopic characters are taken from the collection from the Netherlands, supplemented with some details from other descriptions.

Young and mature basidiocarps can be easily identified by their blue-green pileus, at least at centre. Old basidiocarps may lose this colour completely and then they are difficult to recognise. The photograph in Mos. & Jül. (Farbatl. Basidiomyc. III Pholiotina 3. 1995) may illustrate such faded specimens, but is by no means representative of this species.

4. **Agrocybe** Fay.

MARIJKE M. NAUTA

Agrocybe Fay. in Annls Sci. nat., Sér. VII, 9: 358. 1889. – *Hylophila* ser. *Cyclopus* Quél., Fl. mycol. France: 96. 1888; *Hylophila* (subgen.) *Cyclopus* (Quél.) Barbier in Bull. Soc. Sci. nat. Saône-et-Loire, Sér. II, 33: 131. 1907. — *Togaria* W.G. Sm., Synopsis Brit. Basidiomyc.: 121. 1908. — *Bulla* Earle in Bull. N. Y. bot. Gdn 5: 424. 1909. — *Cyclocybe* Velen., Novit. mycol.: 122. ('1939') 1940.

SELECTED LITERATURE — M. Bon in Bull. Féd. mycol. Dauph. Savoie 76: 32-36. 1980; Nauta, Revisie Agrocybe. 1987; Sing. in Sydowia 30: 192-279. ('1977') 1978; Watling in Br. Fung. Fl. 3: 1-140. 1982.

Basidiocarp collybioid to tricholomatoid; pileus usually convex to applanate, smooth to pruinose or rimose; often hygrophanous; in wet condition yellow to brown and often greasy to slightly viscid, on drying paler; lamellae adnate, emarginate or adnexed, yellow-brown to brown; stipe often with thin white rhizomorphs; veil usually present, sometimes appendiculate at pileus margin or as flocks on pileus, occasionally present in form of annulus; spore print dark yellow-brown to dark red-brown (5-10 YR 3-4/3-6).

Spores smooth, often thick-walled, often with apical or rarely subapical germ pore, sometimes with thin-walled apical spot, yellowish brown with light microscope; cheilocystidia present, pleurocystidia occasionally present; pileipellis a hymeniderm, sometimes irregular, sometimes forming a transition to an epithelium, occasionally with pileocystidia, occasionally covered with gelatinous layer of fragments of hyphae; clamp-connections usually present, sometimes scarce. Development paravelangiocarpic, hymenocarpic, or bivelangiocarpic.– Holotype species: *Naucoria praecox* (Pers. :Fr.) Fay.

HABITAT & DISTR. — Solitary to gregarious or fasciculate, saprotrophic; terrestrial or on wood; widespread, cosmopolitan.

The genus *Agrocybe* forms a natural group, though morphological limitation with *Conocybe* can sometimes form a problem. Research using molecular techniques (Moncalvo et al. in Mol. Phylogen. Evol. 23: 357–400. 2002; Moncalvo et al. in Syst. Biol. 49: 278–305. 2000) suggested a clade formed by *Agrocybe*, possibly related to *Hebeloma*, separate from the *Bolbitius-Conocybe-Pholiotina* group, which is possibly related to *Panaeolus.*

There is no reason to follow the opinions of Romagnesi (in Bull. trimest. Soc. mycol. Fr. 78: 337–358. 1962) and Kühner (in Bull. mens. Soc. linn. Lyon 49: 899.1980), who consider *Simocybe* closely related to and to be incorporated in *Agrocybe*.

Some species within *Agrocybe*, e.g., *A. pediades*, are very variable and seem to represent a complex of taxa at a lower level than species. Careful molecular studies may clarify these complexes.

The spore print colour has not been proven useful for the distinction of species and is therefore not given for each species. Colour of spores with light microscope is in KOH.

Spore size is given as length × (if differing from side-view) width in frontal view × width in side-view. Sizes of cystidia are length × (if appropriate) width of belly × width of neck × width of head.

Agrocybe cylindrica (DC. :Fr.) Maire is edible and widely cultivated.

KEY TO THE SPECIES

1. Annulus present
   2. Spores large, on average 12.5–16.0 × 8.0–11.0 µm, with wide germ pore up to 2.0 µm; cheilocystidia lageniform, up to 45 × 14 µm; pileus small to medium-sized, usually 10–30 mm in diametre . . . **5b. A. pediades** var. **cinctula**
   2. Spores up to 13 × 6.5 µm on average, either with inconspicuous, or narrow or wide germ pore up to 1.5 µm; cheilocystidia usually utriform or clavate, or a mix of clavate and lageniform, if only lageniform then up to 75 × 30 µm; pileus usually larger, up to 110 mm in diametre.

3. Spores without conspicuous germ pore
   4. Pileus yellowish white to yellow-brown; spores on average 10.0–11.0 × 5.0–6.0 µm . . . . . **9. A. cylindrica**
   4. Pileus dark brown, glutinous when moist; spores on average 11.5–13.0 × 6.0–6.5 µm . . . . . **10. A. erebia**
3. Spores usually with conspicuous germ pore up to 1.5 µm; pileus usually yellowish brown, greasy to viscid, sometimes when young dark brown and glutinous
   5. Spores with germ pore up to 0.5 µm wide; pileocystidia present; cheilocystidia only clavate, lamella edge sterile; taste weakly unpleasant but not farinaceous . . . . . **9. A. cylindrica**
   5. Spores with conspicuous germ pore of 1.0–1.5 µm wide; pileocystidia lacking; cheilocystidia either utriform or of two types, if only clavate then lamella edge heterogeneous; taste farinaceous.
      6. Spores on average longer than 11.0 µm
         7. Pileus surface remarkably radially venose; usually with large but fragile annulus; taste farinaceous **4. A. rivulosa**
         7. Pileus surface soon fissurate to areolate-rimose; only when young annulate; taste neutral. . . **3. A. dura**
      6. Pileus surface smooth; spores on average 8.5–10.0 × 5.0–7.0 µm.
         8. Lamella edge sterile, composed of predominantly clavate cheilocystidia of 10–20 × 6.5–11 µm intermixed with lageniform to utriform cheilocystidia of 35–40 µm long; pileus 10–40(60) mm in diametre, shortly translucently striate at margin; stipe slender, 1–4 mm wide; annulus ascending . . **2. A. elatella**
         8. Lamella edge heterogeneous, composed of basidia intermixed with usually utriform cheilocystidia of 35–65 µm long; pileus 20–80 mm in diametre, not translucently striate; stipe not slender, 3–11 mm wide; annulus descending . . . . . **1. A. praecox**

1. Annulus lacking, other veil remnants may be present
   9. Pileus in wet condition whitish to yellowish white, with appendiculate veil at margin; taste of fruitbodies neutral **3. A. dura**
   9. Pileus in wet condition yellow, yellow-brown, or brown, usually without appendiculate veil; taste of fruitbodies farinaceous
      10. Pleurocystidia lageniform with characteristic fingerlike projections. . . . . **7. A. arvalis**
      10. Pleurocystidia different: either lageniform without projections, or utriform or globose, or absent.
         11. Spores small, on average 6.5–9.5 × 4.0–6.0 µm, without or with inconspicuous narrow germ pore up to 0.5 µm wide; pileocystidia often present
            12. Pileus brown or yellowish brown, usually with olivaceous tinges; spores on average 6.5–7.5 × 4.0–5.0 µm; on wood . . . . . **12. A. firma**
            12. Pileus yellowish without olivaceous tinges; spores on average 7.5–9.5 × 5.0–6.0 µm; not on wood
               13. Fruitbodies small to medium-sized, pileus 10–50 mm in diametre; lamella edge heterogeneous; spores on average 7.5–8.5 × 5.0–6.0 µm; average Q (1.45)1.50–1.65(1.70). . . . **11. A. vervacti**
               13. Fruitbodies very small, pileus 3–15 mm in diametre; lamella edge sterile; spores on average 8.0–9.5 × 5.0–5.5 µm; average Q 1.60–1.80 . . . . . **13. A. pusiola**
         11. Spores larger, on average 9.0–15.0 × 5.0–9.5 µm, with conspicuous germ pore of 1.0–2.0 µm wide; pileocystidia present or absent
            14. Spores with germ pore of c. 1.0 µm wide; cheilocystidia up to 60 µm long; pileocystidia usually present
               15. Pileus young with olivaceous tinge; pileocystidia lacking; spores up to 14.5 × 8.5 µm in size; pleurocystidia globose, 25–40 µm long . . . . . **A. smithii** Watl. & Bigelow in Mycotaxon 17: 378. 1983; not yet found in the Netherlands. According to Enderle (in Doc. mycol. 25(100): 147–150. 1995) occurring in southern Germany.
               15. Pileus without olivaceous tinges; pileocystidia present; spores up to 13.5 × 7.5 µm in size; pleurocystidia clavate or utriform, 35–55(65) µm long . . . . . **8. A. putaminum**
            14. Spores with germ pore of 1.5–2.0 µm wide; cheilocystidia up to 45 µm long; pileocystidia absent
               16. Pleurocystidia present, of different size or shape than cheilocystidia . . . . . **6. A. ochracea**
               16. Pleurocystidia absent, sometimes some pleurocystidia near edge of lamella and then of same size and shape as cheilocystidia . . . . . **5. A. pediades**

ALTERNATIVE KEY

1. Spores with conspicuous germ pore; pileocystidia absent or present
   2. Germ pore up to 1.0 µm wide; pileus usually dry; pileocystidia present, rarely absent
      3. Pileocystidia present; spores usually less than 7.0 µm wide, on average 9.0–11.5 × 5.0–7.0 µm, range 8.0–13.5(15.5) × 4.5–8.0(8.5) µm
         4. Annulus present; cheilocystidia clavate . . . . . **9. A. cylindrica**
         4. Annulus absent; cheilocystidia lageniform
            5. Pleurocystidia lageniform with characteristic outgrowths; spores on average 9.0–10.0 × 5.0–5.5 µm **7. A. arvalis**
            5. Pleurocystidia utriform or clavate, without outgrowths; spores on average 10.5–11.5 × 6.0–7.0 µm **8. A. putaminum**
      3. Pileocystidia absent; spores 12.0–14.5 × 7.0–8.5 µm . . . . . **A. smithii** Watl. & Bigelow in Mycotaxon 17: 378. 1983; not yet found in the Netherlands. According to Enderle (in Doc. mycol. 25 (100): 147–150. 1995) occurring in southern Germany.
   2. Germ pore 1.0–2.0 µm wide; pileus greasy to viscid; pileocystidia absent
      6. Veil present, usually in the form of an annulus, or appendicaulte at margin of pileus
         7. Spores with germ pore of 1.5–2.0 µm wide; cheilocystidia lageniform . . . . . **5b. A. pediades** var. **cinctula**
         7. Spores with a germ pore of 1.0–1.5 µm wide; cheilocystidia utriform or predominantly clavate or cylindrical
            8. Veil appendiculate at margin of pileus, annulus only sometimes present when young; taste of fruitbodies neutral; pileus whitish yellow; spore length on average 12.0–13.0 µm . . . . . **3. A. dura**
            8. Veil forming an annulus; taste of fruitbodies farinaceous; pileus yellow to yellow-brown; spore length on average 8.5–12.0 µm
               9. Cheilocystidia utriform . . . . . **1. A. praecox**
               9. Cheilocystidia predominantly clavate or globose, sometimes also utriform
                  10. Spores on average 9.0–10.0 × 6.5–7.0 µm; lamella edge sterile; cheilocystidia predominantly clavate, intermixed with lageniform to utriform cystidia; pileus surface smooth . . . **2. A. elatella**
                  10. Spores on average 11.5–12.0 × 7.0–8.0 µm; lamella edge heterogeneous; cheilocystidia only clavate and globose; pileus surface remarkably radially rimose . . . . . **4. A. rivulosa**
      6. Veil not conspicuous, only sometimes present as remnants
         11. Pleurocystidia present, of different size or shape than cheilocystidia . . . . . **6. A. ochracea**
         11. Pleurocystidia absent, sometimes some pleurocystidia near edge of lamella present and then of same size and shape as cheilocystidia . . . . . **5a. A. pediades** var. **pediades**
1. Spores without germ pore or with inconspicuous narrow germ pore up to 0.5 µm; pileocystidia present or elements of pileipellis with irregular outgrowths
   12. Annulus present; spores on average 10.0–13.0 × 5.0–6.5 µm; pleurocystidia present; at least some of cheilocystidia clavate
      13. Pileus yellow-white, dry to greasy when wet; spores on average 10.0–11.0 × 5.0–6.0 µm . . **9. A. cylindrica**
      13. Pileus dark brown, glutinous when moist; spores on average 11.5–13.0 × 6.0–6.5 µm . . . . . **10. A. erebia**
   12. Annulus lacking; spores on average 6.5–9.5 × 4.0–6.0 µm; pleurocystidia usually absent or scattered, if present lageniform
      14. Spores with narrow germ pore up to 0.5 µm; pleurocystidia absent or very scarce . . . . . **11. A. vervacti**
      14. Spores without germ pore, thin-walled apical spot may be present; pleurocystidia usually scattered, sometimes abundant
         15. Pileus brown or yellowish brown, usually with olivaceous tinge, dry; spores on average 6.5–7.5 × 4.0–5.0 µm; on wood . . . . . **12. A. firma**
         15. Pileus yellow, in wet condition greasy to glutinous; spores on average 8.0–9.5 × 5.0–5.5 µm; not on wood **13. A. pusiola**

Subgen. **Agrocybe**

Germ pore usually wide, sometimes narrow, usually conspicuous.

Sect. **Agrocybe**

Veil well-developed, usually in form of annulus, sometimes present as appendiculate flocks at pileus margin; spores with wide germ pore up to 1.5 µm; pleurocystidia conspicuous, of similar form as cheilocystidia.

1. Agrocybe praecox (Pers. :Fr.) Fay. in Annls Sci. nat., Sér. VII, 9: 358. 1889. – Fig. 202.

Agaricus candicans Schaeff., Fung. Bavariae 4: 50. 1774; *Agaricus praecox* Pers., Comm. Schaeff. Icon. pict.: 89. 1800; *Agaricus praecox* Pers. :Fr., Syst. mycol. 1: 282. 1821; *Pholiota praecox* (Pers. :Fr.) Kumm., Führ. Pilzk.: 85. 1871; *Dryophila praecox* (Pers. :Fr.) Quél., Enchir. Fung.: 67. 1886; *Hylophila praecox* (Pers. :Fr.) Quél., Fl. mycol. France: 97. 1888; *Togaria praecox* (Pers. :Fr.) W.G. Sm., Synopsis Brit. Basidiomyc.: 124. 1908; *Naucoria praecox* (Pers. :Fr.) Fay. in Annls Sci. nat., Sér. VII, 9:358. 1889; non *Agaricus candicans* Pers. :Fr.. — *Agaricus cereolus* Schaeff., Fung. Bavariae 4: 50. 1774. — *Agaricus aestivalis* Schum., Enum. Pl. Saell. 2: 259. 1803. — *Agaricus togularis* Pers., Syn. meth. Fung.: 262. 1801; *Agaricus togularis* Pers. :Fr., Syst. mycol. 1: 241. 1821; *Agaricus ombrophilus* Fr., Hymenomyc. eur.: 216. 1874; *Agrocybe ombrophila* (Fr.) Konr. & M. in Encycl. mycol. 14: 160. 1949; non *Agaricus togularis* Fr. 1874. — *Agaricus sphaleromorphus* Pers., Syn. meth. Fung.: 266. 1801; *Agaricus sphaleromorphus* Pers. :Fr., Syst. mycol., Index gen.: 42. 1832; *Agrocybe sphaleromorpha* (Pers. :Fr.) Konr. & M. in Encycl. mycol. 14: 159. 1949; *Agrocybe praecox* f. *sphaleromorpha* (Pers. :Fr.) Migl. & Coccia in Doc. mycol. 22(88): 23. 1993. — *Agaricus vaporariorum* Weinm., Hymenomyc. Gasteromyc. Imp. ross. obs.: 231. 1836. — *Agaricus confoederans* Britz. in Ber. naturh. Ver. Augsburg 27: 152. 1884 (Hymenomyc. Südbayern 4). — *Agaricus praecavendus* Britz. in Ber. naturh. Ver. Augsburg 27: 152. 1884 (Hymenomyc. Südbayern 4). — *Agaricus propinquatus* Britz. in Ber. naturh. Ver. Augsburg 27: 152. 1884 (Hymenomyc. Südbayern 4). — *Agaricus exsequens* Britz. in Ber. naturh. Ver. Augsburg

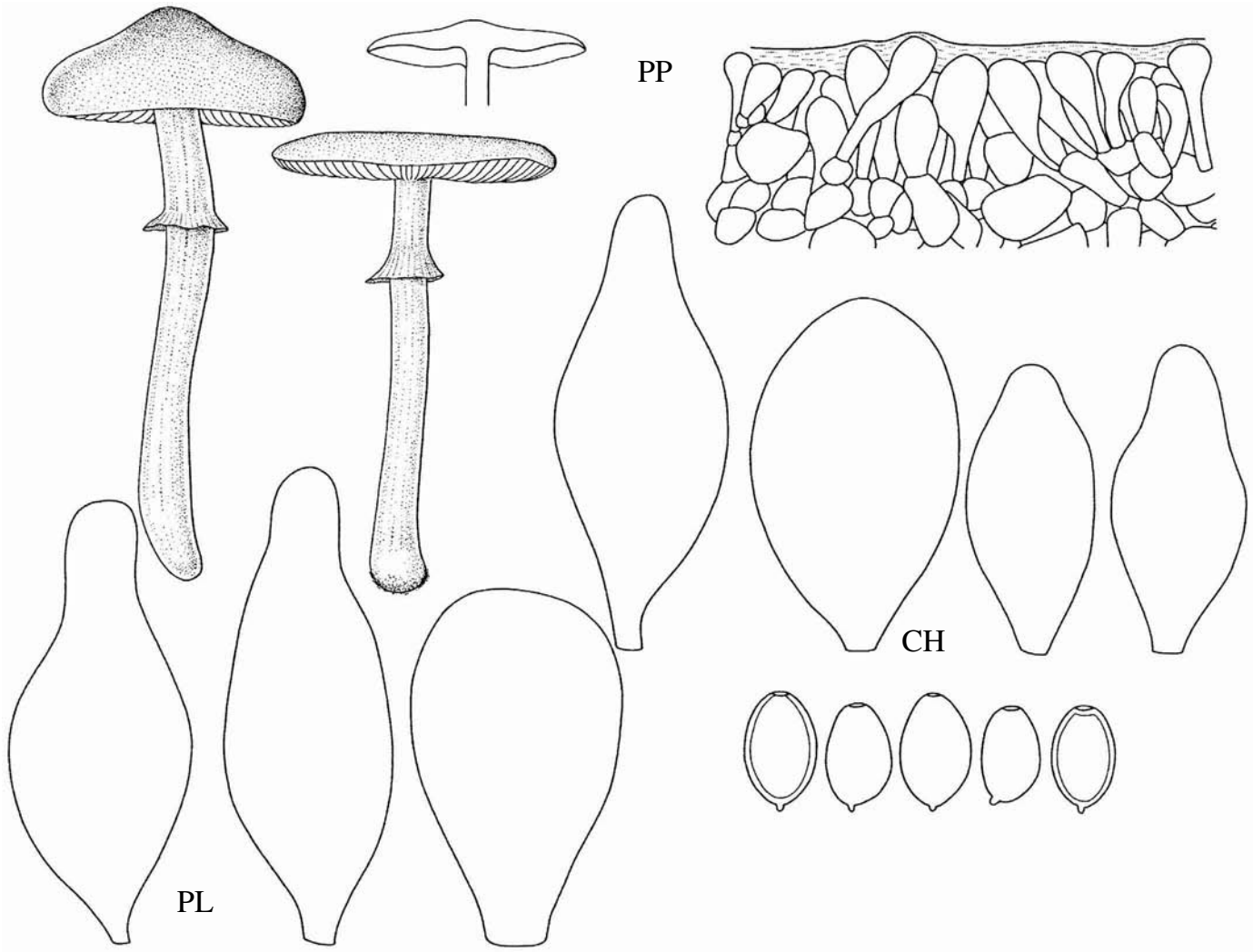


Fig. 202. *Agrocybe praecox*

27: 152. 1884 (Hymenomyc. Südbayern 4). — *Agaricus britzelmayri* Schulzer in Britz. in Ber. naturh. Ver. Augsburg 27: 152. 1884 (Hymenomyc. Südbayern 4); *Agrocybe praecox* var. *britzelmayri* (Schulzer) Watling in Acta bot. Island. 8: 7. 1985.

EXCL. — *Pholiota praecox* sensu Quél. in Mém. Soc. Émul. Montbéliard, Sér. II, 5: 124. 1872 (Champ. Jura Vosges 1) (= *Agrocybe dura*); *Agrocybe ombrophila* sensu M. Bon in Bull. Féd. mycol. Dauph. Savoie 76: 32–36. 1980; sensu Mos., Röhrlinge Blätterpilze, 4. Aufl.: 286. 1978 (= *Agrocybe erebia*).

SEL. ICON. — Dähncke, 1200 Pilze: 592. 1993;J . Lange, Fl. agar. dan. 3: pl. 106G. 1938; Mos. & Jül., Farbatl. Basidiomyc. 10: III-7. 1992; R. Phillips, Paddest. Schimm.: 168. 1981.

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 2: 285. ('1982') 1983; Nauta, Revisie Agrocybe: 45–46. 1987; Watling in Br. Fung. Fl. 3: 15. 1982.

VERN. NAME — Vroege leemhoed.

Pileus (15)20–80(120) mm broad, at first conical, sometimes abruptly conical, expanding to convex to plano-convex, later often applanate, sometimes with low broad umbo, rarely with depressed centre, young with involute, later with straight margin, hygrophanous, when moist ochre to yellowish brown (Mu. 2.5 Y 5–8/4; 10 YR 4/4), with more brown centre (2.5 Y 7–8/4–6; 10 YR 6/6–5/8, 5–7/8), pallescent on drying to pale yellow or pale yellowish or greyish brown (2.5 Y 6–8/4-6; 10 YR 6–8/4-6), at margin sometimes nearly white; surface when wet greasy, sometimes slightly sticky, on drying mat, usually smooth, sometimes rugulose or partly areolate-rimose, especially near margin; margin when young often with appendiculate veil remnants. Lamellae, L = 30–50, l = (1)3–7, moderately crowded, adnate to emarginate, often with short decurrent tooth, subventricose, up to 9 mm broad, at first pale grey-brown (2.5 Y 7/4; 7.5-10 YR 5/4), later dark brown to dark reddish brown (10 YR 5/4, 4/4; 7.5 YR 4/4), with concolorous to paler, minutely denticulate edge. Stipe (20)35–105 × (1.5)3–10(14) mm, usually annulate, sometimes exannulate, usually cylindrical, sometimes clavate or attenuated at base, straight to somewhat flexuous, stuffed to fistulose, white to yellowish or brownish white (2.5 Y 8/4 but paler), towards base pale grey-brown, fibrillose, at base occasionally white tomentose, often with white rhizomorphs. Annulus at 0.50–0.80 of height of stipe, 7–8 mm wide, descending, pendant, sometimes recurved, thin, often torn, white to pale brown, with striate upperside and fibrillose underside. Context 2.5–5 mm thick in pileus, soft, whitish to yellowish or pale brown in pileus (2.5 Y 5/4), pale grey-brown in centre of stipe, more brown at cortex of stipe, in base nearly white. Smell strongly farinaceous, sometimes weakly or pleasant. Taste indistinct to weakly or strongly farinaceous, often with bitter aftertaste.

Spores (7.0)8.0–11.0(12.0) × 5.0–7.5(8.0) × 4.5–6.5 µm, on average 8.5–10.0 × 5.5–6.5 × 5.0–6.0 µm, in frontal view ovoid, Q = 1.40–1.70, Qav = 1.50–1.65, in side-view ellipsoid to oblong and flattened at one side, Q =1.55–1.80, Qav = (1.55)1.60–1.75, thick-walled up to 0.7 µm, with conspicuous apical germ pore of 1.0–1.5 µm wide; with light microscope yellow-brown. Basidia 25–35 × 7.0–9.5 µm, usually solely 4-spored, sometimes also 2-spored basidia present. Lamella edge heterogeneous. Cheilocystidia scarce but conspicuous, 35–65 × 15–33 × 6.0–14 µm, narrowly utriform, sometimes fusiform or cylindrical and then 35–55 × (16)29–35 µm, rarely subcapitate, thin-walled, with colourless or yellowish contents. Pleurocystidia scarce, (35)50–85 × 14–28 × (6.0)8.0–12(19) µm, conspicuous, usually utriform, sometimes cylindrical and then 45–55 × 31–40 µm, thin-walled, with colourless to yellowish contents. Pileipellis a 30–40 µm thick, sometimes slightly gelatinised hymeniderm of erect, clavate elements of 20–30(40) × 9.0–16(19) µm, with yellowish intracellular pigment, occasionally covered with an up to 5 µm thick gelatinous layer; subpellis consisting of rounded quadrangular to rectangular elements of 5.0–14.5 × 3.5–7.0 µm, gradually passing into pileitrama. Stipitipellis a dry to slightly gelatinised regular cutis of sometimes branched, 3.5–5.5 µm wide hyphae with cylindrical to slightly inflated elements with occasionally recurved clavate terminal elements of 25–30 × 6.0–9.5 µm, with yellowish intracellular or parietal pigment. Clamp-connections abundantly present in stipitipellis and stipititrama, rather scarce at base of basidia, cheilocystidia and in tissue of annulus, scarce at base of pleurocystidia and in pileitrama.

HABITAT & DISTR. — Solitary or in groups, saprotrophic; terrestrial under shrubs, in garden beds, city parks, fallow land or nutrient-rich roadside verges on humus-rich, sandy to clayey soil; also found in grasslands, compost-heaps, on wood-chips and once in a greenhouse. Common and widespread in the Netherlands. Apr.–Nov. Widespread and common in Europe. Cosmopolitan.

Agrocybe sphaleromorpha (Pers. :Fr.) Konr. & M., according to Watling & Gregory (in Bibltheca mycol. 82: 58. 1981) differing from *A. praecox* in a browner pileus, is considered here synonymous. The description of Bulliard (Hist. Champ. Fr.: 629. 1812) characterises the pileus as whitish, the plate of Bulliard (Herb. France: pl. 540–II. 1792) also shows a whitish pileus.

The identity of *Agrocybe gibberosa* (Fr.) Sing. is uncertain. It is undoubtedly very close or perhaps identical to *A. praecox*. According to Watling (in Br. Fung. Fl. 3: 13. 1982) *Agrocybe gibberosa* differs from *A. praecox* in smaller spores and a more evanescent annulus.

2. Agrocybe elatella (P. Karst.) Vesterholt in Nordic J. Bot. 9: 317. 1989. – Fig. 203.

Roumeguerites elatellus P. Karst. in Meddn Soc. Fl. Fauna fenn. 9: 43. 1882. — *Pholiota praecox* var. *paludosa* J. Lange in Dansk. bot. Ark. 2: 7. 1921; *Agrocybe paludosa* (J. Lange) Watl. & Gregory in Bibltheca mycol. 82: 46. 1981.

MISAPPL. — *Agrocybe sphaleromorpha* sensu M. Bon in Doc. mycol. 15 (4): 51. 1974.

SEL. ICON. — J. Lange, Fl. agar. dan. 3: pl. 106E. 1938; Dähncke, 1200 Pilze: 591. 1993; R. Phillips, Paddest. Schimm.: 170. 1981 (all as A. paludosa).

SEL. DESCR. & FIGS. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands: 283. ('1982') 1983; Nauta, Revisie Agrocybe: 50–51. 1987; Watling in Br. Fung. Fl. 3: 14. 1982 (all as *A. paludosa*).

VERN. NAME — Moerasleemhoed.

Pileus 10–40(60) mm broad, at first convex, later plano-convex to applanate with slightly depressed centre, sometimes with low umbo, when young with deflexed, later usually straight, short translucently striate margin, hygrophanous, when moist light reddish brown to yellow-brown at centre (Mu. 2.5 Y 6–7/6, 10 YR 7–8/8; 7.5–10 YR 4/4; K. & W. 5B–C6), towards margin paler yellow (2.5 Y 8/6), pallescent on drying to pale yellow-brown to yellow (5 Y 8/4; 2.5 Y 5-6/6, 7-8/4-6), sometimes at centre remaining darker; surface greasy to slightly viscid when wet, smooth, young with some appendiculate veil remnants. Lamellae, L = 35–50, l = 1–3(9), moderately crowded, rarely rather distant, adnate or emarginate, sometimes adnexed, often with decurrent tooth, usually ventricose, up to 6 mm broad, at first pale brown to greyish brown with pale pinkish tinge (2.5 Y 6/4; 10 YR 7/3, 5/3-4; K. & W. 6D5), finally dark brown (10 YR 3-5/3-4; 7.5 YR 4/2; 6E6), with white and usually flocculose edge. Stipe (15)25–110 × 1–4(6) mm, annulate, cylindrical to slightly attenuated to base, sometimes

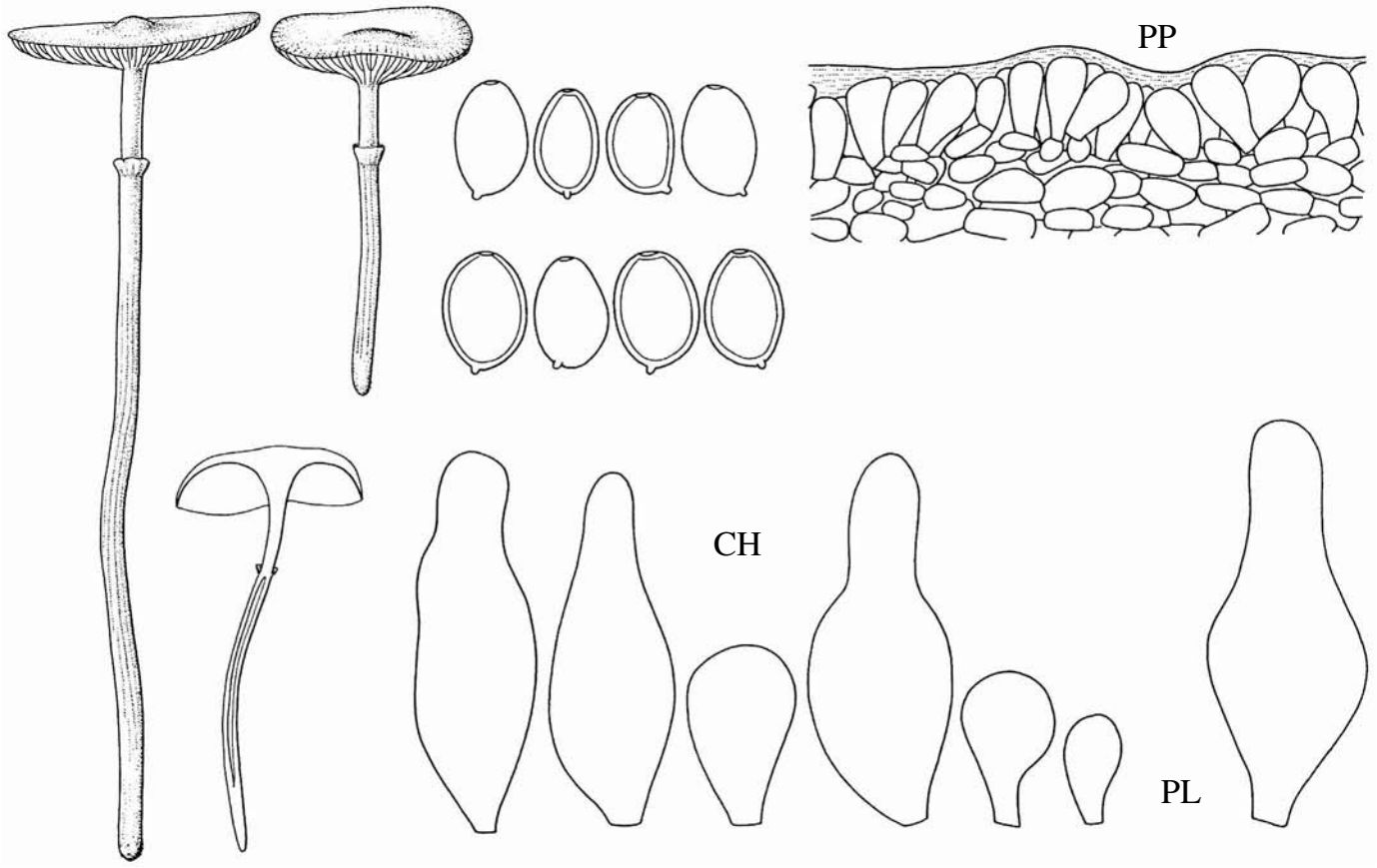


Fig. 203. *Agrocybe elatella*

enlarged to subbulbous and up to 8 mm at base, straight, whitish to pale yellow or pale brown (2.5 Y 10 YR 8/4, 10 YR 7/4–6), later dirty brown, especially on damaging, solid then fistulose, above annulus sometimes pruinose, below annulus smooth to weakly fibrillose; without rhizomorphs. Annulus at 0.70–0.90 of height of stipe, up to 2 mm wide, ascending, at first patent, later sometimes collapsed and pendant, thin, white to pale brown, with brown striate upperside and white, striate to fibrillose underside. Context c. 1 mm thick in pileus, soft, white in pileus, especially later brownish in stipe. Smell farinaceous, especially when cut. Taste strongly farinaceous, sometimes with bitter aftertaste.

Spores 7.5–11.0(12.0) × 5.0–7.5(9.0) × 5.0–7.0(7.5) µm, on average (8.5)9.0–10.0 × (5.5)6.5–7.0 × 5.5–6.5 µm, in frontal view (broadly) ellipsoid to oblong, often ovoid, Q = (1.15)1.20–1.80, Qav = 1.30–1.60, in side-view ellipsoid, sometimes amygdaliform, Q = 1.35–1.75, Qav = 1.55–1.60, thick-walled up to 1.1 µm, with up to 1.5 µm wide apical germ pore; with light microscope yellow-brown. Basidia 25–30 × 7–9.5 µm, clavate to cylindrical, usually solely 4-spored, sometimes also 2-spored basidia present, rarely with many 2-spored basidia. Lamella edge usually sterile. Cheilocystidia of two types: mostly clavate, (10)15–25 × 6.5–15 µm, occasionally intermixed with lageniform to utriform type of 35–55(65) × 16–23 × 7.5–13 µm; thin-walled, with colourless contents. Pleurocystidia scarce, conspicuous, 35–60 × 17–21 × 8.0–11 µm, lageniform to utriform, rarely fusiform and then c. 45 × 14–15 µm, thin-walled, translucent, colourless or with yellowish contents. Pileipellis a 30–40 µm thick, usually weakly to strongly gelatinised hymeniderm consisting of erect, clavate elements of 20–30 × 7.0–13 µm, with pale yellow encrusting to intracellular pigment, covered with a 4.0–9.0 µm thick gelatinised layer; subpellis consisting of repent rounded rectangular elements of 9.0–19.0 × 3.0–8.0 µm, gradually passing into pileitrama. Stipitipellis a slightly gelatinised regular cutis of sometimes branched, 2.5–4.0 µm wide hyphae with cylindrical elements, with pale yellowish intracellular pigment. Clamp-connections abundantly present in stipitipellis and tissue of annulus, rather rare in stipititrama, pileitrama and at base of basidia and cheilocystidia.

HABITAT & DISTR. — Solitary or in small groups, saprotrophic; terrestrial or in *Sphagnum* on wet to moist places as wet dune slacks, shores of lakes, brooks or ditches, or in wet grasslands or hayfields on nutrient-poor sandy or clayey to peaty soil; rarely in moist roadside verges. Moderately common and widespread in the Netherlands. Apr.–July. Widespread and rare in Europe.

Agrocybe elatella can be difficult to distinguish from small forms of *A. praecox*. Reliable characters are the form and abundance of the cheilocystidia.

3. Agrocybe dura (Bolt.) Sing. in Beih. bot. Zbl. 56B: 165. 1936. – Fig. 204.

Agaricus durus Bolt., Hist. Fung. Halifax: 67. 1788; Pholiota dura (Bolt.) Kumm., Führ. Pilzk.: 84. 1871; *Dryophila dura* (Bolt.) Quél., Enchir. Fung.: 67. 1886; *Hylophila dura* (Bolt.) Quél., Fl. mycol. France: 97. 1888; *Togaria dura* (Bolt.) W.G. Sm., Synopsis Brit. Basidiomyc.: 123. 1908. — *Pholiota dura* var. *xanthophylla* Bres., Fungi trident. 2: 52. 1892; *Agrocybe dura* var. *xanthophylla* (Bres.) P.D. Orton in Trans. Br. mycol. Soc. 43: 174. 1960. — *Agaricus molestus* Lasch in Linnaea 3: 421. 1828; *Agrocybe molesta* (Lasch) Sing. in

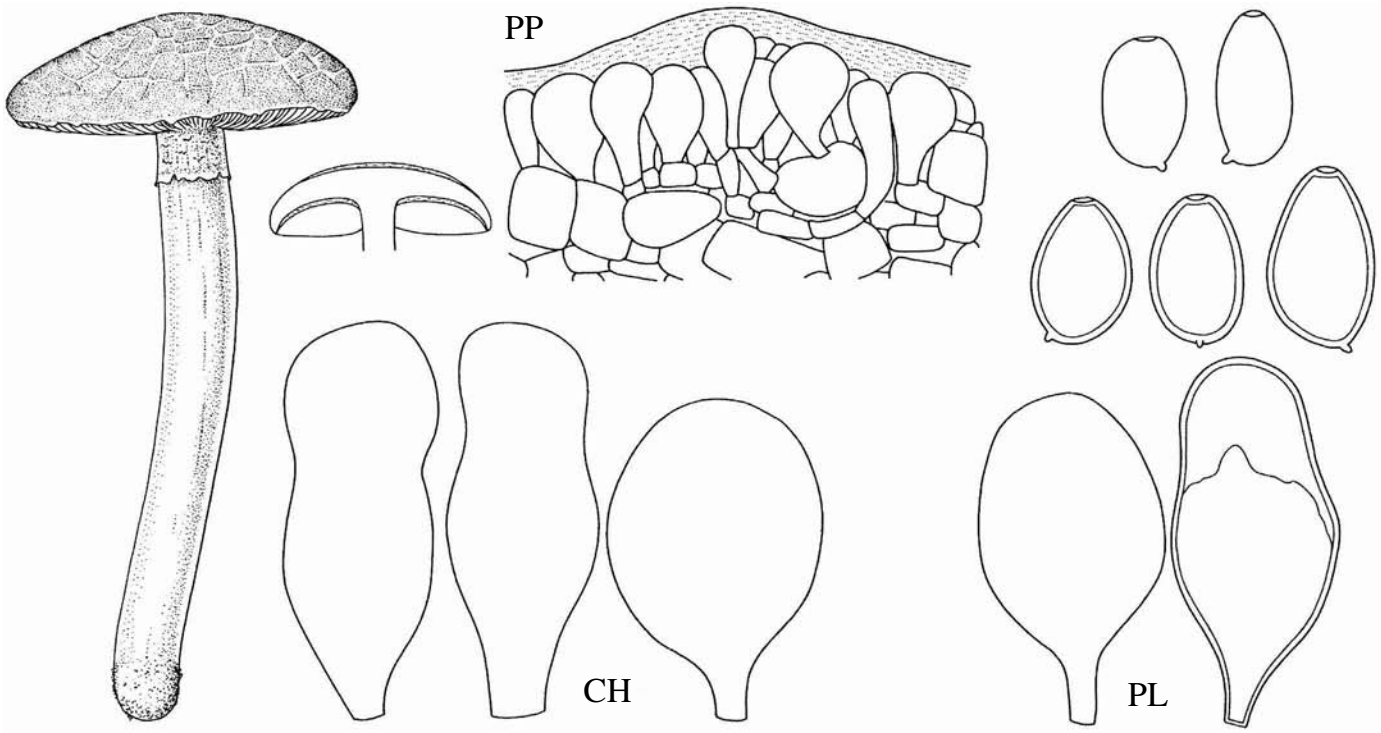


Fig. 204. *Agrocybe dura*

Sydowia 30: 197. ('1977') 1978. — *Agaricus vermifluus* Peck in Bull. N.Y. St. Mus. 31: 34. 1897; *Pholiota vermiflua* (Peck) Sacc., Syll. Fung. 5: 739. 1887; *Agrocybe vermiflua* (Peck) Watling in Kew Bull. 31: 592. 1976.

MISAPPL. — *Pholiota praecox* sensu Quél. in Mém. Soc. Émul. Montbéliard, Sér. II, 5: 124. 1872 (Champ. Jura Vosges 1).

SEL. ICON. — Dähncke, 1200 Pilze: 590. 1993; J. Lange, Fl. agar. dan. 3: pl. 105D. 1938; R. Phillips, Paddest. Schimm.: 170. 1981; Redeuilh in Bull. trimest. Soc. mycol. Fr. 109 Atlas: pl. 274. 1993.

SEL. DESCR. & FIGS. — M. Bon in Doc. mycol. 3(11): 53–54. 1973; Redeuilh in Bull. trimest. Soc. mycol. Fr. 109 Atlas: pl. 274. 1993; Watling in Br. Fung. Fl. 3: 18. 1982 (as *A. molesta*).

VERN. NAME — Barstende leemhoed.

Pileus (25)35–85 mm broad, at first hemispherical, expanding to convex or plano-convex or applanate, sometimes with faint umbo, with involute, later straight or inflexed margin, not hygrophanous, usually pale yellow-white to whitish with yellow hue to very pale yellowish brown (Mu. 2.5–5 Y 8/2–4), darkening when handled, at centre usually darker yellow or yellow-brown (2.5 Y 7-8/6-4); surface usually greasy to slightly viscid and shiny when moist, smooth at first, soon cracked to areolate-rimose, with few velar flocks; when young margin connected to stipe by fibrillose, ochraceous partial veil, later with often abundant appendiculate yellowish velar remnants. Lamellae, L = 40–55, l = 3–7, when young crowded, later more distant, emarginate with or without decurrent tooth to narrowly adnate, sometimes adnexed to free, rarely anastomozing, ventricose, up to 7(9) mm broad, at first pale brown to greyish brown (10 YR 5–6/2–4), later often orange-brown (7.5 YR 4/4), with especially at first white, irregularly dentate to flocculose edge. Stipe (35)45–90(110) × 3–9(16) mm, often when very young annulate, later only sometimes with velar remnants, cylindrical to subclavate, often enlarged near apex, straight to slightly flexuous, young narrowly fistulose, later widely fistulose, whitish to pale yellowish or yellowish brown (2.5Y 10 YR 8/2–4), above annulus smooth to striate and fibrillose or squamulose, below annulus strongly fibrillose, often with some yellowish brown squamules, sometimes with few, white rhizomorphs. Annulus at 0.80–0.90 of height of stipe, c. 1 mm wide, descending, at first spreading, fibrillose, rather soon disappearing, whitish, with striate upperside; underside furrowed. Context 4–9 mm thick in pileus, soft, whitish to ochraceous yellow, with thin gelatinous layer above lamellae, sometimes shiny yellow-brown at centre of stipe. Smell indistinct to raphanoid to fresh-sourish or fungoid, sometimes sweetish. Taste indistinct to fungoid or slightly sourish.

Spores 10.5–14.0(18.0) × 7.0–9.0(10.5) × 6.0–8.0(9.0) µm, on average 12.0–13.0 × 7.5–8.0(8.5) × 7.0–7.5(8.0) µm, in frontal view ellipsoid to oblong, often ovoid, Q = (1.25)1.40–1.85, Qav = (1.40)1.50–1.75, in side-view ellipsoid to oblong, sometimes amygdaliform, Q = 1.45–1.85(2.00), Qav =1.45–1.80, sometimes irregular and with papilla, thick-walled up to 0.8 µm, with apical, conspicuous, up to 1.5 µm wide germ pore; with light microscope yellow-brown. Basidia 25–35 × 7.0–12.0 µm, cylindrical, usually 4-spored, sometimes also 2-spored, slightly larger basidia present. Lamella edge sterile. Cheilocystidia of two types: constricted cylindrical or broadly utriform, 35–65 × 13–20(23) × 13–20 µm, rarely truncately fusiform; intermixed with clavate or ellipsoid elements on long pedicel of 25–45 × 9.0–19(28) µm; thin-walled, colourless or with yellowish brown agglutinated contents. Pleurocystidia scattered, 35–50 × 20–24.5 × 15–16.5 µm, usually long-stipitate ellipsoid or utriform, thin-walled, colourless or with yellowish contents. Pileipellis a 40–60 µm thick hymeniderm, consisting of erect clavate to cylindrical elements of 25–40 × 11–21 µm, with pale yellow intracellular or sometimes encrusting pigment, covered with 5.0–15 µm thick gelatinous layer; subpellis consisting of rounded rectangular elements of 15–30 × 7.0–17 µm, gradually passing into pileitrama. Stipitipellis a slightly gelatinised cutis of regularly arranged, unbranched, 4.0–5.0(7.0) µm wide hyphae with cylindrical elements, often with clavate terminal elements of

40–50 × 13–22 µm, with pale yellow intracellular pigment. Clamp-connections abundant in stipitipellis, at base of basidia; scarce but present in pileitrama, absent in pileipellis.

HABITAT & DISTR. — Solitary, sometimes in small groups, saprotrophic; terrestrial on nutrient-rich or disturbed places as grassy roadside verges or lawns on more or less sandy soil. Rarely on fallow land, on soil in deciduous woods or under shrubs, or on grassy places in the dunes. Rather common and widespread in the Netherlands. May–Sept. Rare but widespread in Europe.

In contrast to Singer (in Sydowia 30: 197. ['1977'] 1978) and in accordance with Watling (in Br. Fung. Fl. 3: 18. 1982) *Agrocybe molesta* and *A. dura* are here considered synonymous. The correct name is *Agrocybe dura*. Bolton's plate of *A. dura* seems to represent what is nowadays in Europe known under that name, though one specimen on this plate is slightly aberrant. Variety *xanthophylla* is considered not worth distinguishing, as the more yellow colour of the lamellae is caused by the presence of more pleurocystidia and hyphae with yellow pigment.

4**. Agrocybe rivulosa** Nauta in Persoonia 18: 272. 2003. – Fig. 205.

SEL. ICON.— G.J. Keizer, Interactieve paddestoelengids: 102. 2001. (as *Agrocybe* spec.)

SEL. DESCR. & FIGS. — G.J. Keizer, Interactieve paddestoelengids: 102. 2001. (as *Agrocybe* spec.); Nauta in Coolia 45: 58–59. 2002; Nauta in Persoonia 18: 272–273. 2003.

VERN. NAME — Geaderde leemhoed.

Pileus (30)40–100 mm broad, at first truncately conical, later convex to plano-convex or applanate with a conspicuous umbo, with straight margin, slightly exceeding lamellae, hygrophanous, in wet condition young warm brown, later yellow-brown (Mu. 10 YR 7/4–8) at centre, paler towards margin, pallescent on drying to pale yellowish brown at centre (10 YR 7/4–6), towards margin pale yellow (2.5 Y 8/2); surface young glutinous and smooth, later dry and strongly radially venose;

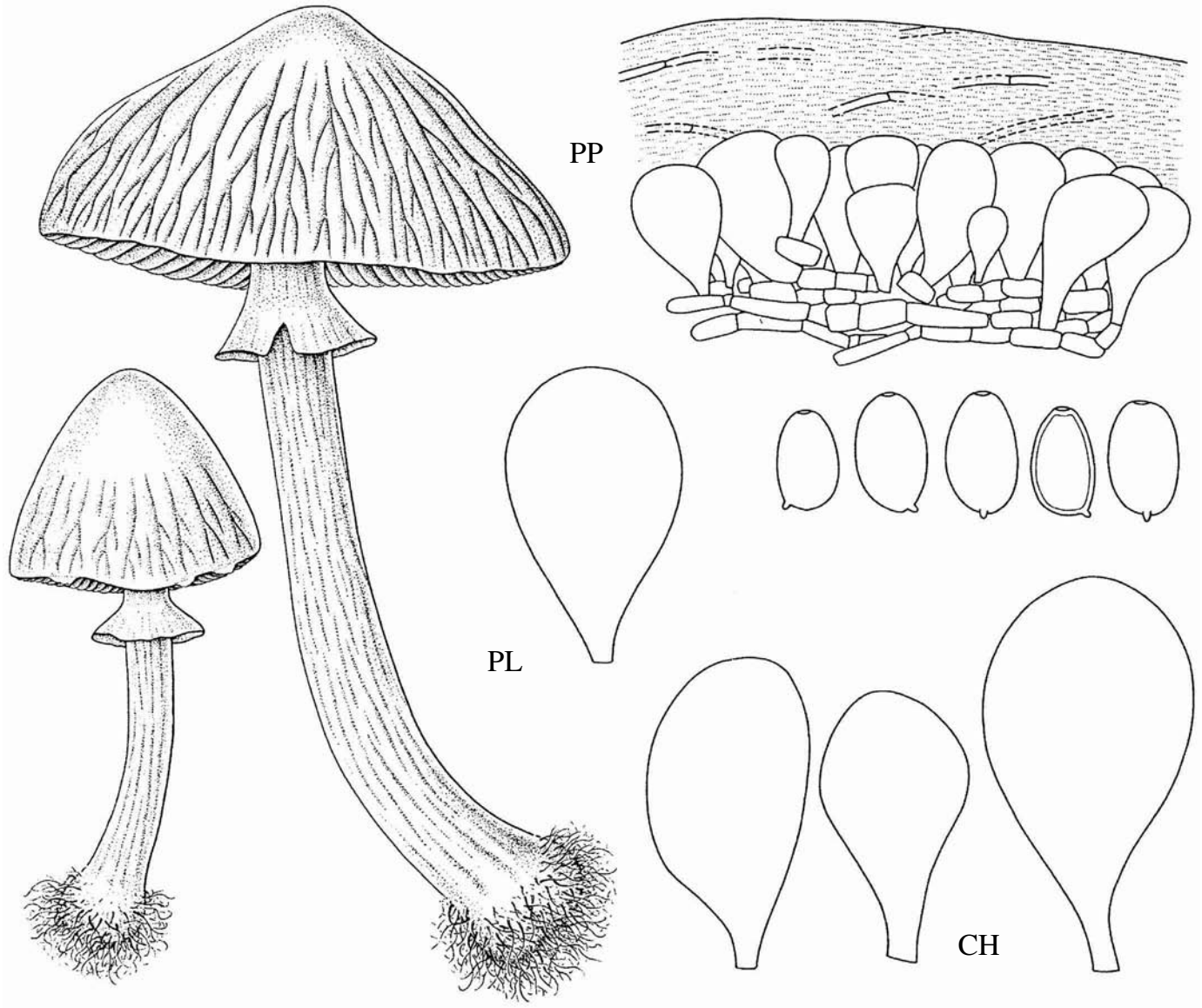


Fig. 205. *Agrocybe rivulosa*

young with dirty white to greyish veil, later margin with short fringe of veil remnants. Lamellae, L = 45–60, l = 1–3(7), crowded, emarginate, subventricose, 4–8 mm broad, at first pale yellow to grey-brown, later greyish brown (10 YR 6/3-4), later more brown (7.5 YR 4/4 , 10 YR 6/4), with slightly paler, minutely denticulate edge. Stipe 50–115 × (3)5–12 mm, annulate, cylindrical with bulbous base up to 16 mm, curved, broadly fistulose, white in upper part, pale yellowish brown downwards, becoming brownish on handling in lower part, above annulus smooth to pruinose, below annulus strongly striate-fibrillose; base often whitely tomentose, with several small white rhizomorphs, often with large mycelial tangle. Annulus at 0.60–0.75 of height of stipe, up to 10 mm wide, often partly attached to margin of pileus, descending, slightly spreading, fragile, thin, easily torn, whitish, with smooth to slightly striate upperside; underside smooth or sometimes fibrillose or with some small teeth at margin. Context 3 mm thick in pileus, tough, whitish to pale yellowish. Smell indistinct, pleasant, sometimes sweetish. Taste strongly farinaceous.

Spores 10.0–14.0 × (6.0)6.5–8.0(8.5) µm, on average 11.5–12.0 × 7.0–8.0 µm, Q = 1.45–1.80, Qav = (1.55)1.60–1.70, ellipsoid to oblong, in side-view often slightly amygdaliform, thick-walled, with a usually conspicuous, 0.8–1.5 µm wide apical germ pore; yellow-brown with light microscope. Basidia 20–30 × 8–10 µm, usually mostly 4-spored; few 2-spored basidia may be present. Lamella edge heterogeneous. Cheilocystidia (20)35–60 × (11)20–30(35) µm, clavate to pedicellate globose, thin-walled, colourless. Pleurocystidia scarce, of same size and shape as cheilocystidia, sometimes up to 130 × 60 µm. Pileipellis a 50–100 µm thick hymeniderm, consisting of erect, clavate to pedicellate globose elements of 20–40(55) × (14)20–30(35) µm, sometimes with irregular finger-like outgrowths, with intracellular, yellowish pigment, covered with an up to 50 µm thick gelatinous, amorphous layer. Veil present on pileus as patches, composed of irregularly interwoven, 3.0–5.0 µm wide hyphae intermixed with inflated elements of c. 30 × 24–28 µm, with intracellular and encrusting yellow pigment. Pileocystidia very scarce to absent, utriform, up to 50 × 15 µm. Stipitipellis a slightly gelatinised cutis of regular, unbranched, 4.0–5.5 µm wide hyphae with cylindrical elements, with pale yellowish intracellular pigment. Clamp-connections abundantly present in stipitipellis and pileipellis and veil, also present at base of basidia.

HABITAT & DISTR. — Gregarious to rarely fasciculate, saprotrophic; on heating heaps of wood-chips and on wood-chips along paths in city parks. Rare, mainly in the western part of the Netherlands, but spreading eastwards. Sept.–Dec. Also recorded from Luxembourg.

Sect. **Pediades** Sing. ex Nauta

Veil usually not well-developed; spores with a broad, 1.5–2.0 µm wide germ pore; spore width > 7 µm; pleurocystidia usually lacking.

5. Agrocybe pediades (Fr. :Fr.) Fay. in Annls Sci. nat., Sér. VII, 9: 358. 1889.

Agaricus pediades Fr. :Fr., Syst. mycol. 1: 290. 1821; *Naucoria pediades* (Fr. :Fr.) Kumm., Führ. Pilzk.: 78. 1871; *Simocybe pediades* (Fr. :Fr.) P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 427. 1879. — *Agaricus semiorbicularis* Bull., Herb. France: pl. 422. 1789; *Naucoria semiorbicularis* (Bull.) Gillet, Hyménomycètes: 548. 1876; *Simocybe semiorbicularis* (Bull.) P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 232. 1879; *Hylophila semiorbicularis* (Bull.) Quél., Fl. mycol. France: 88. 1888; *Agrocybe semiorbicularis* (Bull.) Fay. in Annls Sci. nat., Sér. VII, 9: 358. 1889. — *Agaricus pusillus* Schaeff., Fung. Bavariae 4: 45. 1774. — *Agaricus arenicola* Berk. in Lond. J. Bot. 2: 511. 1843; *Naucoria arenicola* (Berk.) Sacc., Syll. Fung. 5: 845. 1887; *Agrocybe arenicola* (Berk.) Sing. in Beih. bot. Zbl. 56B: 169. 1936. — *Naucoria arenaria* Peck in Bull. N.Y. St. Mus. 157: 29. 1912; *Agrocybe arenaria* (Peck) Sing. in Beih. Nova Hedwigia 29: 227. 1969. — *Naucoria subpediades* Murrill in Lloydia 5: 150. 1942; *Agrocybe subpediades* (Murrill) Watling in Kew Bull. 31: 592. 1977. — *Agrocybe splendida* Clémençon in Nova Hedwigia 28. 1977. — *Naucoria pediades* var. *obscuripes* Fay. in Verh. bot. Ver. Prov. Brandenb.: 226. 1889. — *Agrocybe semiorbicularis* f. *bispora* J.E. Sass in Am. J. Bot. 16: 680. 1929.

MISAPPL. — *Naucoria vervacti* sensu Rick., Blätterpilze: 210. 1915. *Agrocybe arvalis* sensu Sing. in Beih. bot. Zbl. 56B: 167. 1936.

KEY TO THE VARIETIES

1. Pileus also when old with conspicuous appendiculate veil at margin, later areolate-rimose at centre; on dung. . . . . 5c. var. **fimicola**
1. Pileus only when young sometimes with appendiculate veil at margin, smooth, not areolate-rimose; not on dung
   2. Stipe without annulus . . . . . 5a. var. **pediades**
   2. Stipe with annulus. . . . . 5b. var. **cinctula**

5a. var. **pediades** – Fig. 206.

SEL. ICON.— Dähncke, 1200 Pilze: 595 (as *A. semiorbicularis*), 596 (as *A. arenaria*). 1993; R. Phillips, Paddest. Schimm.: 168. 1981; Ryman & Holmåsen, Svampar: 438. 1984.

SEL. DESCR. & FIGS. — Michael et al., Handb. Pilzfr. 3. Aufl., 4: pl. 392. 1985 (as *A. semiorbicularis*); Nauta, Revisie Agrocybe: 30–32. 1987; Watling in Br. Fung. Fl. 3: 19–21. 1982 (as *A. pediades*, *A. semiorbicularis* and *A. subpediades*).

VERN. NAME — Grasleemhoed.

Pileus (5)10–30(50) mm broad, at first truncately conical to hemispherical, expanding to convex to plano-convex or almost applanate, with involute margin when young, later straight to deflexed, slightly hygrophanous, in wet condition yellow to yellow-brown or brown (Mu. 2.5 Y 7–8/4–6, 10 YR 5–8/4–8), sometimes paler towards margin, pallescent on drying; surface when wet weakly to strongly greasy to viscid; smooth to slightly rugulose; young sometimes with appendiculate veil remnants. Lamellae, L = 24–42, l = 1–3(7), moderately crowded, adnate to narrowly adnate, sometimes emarginate, sometimes decurrent with short tooth, straight to ventricose, up to 5.5 mm broad, at first pale brown to yellow-brown, sometimes light grey-brown with pinkish tinge (2.5 Y 5–7/4; 10 YR 4-6/3–4, 7.5 YR 5/4), later brown to dark brown, sometimes grey-brown (10 YR 5–7/3–8, 7.5 YR 3/2; 5–7.5 YR 5/4), with irregularly dentate to fimbriate, concolorous to white edge. Stipe 25–50(75) × 1.5–5(10) mm, cylindrical to often attenuated towards base, sometimes enlarged at base, sometimes subbulbous to bulbous, without annulus, straight, stuffed to narrowly fistulose, pale yellow, yellowish brown to pale brown (2.5 Y 7–8/6; 10 YR 7–8/4–6), weakly to strongly fibrillose, rarely dispersed squamulose, at apex slightly pruinose, at base often with short, thin to thick white rhizomorphs, occasionally agglutinated with sand, forming a clod. Context 2.5–3.5 mm thick in pileus, white to yellow-white to pale brown in pileus, slightly darker in stipe, sometimes with white medulla. Smell usually weakly to strongly farinaceous, sometimes indistinct. Taste usually weakly to strongly farinaceous, sometimes with bitter aftertaste.

Spores (10.5)11.5–18.5(20.0) × 7.5–12.0(15.0) × 7.0–10.5(12.5) µm, on average (12.0)12.5–16.0(17.0) × 8.0–11.0(13.0) × 8.0–9.5(10.5) µm, in frontal view usually (broadly) ellipsoid, sometimes oblong, sometimes ovoid, Q =1.25–1.70(1.85), Qav = (1.35)1.45–1.55(1.60), in side-view

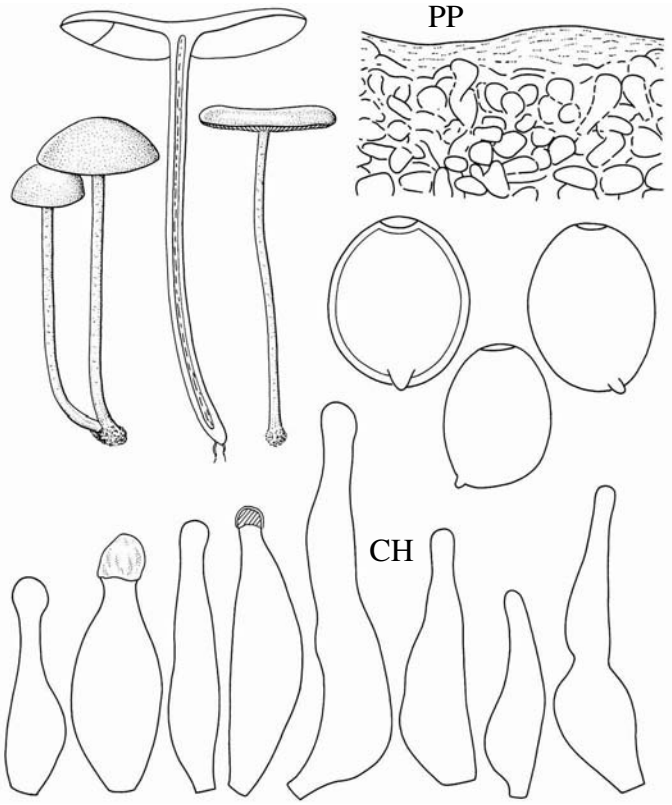


Fig. 206. *Agrocybe pediades* var. *pediades*

usually ellipsoid, occasionally oblong, sometimes amygdaliform, Q = (1.30)1.40–1.80(1.85), Qav =(1.35)1.45–1.60(1.65), thick-walled up to 1.0–1.5 µm, with apical, 1.5–2.0 µm wide germ pore; yellow-brown with light microscope. Basidia 20–35 × 7.0–13 µm, usually mixed 2- and 4-spored, sometimes only 4-spored, rarely only 2-spored, clavate to cylindrical. Lamella edge usually sterile. Cheilocystidia abundant, 20–45(54) × 8.0–14(16) × 1.0–8.0 × 2–7.5 µm, irregularly lageniform to narrowly utriform with subcapitate to capitate apex, sometimes clavate and then 15–28 × 8.0–13 µm, rarely conical and then 30–35 × 12 µm, rarely with acute apex, sometimes with mucilaginous bulb or clots at apex, sometimes with mucilaginous annulus, thin-walled, colourless, translucent. Pleurocystidia usually absent, sometimes scarcely present near edge, of similar size and form as cheilocystidia. Pileipellis 45–75(85) µm thick, sometimes entirely gelatinised, composed of an irregular hymeniderm, in old specimens only partially present, consisting of erect, clavate elements of 7.0–16 × 3–12 µm, with pale yellow intracellular pigment, covered with a 6.0–23 µm thick gelatinous amorphous layer; subpellis consisting of rounded rectangular elements of 6.0–12 × 2.5–7.0 µm, gradually passing into pileitrama. Stipitipellis a dry to often rather gelatinised, regular cutis of rarely branched, 3.5–6.0 µm wide hyphae with cylindrical elements, occasionally with recurved terminal elements, especially near apex of stipe, with pale yellow intracellular pigment. Clamp-connections rather abundant in stipitipellis, rather scarce in stipititrama and at base of cheilocystidia.

HABITAT & DISTR. — Solitary or in small groups, saprotrophic; terrestrial on nutrient-rich, usually disturbed places in grassy roadside verges, lawns, garden beds and grassy or open places in dunes. Very common in most of the Netherlands, less common in the southeast. May–June; occasionally till Nov. Widespread and common in Europe, cosmopolitan.

Agrocybe pediades is an extremely variable species. Although in western Europe many authors distinguish several species close to *A. pediades* based on morphological characters such as pileus colour, viscidity, amount of veil, shape of pileus, spore size, thorough morphological studies have demonstrated most species to be synonymous with *A. pediades.* The variation in spore size is usually caused by the amount of 2-spored basidia. For an extensive discussion see Nauta (in Persoonia 18: 429–432. 2005.

Agrocybe temulenta (Fr. :Fr.) Sing. sensu Watling (in Br. Fung. Fl. 3: 21. 1982) is very close to *A. pediades*. It differs, apart from faint colour differences in the pileus, in the presence of pleurocystidia, and may be the same as *A. ochracea* Nauta.

5b. var. **cinctula** Nauta in Persoonia 18: 429. 2004. – Fig. 207.

CHARACTERISTICS — Differing from the typical variety in the presence of an annulus. Microscopically not different from var. *pediades*.

HABITAT & DISTR. — Solitary, saprotrophic, terrestrial in grasslands or roadside verges. Rare in the Netherlands. July–Oct. Probably widespread but rare in Europe.

Agrocybe pediades var. *cinctula* may be the same taxon as Singer had in mind (in Trudy bot. Inst. Akad. Nauk SSSR, Ser. II, 6: 457. 1950) when he published a description of *A. pediades* var. *annulata* (invalid: nomen nudum).

5c. var. **fimicola** (Speg.) Nauta in Persoonia 18: 432. 2004.

Naucoria fimicola Speg. in An. Mus. nac. Hist. nat. B. Aires 6: 133. 1899; Agrocybe fimicola (Speg.) Sing. in Lilloa 23: 209. 1950.

SEL. ICON.— Consiglio in Boll. Gruppo micol. G. Bres. 42: 68. 1999 (as *A. subpediades*).

CHARACTERISTICS — Differing from the typical variety in the presence of conspicuous appendiculate floccose veil at margin of pileus, also when mature, and in a later stage areolate-rimose pileus.

Spores 12.0–14.5(15.5) × 8.5–9.5 × 7.5–8.5 µm, on average 13.0 × 9.0 × 8.5 µm. Basidia usually 4-spored, some 2-spored present. Further microscopically not differing from var. *pediades*.

HABITAT & DISTR. — Gregarious or solitary, saprotrophic, on dung of cow (or horse) in grasslands in the coastal dunes. Very rare in the Netherlands (Vogelenzang, Amsterdamse Waterleidingduinen), but

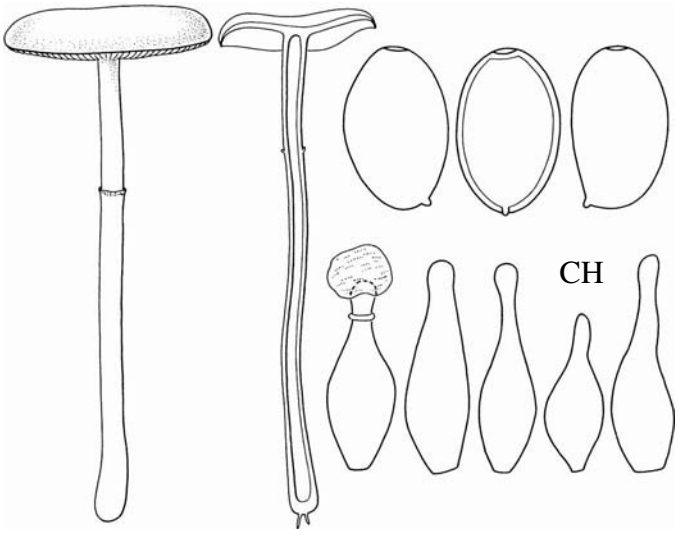


Fig. 207. *Agrocybe pediades* var. *cinctula*

probably overlooked. July. Very rare in Europe (Italy), probably more widespread. Also known from the Americas.

6. Agrocybe ochracea Nauta in Persoonia 18: 429. 2004. – Fig. 208.

Pileus 10–28 mm broad, convex, ochraceous yellow, at centre usually more brownish, at margin paler; surface smooth, viscid. Lamellae, L = c. 60, l = 1–3, moderately crowded, adnate to narrowly adnate, ventricose, up to 3 mm broad, brown. Stipe 30–50 × 2–4 mm, without annulus, cylindrical to slightly enlarged towards base, pale yellow, towards base slightly brownish, fistulose, slightly fibrillose. Context 2 mm thick in pileus, whitish. Smell farinaceous when cut.

Spores 11.5–15.5 × 8.5–11.0(12.0) × 8.0–9.5(10.0) µm, on average 13.5–14.0 × 9.5–10.0 × 8.5–9.5 µm, ellipsoid, in frontal view Q = 1.25–1.55, Qav = 1.40–1.45, in side-view Q= 1.40–1.75(1.80), Qav = 1.50–1.55, thick-walled up to 1.1 µm, with wide and sometimes slightly eccentrical germ pore of 1.5–2.0 µm wide; yellow-brown with light microscope. Basidia 20–30 × 10–12 µm, usually a mixture of 4- and 2-spored in the ratio of 3:1. Lamella edge almost sterile. Cheilocystidia abundant, (15)25–35(40) × 5.0–15(17.5) × 2.0–5.0(7.0) × 2.0–5.0(8.0) µm, lageniform, often (sub)capitate, sometimes lecythiform, with slightly thickened walls, with colourless contents. Pleurocystidia rather abundant, 35–55 × 12–18 × (3.0–4.0 ×) 4.0–9.5(12.0) µm, of different size or shape than cheilocystidia, lageniform to utriform or lecythiform, sometimes multi-apiculate, often with mucilaginous cap, with slightly enlarged walls up to 2 µm, translucent, colourless. Pileipellis 55–85 µm thick, strongly gelatinised, composed of an irregular hymeniderm, consisting of erect, clavate elements of 15–30 × 8.0–11(17) µm, with pale yellowish intracellular pigment, covered with a gelatinous, 8.0–15 µm thick layer composed of remnants of 2.5–3.5 µm wide hyphae; subpellis gelatinised, consisting of rounded rectangular elements of 6.0–15 × 2.5–4.5 µm, gradually passing into pileitrama. Stipitipellis a slightly gelatinised cutis of unbranched, 2.0–4.5 µm wide hyphae with cylindrical elements, with pale yellowish intracellular or parietal pigment. Clamp-connections abundant in stipitipellis, pileipellis, and at base of basidia and cheilocystidia.

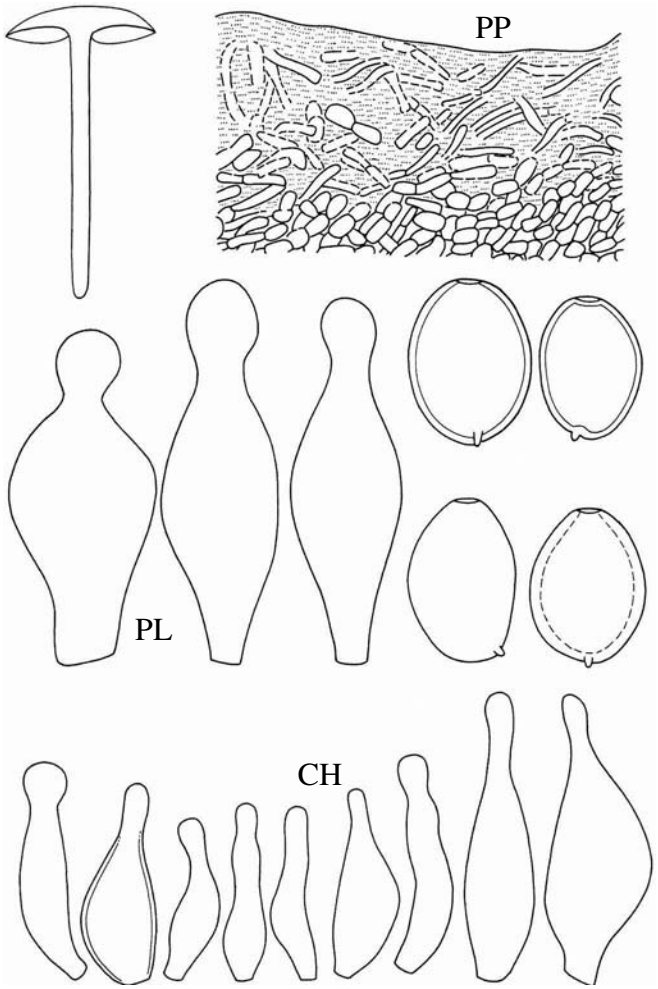


Fig. 208. *Agrocybe ochracea*

HABITAT & DISTR. — Gregarious, saprotrophic; terrestrial on soil mixed with wood-chips at verge of a parking place in mixed forest. Very rare in the Netherlands (Breda, Mastbos), but probably confused with *A. pediades*; May. Also recorded from Portugal (Azores), Italy (Migliozzi & Coccia in Micol. ital. 1: 27–28. 1993; as *A. temulenta* sensu Watling), probably more widespread.

This taxon may be the same as *A. temulenta* sensu Watling (in Br. Fung. Fl. 3: 22. 1982). Because of the different interpretations of Singer (in Beih. bot. Zbl. 56B: 167. 1936. = *A. arvalis*) and Watling, which are partly in contrast with the original description of Fries (Syst. mycol. 1: 268. 1821), and because of the absence of original material of *A. temulenta*, this name may best be considered as ambiguous.

For an extensive discussion see Nauta (in Persoonia 18: 429–430. 2004.

Sect. **Microsporae** Sing.

Germ pore narrow, up to 1.0 µm; pileocystidia present.

7. Agrocybe arvalis (Fr. :Fr.) Heim & Romagn. in Bull. trimest. Soc. mycol. Fr. 50: 171. 1934. – Fig. 209.

Agaricus arvalis Fr. :Fr., Syst. mycol. 1: 263. 1821; *Naucoria arvalis* (Fr. :Fr.) Gillet, Hyménomycètes: 548. 1878; *Simocybe arvalis* (Fr. :Fr.) P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 428. 1879. — *Agaricus perpendicularis* Bull., Herb. France: pl. 422–2. 1789. — *Galera arvalis* var. *tuberigena* Quél. in C. r. Ass. franç. Av. Sci. 18: 510. 1890 (Champ. Jura Vosges 17); *Agrocybe tuberigena* (Quél.) Romagn. in Bull. trimest. Soc. mycol. Fr. 58: 127. 1942; *Naucoria arvalis* var. *tuberigena* (Quél.) Pears. & Dennis in Trans. Br. mycol. Soc. 31: 174. 1948. — *Naucoria tuberosa* P. Henn. in Hedwigia 42: 310. 1903; *Agrocybe tuberosa* (P. Henn.) Sing. in Beih. bot. Zbl. 56B: 167. 1936. — *Naucoria scleroticola* C.G. Lloyd in Mycol. Notes 51: 722. 1917; *Naucoria sclerotina* Velen. in Mykologia 1(9): 144. 1924.

EXCL. — *Agrocybe arvalis* sensu Sing. in Beih. bot. Zbl. 56B: 167. 1936. (= *A. pediades*)

MISAPPL. — *Naucoria temulenta* sensu Rick., Blätterpilze: 213. 1915; *Agrocybe temulenta* sensu Sing. in Beih. bot. Zbl. 56B: 167. 1936.

SEL. ICON. — Dähncke, 1200 Pilze: 594. 1993; Enderle in Boll. Gruppo micol. G. Bres. 42: 166. 1999; J. Lange, Fl. agar. dan. 4: pl. 126D. 1939.

SEL. DESCR. & FIGS. — Göpfert in Schweiz. Z. Pilzk. 84: 128. 1984; Nauta, Revisie Agrocybe: 65–67. 1987; Watling in Br. Fung. Fl. 3: 22. 1982.

VERN. NAME — Knolletjesleemhoed.

Pileus 10–40(50) mm broad, young sometimes hemispherical, later convex with flattened centre to plano-convex, young with inflexed, sometimes involute, later straight margin, in wet condition often trans-

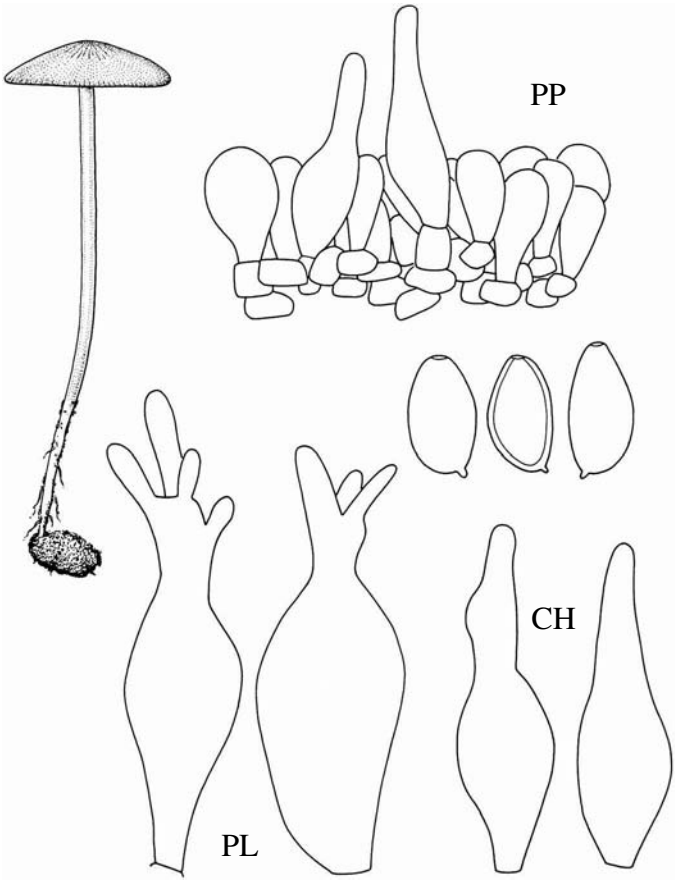


Fig. 209. *Agrocybe arvalis*

lucently striate, hygrophanous, in wet condition yellow-brown (Mu. 10 YR 5–6/6–8; 5 YR 5/8, 2.5 Y 6/6–7.5 YR 5/8), at centre sometimes darker (7.5 YR 5/8), towards margin usually paler, pallescent on drying to pale yellow-brown (10 YR 7/8–2.5 Y 8/4–8); surface dry, rarely weakly viscid when moist, usually partly rugulose, or smooth and glabrous. Lamellae, L = 30–45, l = 3–7, young crowded, later more distant, emarginate to adnexed, ventricose, up to 6(8) mm broad, at first pale brown to pale greyish brown (10 YR 5/8, 10 YR 8/3–7.5 YR 6/6), later dark yellowish brown (10 YR 3-4/4),with paler to white, irregularly denticulate edge. Stipe (10)30–70(130) × 1.5–5.0(6.0) mm, cylindrical, sometimes subbulbous and at base up to 9 mm broad, straight, narrowly fistulose, yellowish white to pale yellow-brown, pruinose to granulose or flocculose, especially at apex, or fibrillose, usually with short to long white rhizomorphs, sometimes with pseudorhiza, often attached to sclerotium. Sclerotium irregularly ellipsoid, up to 18 mm in diametre, firm; surface dark grey-brown to blackish brown (10 YR 3/4), wrinkled; inside whitish. Context 1.0–1.5 mm thick in pileus, whitish to ochraceous yellow, white to yellow-brown in centre of stipe. Smell indistinct to pleasant or (weakly) farinaceous, especially when cut. Taste slightly bitter to farinaceous with bitter aftertaste.

Spores 8.0–10.5 × 4.5–6.0 µm, on average 9.0–9.5 × 5.0–5.5 µm, Q = 1.60–2.10(2.25), Qav = 1.80–1.95, ellipsoid to oblong to subcylindrical, sometimes ovoid, thick-walled up to 0.6 µm, with narrow apical germ pore up to 1.0 µm; light yellow-brown with light microscope. Basidia 20–25 × 6.5–7.5(8.5) µm, 4-spored. Lamella edge sterile. Cheilocystidia 20–55(60) × (7.5)9–20 × 2.5–6.5 µm, usually lageniform, sometimes conical, sometimes bifurcate, sometimes apically with several fingerlike projections, thin-walled. Pleurocystidia in young specimens abundant and similar to cheilocystidia, later rather scarce, 35–55 × 10–23(26) × 3–15 µm, usually lageniform with few fingerlike projections of 3.5–20(45) × 2.0–4.0 µm, sometimes utriform, thin-walled. Pileipellis a 35–50 µm thick sometimes gelatinised hymeniderm of clavate elements, 15–25 × 5.0–11 µm, sometimes covered with thin, c. 1 µm thick gelatinous layer, with pale yellow intracellular or parietal pigment; subpellis consisting of rounded rectangular elements of 4.0–11 × 4.0–6.0 µm, gradually passing into pileitrama. Pileocystidia scattered, sometimes absent, 35–50 × 9.0–12 × 4.0–6.0 µm, conical to lageniform. Stipitipellis a cutis of unbranched, 2.5–4.5 µm wide hyphae of cylindrical elements, often with differentiated terminal elements, with pale yellowish intracellular pigment. Caulocystidia at apex of stipe abundant, lower rarer but present over whole length of stipe, usually in clusters, 35–60(100) × 9.0–13 × 2.5–5.5 µm, lageniform, somewhat thick-walled up to 1.0 µm, colourless or with yellow-brown contents. Clamp-connections abundant in stipitipellis and in centre of stipe, rather scarce at base of basidia, cheilocystidia and pleurocystidia, and in lamella trama and cortex of stipe.

HABITAT & DISTR. — Solitary or in small groups, saprotrophic; usually terrestrial, on litter, or among wood-chips in city parks, deciduous woods or avenues on humus-rich sandy soil. Rather rare in the Netherlands. June–Oct. Widespread in Europe.

8. Agrocybe putaminum (Maire) Sing. in Beih. bot. Zbl. 56B: 167. 1936. – Fig. 210.

Naucoria putaminum Maire in Annls mycol. 11: 350. 1913.

SEL. ICON. — Legros in Bull. trimest. Soc. mycol. Fr. 112, Atlas: pl. 313. 1996; Pegler & Legon in Mycologist 12: 60. 1998; Rald in Svampe 19: 40. 1989.

SEL. DESCR. & FIGS. — Bas in Blumea, Suppl. 4: 141. 1958; Colin & Joss. in Bull. mens. Soc. linn. Lyon 36: 443. 1967; Derbsch in Z. Pilzk. 42: 161. 1976; Pegler & Legon in Mycologist 12: 60. 1998.

VERN. NAME — Fluweelleemhoed.

Pileus (10)30–70(90) mm broad, at first truncately conical to hemispherical, expanding to irregular convex or plano-convex, sometimes with faint umbo, with inflexed to deflexed margin when young, later straight to sometimes reflexed margin, not hygrophanous, young ochraceous yellow to bright yellow-brown (Mu. 7.5 YR 5/6–8), later uniformly yellow-brown or dark yellow- to rustbrown (7.5–10 YR 5–8/6–8, 8/4); surface dry, velutinous, especially when young, at margin later often slightly rugulose. Lamellae, L = 30–60, l = (1)3–7, crowded, adnate to narrowly adnate, sometimes with decurrent tooth, (sub)ventricose, (3.5)6–14 mm broad, at first pale yellow to pale brown (2.5 Y 8/4, 7/6; 2.5 Y–10 YR 8/6; 10 YR 7/3–4), later brown (10 YR 7/4, 5–6/6, 7.5 YR 5/6–8), with concolorous to whitish, entire to denticulate edge. Stipe (15)25–80 × 4–8(10) mm, not annulate, clavate, sometimes subbulbous and at base up to 15 mm broad, straight, stuffed or (later) narrowly fistulose, at first uniformly pale brown to pale yellow (2.5 Y 8/4; 10 YR 7–8/3–4, 7/6), soon towards base browner (10 YR 5–8/6), also on handling, strongly fibrillose, or dark brown granulose-flocculose, especially in lower half, often with rhizomorphs. Context 2.5–6 mm thick in pileus, firm, whitish to pale brown (10 YR 8/2), darkening when cut (10 YR 5/6), especially in base of stipe. Smell indistinct to aromatic, farinaceous when cut. Taste weakly to strongly farinaceous, often with weak to strong, bitter aftertaste.

Spores 9.5–13.5(15.5) × 6.0–8.0(8.5) × 5.5–7.0 µm, on average 10.5–11.5 × 6.0–7.0 × 6.0–7.0 µm, Q = (1.45)1.65–2.05, Qav = 1.70–1.85(1.90), ellipsoid to oblong, moderately thick-walled up to 0.8 µm, with narrow apical germ pore up to 1.2 µm wide; yellow-brown with light microscope. Basidia 25–35 × 8.0–10(12.5) µm, 4-spored.

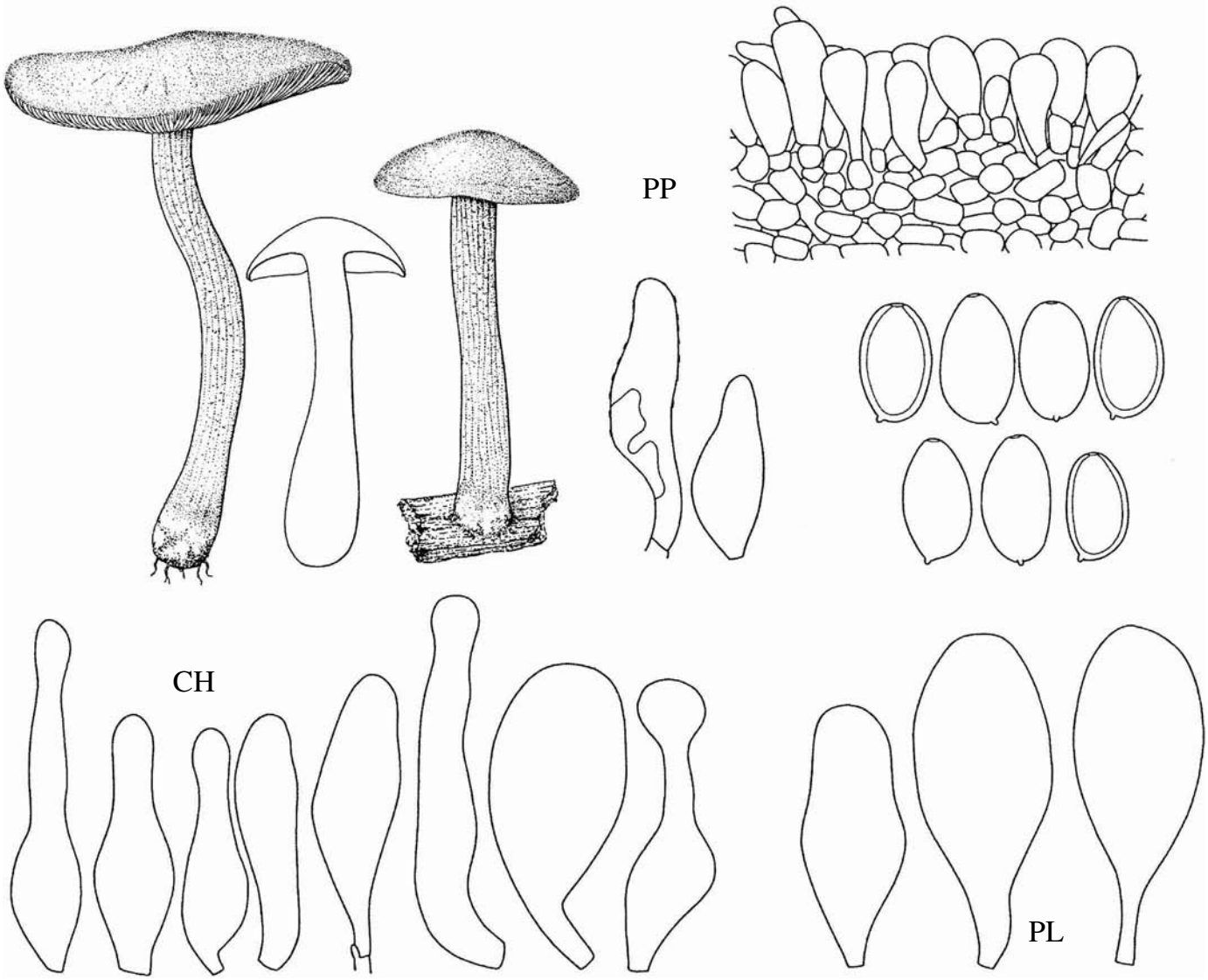


Fig. 210. *Agrocybe putaminum*

Lamella edge usually sterile. Cheilocystidia 25–60 × 7.5–14.0 × 4.5–6.5 µm, variable, mostly lageniform to narrowly utriform, usually (sub)capitate, sometimes clavate and then 20–30 × 7.5–10 µm, sometimes with mucilaginous matter around apex, thin-walled, sometimes with yellow-brown refractive contents. Pleurocystidia scattered to rather abundant, inconspicuous, 35–55 × 10–20 µm, usually clavate, or narrowly utriform and then 35–50(65) × 9.0–16 × 8.0–13 µm, sometimes with crystals at apex, thin-walled, often with brown or yellowish refractive contents. Pileipellis a 40–65 µm thick irregular hymeniderm with transitions to an epithelium of erect, irregularly clavate, 20–35 × 12–15 µm elements, with sometimes irregular outgrowths, with pale yellow to brown encrusting or parietal pigment; subpellis composed of rounded rectangular elements of 6.0–19 × 5.0–11 µm, gradually passing into pileitrama. Pileocystidia scattered to abundant, 25–40 × 6.5–16 × 4.5–6.0 µm, lageniform to utriform, sometimes subcapitate, thin-walled, sometimes with encrusting brown pigment, sometimes with brown contents. Stipitipellis a dry regular cutis of unbranched, 3.0–5.0 µm wide hyphae with cylindrical elements. Caulocystidia abundant, clustered and recurved, 30–55 × 12–19 × 5.0–11 µm, usually lageniform, rarely utriform, thin-walled, usually with brown contents. Clamp-connections rather scarce, in stipitipellis, stipititrama and at base of basidia.

HABITAT & DISTR. — Gregarious, sometimes fasciculate, saprotrophic; on buried wood or wood-chips in roadside verges, in gardens, on ruderal places. Recently increased in the Netherlands, now rather rare, predominantly occurring in the west. June–Dec. Rare in western Europe.

Subgen. **Aporus** Sing.

Germ pore absent or inconspicuous and narrow.

9. Agrocybe cylindrica (DC. :Fr.) Maire in Mém. Soc. Sci. nat. Maroc 45: 106. 1937. – Fig. 211.

Agaricus cylindraceus DC. in DC. & Lam., Fl. franç. 5: 51. 1815; *Agaricus cylindricus* DC. :Fr., Syst. mycol., Index gen.: 16. 1832. — *Agaricus attenuatus* DC. in DC. & Lam., Fl. franç. 5: 51. 1815; *Agaricus attenuatus* DC. :Fr., Syst. mycol., Index gen.: 8. 1832. — *Agaricus*

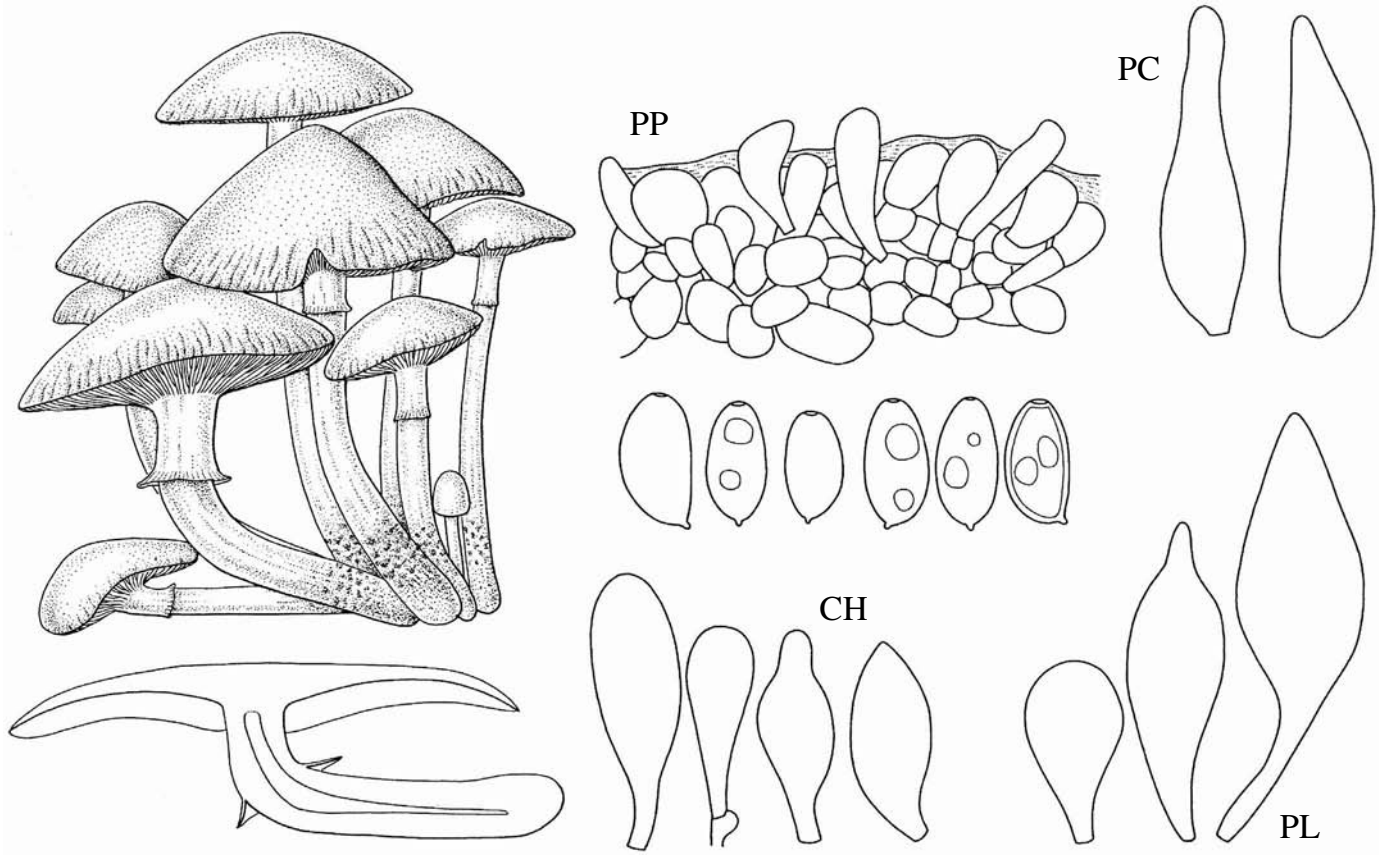


Fig. 211. *Agrocybe cylindrica*

pudicus Bull. in Bull. & Vent., Hist. Champ. Fr.: 635. 1812; *Pholiota pudica* (Bull.) Gillet, Hyménomycètes: 439. 1874. — *Agaricus aegirita* Brig., Hist Fung. Neapol.: pl. 1. 1824; *Pholiota aegirita* (Brig.) Quél. in Mém. Soc. Émul. Montbéliard, Sér. II, 5: 249. 1872 (Champ. Jura Vosges 1) (as *P. aegerita*); *Agrocybe aegirita* (Brig.) Sing. in Schweiz. Z. Pilzk. 27: 97. 1939.

SEL. ICON. — Marchand, Champ. Nord Midi 1: pl. 21. 1971; R. Phillips, Paddest. Schimm.: 170. 1981; Dähncke, 1200 Pilze: 589. 1993 (as *A. aegerita*).

SEL. DESCR. & FIGS. — Nauta, Revisie Agrocybe: 80. 1987; Schwegler in Beitr. Kenntn. Pilze Mitteleur. 2: 163. 1986; Watling in Br. Fung. Fl. 3: 27. 1982.

VERN. NAME — Populierleemhoed.

Pileus (5)20–110(150) mm broad, at first convex, sometimes hemispherical, soon expanding to irregular plano-convex or applanate, with inflexed, later straight margin, not hygrophanous, young entirely brown to greyish brown, later at centre yellowish white to pale yellow-brown or pale brown (Mu. 7.5 YR 5/6, 10 YR 7/6–8/4), near margin paler; surface young greasy, later often velutinous, later usually areolate-rim(µl)ose, rarely rugose or radially venulose; margin later split, sometimes with attached veil remnants. Lamellae, L = 45–60, l = 3–7, rather crowded, adnate to emarginate, often with decurrent tooth, arcuate, up to 6(12) mm broad, at first yellowish white to pale brown (10 YR 6–8/4), later darker to pale to dark yellow-brown (10 YR 4–5/4–6, 7.5 YR 4–5/4), with paler to whitish, pruinose to granulose edge. Stipe (25)40–110 × 4–16 mm, annulate, cylindrical to slightly enlarged at base, usually curved, stuffed, whitish to pale brown, browner on handling, above annulus sometimes pruinose, below annulus fibrillose to squamulose. Annulus at 0.75–0.80 of height of stipe, 6–10 mm wide, descending, pendant to patent, rather thin, white to pale brown, with smooth to sometimes striate upperside; underside flocculose-squamulose. Context 3–4 mm thick in pileus, whitish to pale brown, slightly darker when cut. Smell aromatic, spicy. Taste weakly unpleasant.

Spores 8.5–12.5(15.5) × 5.0–7.0(8.0) × 4.5–6.5 µm, on average 9.5–11.0 × 5.5–6.0 × 5.0–5.5 µm, in frontal view Q = 1.50–2.10(2.30), Qav = 1.70–1.85(2.00), in side-view Q = 1.55–2.15(2.30), Qav = 1.70–1.95, oblong, sometimes slightly phaseoliform, thick-walled up to 1.0 µm, with or without apical germ pore up to 0.5 µm wide, often with 1–2 oil drops; with light microscope pale brown. Basidia 20–30 × 6.0–10.5 µm, usually solely 4-spored, occasionally also 2-spored present. Lamella edge sterile. Cheilocystidia (15)20–40(45) × 7.0–16(19) µm, clavate, intermixed with some lageniform or utriform elements of 25–35 × 10–11 × 4.5–5.5 µm, thin-walled, colourless. Pleurocystidia scattered, (15)25–55 × 9.5–19 µm, clavate to fusiform, with slightly thickened walls, without contents. Pileipellis a 60–95(110) thick hymeniderm of clavate to obovoid erect elements, 25–35 × 12–20 µm, with pale yellowish parietal or intracellular pigment; subpellis composed of horizontal rounded rectangular elements of 8–15.5 × 3.0–6.0(10) µm, gradually passing into pileitrama. Pileocystidia usually rather abundant, 35–40 × 8.0–13 µm, clavate, or lageniform and then 30–45 × 7.5–13 × 3.0–6.5 µm, thin-walled, with colourless or brownish contents. Stipitipellis a slightly gelatinised cutis of unbranched, 3.0–4.0 µm wide hyphae with cylindrical elements, without caulocystidia. Clamp-connections abundant in stipitipellis and veil, rather scarce in stipititrama and at base of lamellar cystidia.

HABITAT & DISTR. — Usually fasciculate or gregarious, saprotrophic; on trees, trunks, buried wood, or on wood-chips of deciduous trees, especially of *Populus* or *Salix*. Seems to be increasing and spreading in the Netherlands, now moderately common, predominantly in southwestern part of the Netherlands and there rather common. May–Aug. Rare but widespread in Europe, especially in southern parts. Cosmopolitan.

Fries (Syst. mycol., Index gen.: 16. 1832) sanctioned the name and the spelling of this species, which was originally described as *Agaricus cylindraceus*, and is commonly known as *Agrocybe cylindracea*.

Agrocybe cylindrica is edible and widely cultivated.

10. Agrocybe erebia (Fr. :Fr.) Sing. in Schweiz. Z. Pilzk. 17: 97.1939. – Fig. 212.

Agaricus erebius Fr. :Fr., Syst. mycol. 1: 246. 1821; *Pholiota erebia* (Fr. :Fr.) Gillet, Hyménomycètes: 431. 1874. — *Agaricus leveilleanus* Dozy & Molkenboer in Tijdschr. nat. Gesch. Phys. 12: 277. 1845. — *Agaricus jecorinus* B. & Br. in Ann. Mag. nat. Hist. 2: 260. 1848. — *Pholiota phragmatophylla* Guern. in Gillet, Hyménomycètes: 433. 1874. — *Pholiota washingtonensis* Murrill in Mycologia 4: 259. 1912. — *Inocybe annulata* Velen., České Houby: 371. 1920. — *Agaricus denigratus* var. *geophilus* Fr. in Öfvers. K. Vetensk. Akad. Förh. Stockholm 18(1): 19. 1861.

MISAPPL. — *Agrocybe ombrophila* sensu M. Bon in Bull. Féd. mycol. Dauph. Savoie 76: 32–36. 1980, sensu Mos., Röhrlinge Blätterpilze, 4. Aufl.: 286. 1978; *Agrocybe brunneola* sensu M. Bon in Bull. Féd. mycol. Dauph. Savoie 76: 32–36. 1980; sensu Watling in Br. Fung. Fl. 3: 28. 1982.

SEL. ICON. — Dähncke, 1200 Pilze: 588. 1993; R. Phillips, Paddest. Schimm.: 169. 1981; Michael et al., Handb. Pilzfr., 3. Aufl., 4: pl. 223. 1985.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 51: 9. 1985; Nauta, Revisie Agrocybe: 86. 1987; Watling in Br. Fung. Fl. 3: 29. 1982.

VERN. NAME — Leverkleurige leemhoed.

Pileus (15)20–70 mm broad, at first truncately conical, expanding to convex or plano-convex, later applanate or concave, usually with blunt umbo, when young with deflexed, later reflexed margin, hygrophanous, when moist at centre dark yellow-brown, dark brown to dark reddish brown (Mu. 5-10 YR 4–5/6, 5 YR 3/2–7.5 YR 3/4, 5 YR 3/3, 7.5 YR 5/3), towards margin paler, pallescent on drying to light brown or brown at centre (7.5 YR 4-5/4), when moist at margin conspicuously translucently striate; surface when moist viscid, often rugulose; marginal zone with whitish velar flocks. Lamellae, L = 25–45, l = (3)5–9, rather crowded, adnate with decurrent ridges along stipe, sometimes emarginate, subventricose, sometimes segmentiform or arcuate, sometimes anastomozing, up to 4–7 mm broad, at first pale brown to grey-brown (10 YR 7/4), later pale yellow-brown to brown or dark grey-brown (5 YR 5–6/3, 10 YR 7–6/4, 7.5 YR 5/2–4), with paler to white, denticulate edge. Stipe (25)35–65(100) × 3–10(16) mm, annulate, cylindrical to slightly flattened, often slightly enlarged at base, straight, stuffed, whitish to pale brown (10 YR 7/4), at base and on handling darker brown, above annulus with ridges, below annulus fibrillose-squamulose. Annulus at 0.65–0.80 of height of stipe, up to 9 mm wide, descending, slightly spreading, fibrillose, persistent, white to pale brown, with striate upperside; underside smooth. Context 2–4 mm thick in pileus, whitish to dirty brown, darker in base of stipe. Smell pleasant, aromatic, rarely slightly farinaceous. Taste usually farinaceous, with bitter aftertaste.

Spores (9.0)10.0–15.0 × (5.0)5.5–7.0(7.5) µm, on average 11.5–13.0 × 6.0–6.5 µm, Q = (1.50)1.65–2.35(2.45), Qav = 1.90–2.15, aberrant spores up to 18 µm occur, oblong, ovoid to amygdaliform, thick-walled up to 0.7 µm, without germ pore, often with thin-walled apical spot; with light microscope yellow-brown. Basidia 25–40 × 5.0–9.0 µm, usually 2-spored, sometimes a few 3- or 4-spored basidia present. Lamella edge sterile. Cheilocystidia variable, a mixture of clavate elements of 20–45 × (5)7.5–15.5 µm, and lageniform to narrowly utriform elements of 20–75 × 8.0–28 × 5.0–10 µm, sometimes with crystalline matter around apex, thin-walled, colourless. Pleurocystidia scattered to abundant, 32–82 × (11)12– 20(27) × 6.0–10 µm,

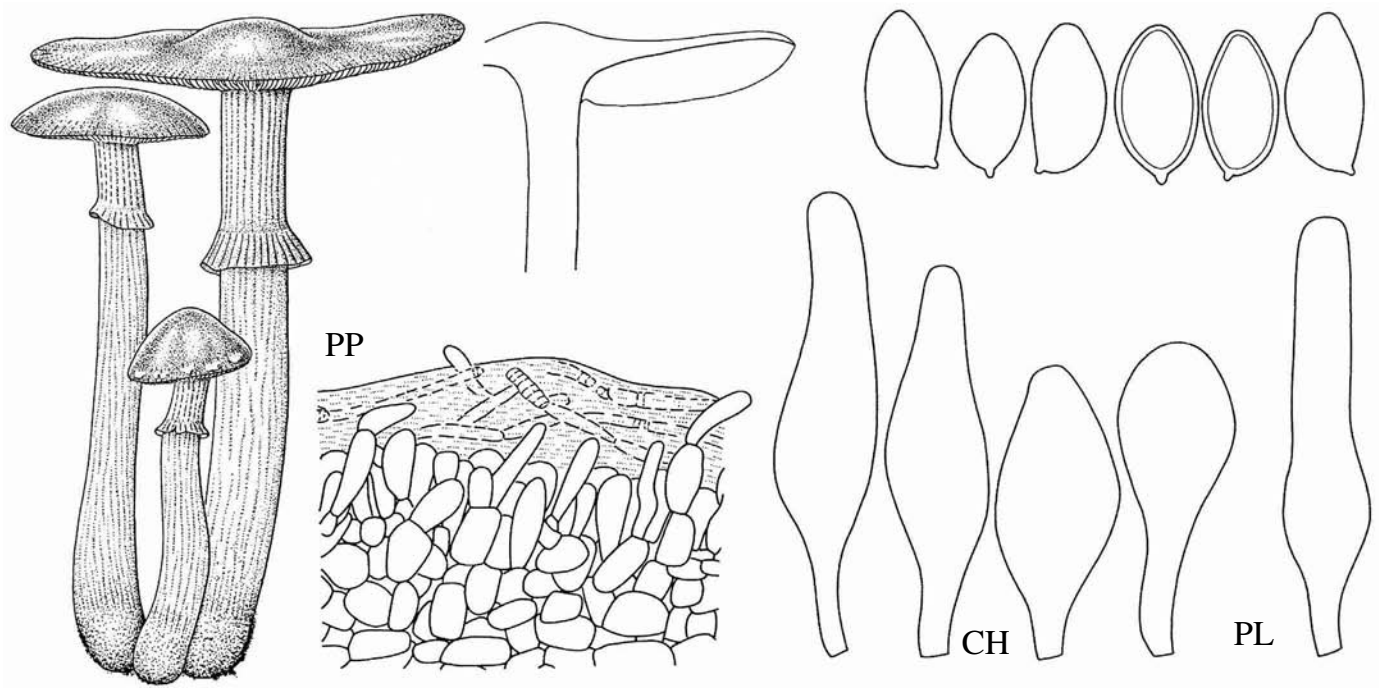


Fig. 212. *Agrocybe erebia*

usually lageniform to narrowly utriform, sometimes clavate and then 37–46 × 12–16 µm, thin-walled, colourless. Pileipellis a 35–70(105) µm thick hymeniderm of erect, narrowly to broadly clavate elements, 15–30 × 4–14 µm, often with irregular outgrowths, with yellowish to brownish parietal or encrusting pigment, covered with a 7.0–18 µm thick gelatinous layer with remnants of 4.0–5.0 µm wide hyphae with encrusting pigment. Subpellis composed of radially arranged, rounded rectangular elements of 8.0–18 × 5.0–7.0 µm, gradually passing into pileitrama. Stipitipellis a dry cutis of unbranched, 2.5–5.0 µm wide hyphae with cylindrical elements. Clamp-connections scarce, sometimes in stipitipellis or at base of basidia.

HABITAT & DISTR. — Gregarious, saprotrophic; terrestrial in city parks, orchards or deciduous woods on clayey or sandy soil. Rather common in the Netherlands. Aug.–Nov. Rather rare but widespread in western Europe.

Agrocybe brunneola (Fr.) J. Lange is very probably a dark form of *A. praecox*. The interpretations of Watling (in Br. Fung. Fl. 3: 28. 1982) and Bon (in Bull. Féd. mycol. Dauph. Savoie: 32–36. 1979) refer to *A. erebia*. *Agrocybe ombrophila* (Fr.) Konr. & M. is synonymous with *A. praecox*.

11. Agrocybe vervacti (Fr. :Fr.) Sing. in Beih. bot. Zbl. 56B: 167. 1936. – Fig. 213.

Agaricus vervacti Fr. :Fr., Syst. mycol. 1: 263.1821; *Simocybe vervacti* (Fr. :Fr.) P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 426. 1879; *Hylophila vervacti* (Fr. :Fr.) Quél., Fl. mycol. France: 88. 1888; *Naucoria vervacti* (Fr. :Fr.) Rick., Blätterpilze: 210. 1915; *Agrocybe pediades* var. *vervacti* (Fr. :Fr.) Sing. in Trudy bot. Inst. Akad. Nauk SSSR, Ser. II, 6: 457. 1950.

EXCL. — *Naucoria vervacti* sensu Rick., Blätterpilze: 210. 1915. (= *A. pediades*)

SEL. ICON. — Consiglio in Boll. Gruppo micol. G. Bres. 42: 69. 1999; J. Lange, Fl. agar. dan. 3: pl. 126G. 1939 (as *Naucoria vervacti*); Michael et al., Handb. Pilzfr. 4, 3 Aufl.: pl. 225. 1985.

SEL. DESCR. & FIGS. — Nauta, Revisie Agrocybe: 74. 1987; Pegler & Legon in Mycologist 12: 60. 1998; Romagn. in Bull. Soc. mycol. Fr. 58: 138. 1942; Watling in Br. Fung. Fl. 3: 23. 1982.

VERN. NAME — Gelige leemhoed.

Pileus 10–50 mm broad, at first hemispherical to convex, expanding to plano-convex or applanate, with deflexed, later straight margin, at centre ochre-yellow to yellow-brown (Mu. 10 YR 7/8), towards margin paler and there yellow to whitish (7.5 YR 6/8), dry, in wet condition slightly viscid; young at margin sometimes with some velar remnants. Lamellae, L = 30–45, l = 1–5, rather distant, adnexed to adnate or emarginate, sometimes decurrent with short tooth, subventricose, 3.5–6 mm broad, at first pale brown to light brown (10 YR 7/3), sometimes with violaceous tinge, later darker brown (7.5 YR 4/6), with paler to almost white, denticulate edge. Stipe 15–60 × 2–5 mm, without annulus, cylindrical to attenuated to base, often somewhat flexuous, fistulose, whitish, later with pale yellowish brown tinge, shiny, fibrillose to rarely whitish squamulose, at apex subpruinose, at base sometimes slightly tomentose. Context up to 3.5 mm thick in pileus, white, fibrillose in stipe. Smell indistinct to sweetish. Taste unknown.

Spores (6.5)7.0–9.5(10.5) × 4.5–6.5 × 4.0–6.0 µm, on average 7.5–8.5 × 5.0–6.0 × 5.0(6.0) µm, in frontal view Q = 1.35–1.80(1.85), Qav = 1.50–1.65(1.70), in side-view Q = 1.30–1.90(2.00), Qav = (1.45)1.55–1.65, ellipsoid to oblong, usually ovoid, thick-walled up to 0.8 µm, with narrow, inconspicuous germ pore up to 0.5 µm, sometimes germ pore absent, sometimes with central oil drops; yellow-brown with

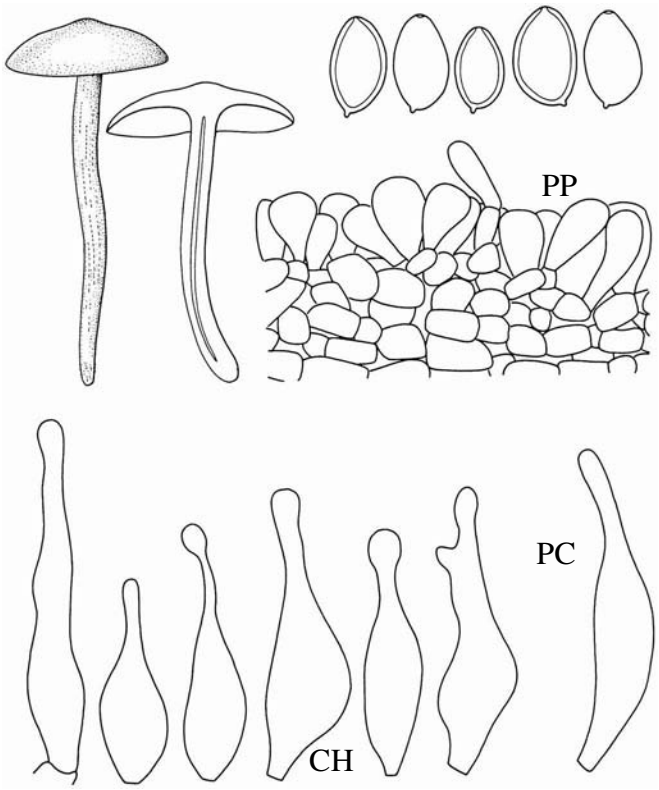


Fig. 213. *Agrocybe vervacti*

light microscope. Basidia 25–30 × 6.0–8.0 µm, usually 4-spored, often also some (less than 5%) 2-spored basidia present. Lamella edge heterogeneous. Cheilocystidia abundant, 20–50 × 5.0–13 × 1.5–2.5(5.0) × 2.5–5.0 µm, lageniform, usually subcapitate, sometimes bi-apiculate or with fingerlike projections, thin-walled, colourless. Pleurocystidia absent to very scarce nearby edge, similar to cheilocystidia. Pileipellis a 50–65 µm thick hymeniderm of erect, clavate to ellipsoid elements of 15–30 × 7.0–15 µm, with pale yellow intracellular pigment; subpellis composed of rounded rectangular elements of 5.0–20 × 5.0–11 µm, gradually passing into pileitrama. Pileocystidia scattered, often absent, lageniform, 40–45 × 8.5–10 × 2.0 µm, sometimes subcapitate, thin-walled, with colourless or brownish contents. Stipitipellis a slightly gelatinised cutis of unbranched, 2.0–5.5 µm wide hyphae with cylindrical elements with pale yellow parietal pigment. Clamp-connections present, abundant in stipitipellis, stipititrama and at base of basidia and cheilocystidia, rare in pileitrama.

HABITAT & DISTR. — Solitary or in small groups, saprotrophic; terrestrial in short grassy vegetation in verges of roadsides and grasslands on sandy dry soil. Rather rare in the Netherlands. June–Oct. Presumably rare in western Europe. Cosmopolitan.

12. Agrocybe firma (Peck) Sing. in Rev. Mycol. 5: 11. 1940. – Fig. 214.

Naucoria firma Peck in Ann. Rep. N.Y. State Mus. Nat. Hist. 54: 148. 1901. — *Agrocybe firma* var. *attenuata* Kühner in Schweiz. Z. Pilzk. 31: 150. 1953; *Agrocybe attenuata* (Kühner) P.D. Orton in Trans. Br. mycol. Soc. 43: 174. 1960.

SEL. ICON. — Mos. in Fung. rar. Ic. col. 7: pl. 54. 1978; Schwöbel in Südwestd. Pilzrundschau 24: 8. 1988.

SEL. DESCR. & FIGS. — Enderle in Z. Mykol. 51: 11–13. 1985; Mos. in Fung. rar. Ic. col. 7: 187. 1978; Romagn. in Bull. trimest. Soc. mycol. Fr. 78: 356. 1962.

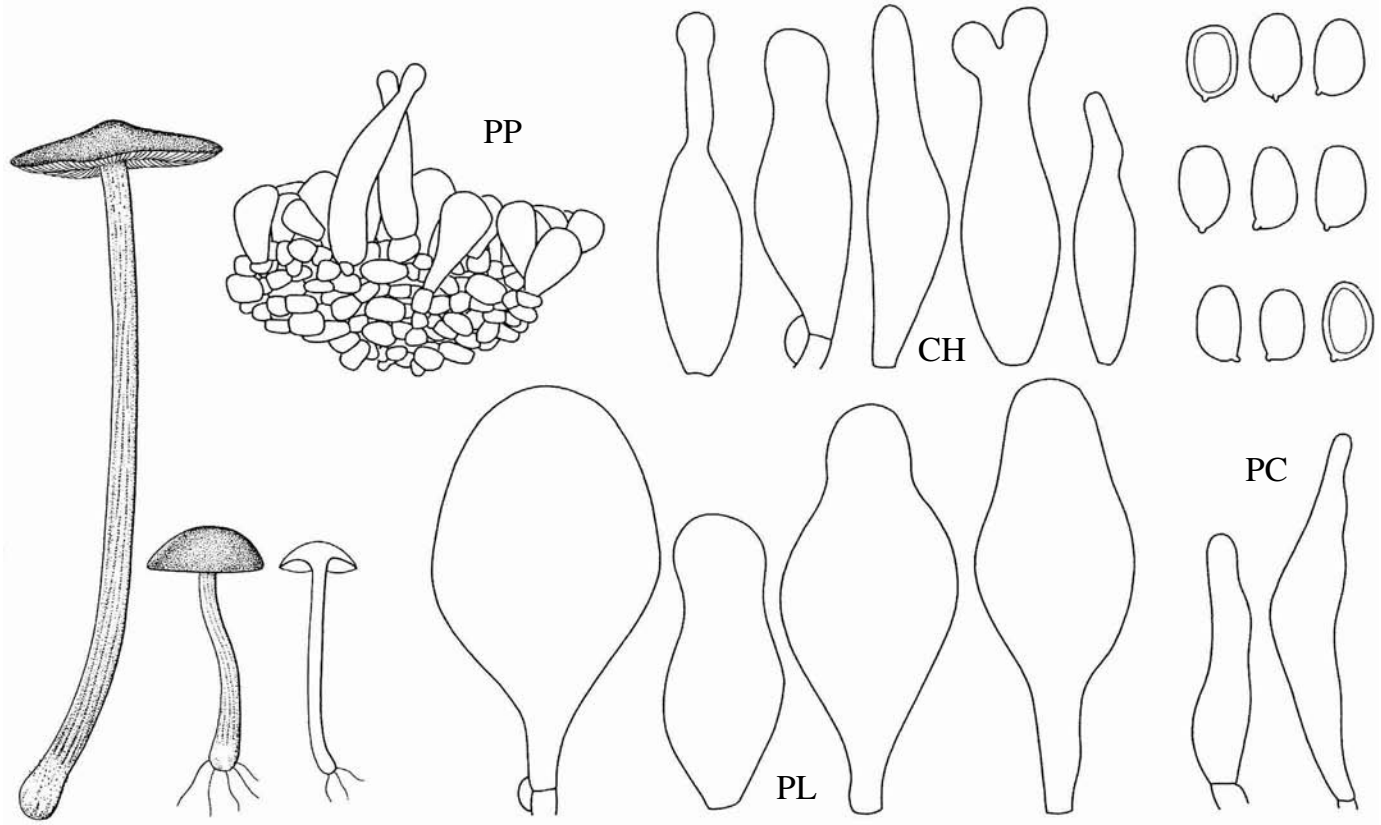


Fig. 214. *Agrocybe firma*

VERN. NAME — Donkere leemhoed.

Pileus (5)10–30(40) mm broad, at first conico-convex or abruptly conical, later convex or plano-convex, sometimes with umbo, with inflexed, later straight margin, not to very shortly striate at margin, usually hygrophanous, in wet condition at centre dark brown, olivaceous brown or dark yellow-brown, usually with olivaceous tinge (Mu. 2.5 Y 4/3–4; 7.5 YR 3/2, 4/4, 5 YR 2–3/2), paler towards margin, pallescent on drying to yellowish or greyish brown (10 YR 5/8), shiny when moist, weakly pruinose when dry. Lamellae, L = 25–35, l = 1–3, rather crowded, adnate to emarginate or adnexed, sometimes with short decurrent tooth, subventricose, 2–5 mm broad, at first pale brown to yellow-brown, later darker yellow-brown to brown (10 YR 5–7/3–4, 7/2), with paler, entire to sometimes denticulate or flocculose edge. Stipe 25–50(90) × 1–3(5.5) mm, not annulate, cylindrical, usually with a broadened base, sometimes attenuated towards base, rarely with small bulb, straight to slightly curved, narrowly fistulose, pale brown to pale yellow or light grey-brown (2.5 Y 10 YR 8/4), dark brown towards base and darkening on handling, usually entirely pruinose to flocculose, sometimes white tomentose at base, usually with long white radiating rhizomorphs. Context 1–3 mm thick in pileus, pale yellow to pale brown. Smell weakly to strongly farinaceous, especially when cut. Taste at first weakly to strongly farinaceous, later sometimes bitter.

Spores (5.5)6.0–8.0(8.5) × 4.5–5.5 × (3.5)4.0–5.0 µm, on average 6.5–7.5 × 4.5–5.0 × 4.0–4.5 µm, in frontal view Q = 1.35–1.70, Qav = 1.50–1.65, in side-view Q = 1.40–1.85, Qav = 1.55–1.80, ellipsoid, thick-walled up to 1 µm, without or with inconspicuous germ pore; light yellow-brown with light microscope. Basidia 20–30 × 6.0–7.5 µm, 4-spored. Lamella edge heterogeneous to almost sterile. Cheilocystidia abundant, variable in form, usually narrowly lageniform, 30–60 × 6–25(28) × 2.5–13.5 µm, sometimes subcapitate, sometimes with two or more apices, sometimes clavate or lecythiform, thin-walled, colourless or with pale yellow contents. Pleurocystidia scarce to abundant, 35–65 × 12–27 × 10–16.5 µm, conspicuous, usually broadly utriform, or pedicellate ellipsoid and then 35–55 × 23–30 µm, rarely lageniform, thin-walled, colourless or with yellowish contents. Pileipellis a 40–55 µm thick hymeniderm of broadly clavate, erect elements of 20–25 × 8.0–14 µm, sometimes in two or more layers and forming transition to epithelium, with brownish intracellular or encrusting pigment, gradually passing into irregular pileitrama, with scarce to abundant pileocystidia. Pileocystidia 30–65 × 6.0–13 × 7.5–8 µm, cylindrical to lageniform, sometimes subcapitate, sometimes with attached crystals around apex, thin-walled, colourless or with brown contents. Stipitipellis a dry cutis of unbranched, 2.5–5.0 µm wide hyphae with cylindrical elements with recurved terminal elements, with yellowish to brownish intracellular pigment. Caulocystidia rather abundant, especially at apex of stipe, 40–95(120) × 9.5–15 × 4.0–6.5 µm, usually clustered and lageniform, sometimes cylindrical and of 20–30 × 3.5–5.5 µm, thin-walled, often with yellow-brown contents. Clamp-connections present but scarce in pileitrama, stipitipellis and at base of basidia and pleurocystidia, rarely also present in stipititrama.

HABITAT & DISTR. — Solitary or in small groups, saprotrophic; on (buried) wood, trunks or branches of Fagus, Alnus, on sawdust, on fallow land or in deciduous woods, usually on nutrient-rich soil. Rather rare in the Netherlands. June–Nov. Probably widespread but rare in Europe.

Kühner distinguished an *Agrocybe firma* var. *attenuata*, differing from the typical variety in the smaller fruitbodies. The description of Kühner of this variety, however, matches closely with the original description of Peck. Kühner's var. *firma* has larger fruitbodies. The Dutch material is in accordance with the description of Peck and there is no reason to distinguish a variety with larger fruitbodies.

13. Agrocybe pusiola (Fr. :Fr.) R. Heim in Mus. barcin. Scient. nat. Op. 15: 129. 1934. – Fig. 215.

Agaricus pusillus Fr. :Fr., Syst. mycol. 1: 264. 1821, non *Agaricus pusillus* Pers. 1801 :Fr. — *Agaricus pusiolus* Fr. :Fr., Elenchus: 36. 1828; *Naucoria pusiola* (Fr. :Fr.) Kumm., Führ. Pilzk.: 77. 1871; *Simocybe pusiola* (Fr. :Fr.) P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 423. 1879.

SEL. ICON.— Migl. & Coccia in Boll. Ass. micol. ecol. Romana 15: 31. 1988; De Raeve in Ic. mycol.: pl. 127. 1986.

SEL. DESCR. & FIGS. — Bas in Blumea Suppl. 4: 137. 1958; Nauta, Revisie Agrocybe: 97–99. 1987; Guinberteau & Courtecuisse in Bull. trimest. Soc. mycol. Fr. 109: 124. 1993.

VERN. NAME — Dwergleemhoed.

Pileus 5–15 mm broad, at first hemispherical to convex, expanding to plano-convex or almost applanate, rarely plano-concave, rarely with an inconspicuous umbo, with inflexed, later straight margin, not hygrophanous, light yellow, ochraceous yellow or yellowish brown (Mu. 2.5 Y 8/4-6, 7/6; 10 YR 5–7/6–8), towards margin slightly paler; surface when moist greasy to glutinous and shiny, smooth, sometimes when dry slightly areolate-rimose; margin without remnants of veil. Lamellae, L = 11–17, l = 0–3, rather distant, adnate to emarginate, rarely with short decurrent tooth, (sub)ventricose, up to 3 mm broad, at first greyish brown to light brown (2.5 Y 8/4, 10 YR 8/4), later brown to dark brown (10 YR 6–7/6; 7.5–10 YR 5/6; 7.5 YR 6/6; 5 YR 4/6), with concolorous to whitish, entire to denticulate edge. Stipe 5–25 × 0.5–1.5(2.5) mm, cylindrical to slightly broadened or attenuated towards base, often flexuous, stuffed, light brown to light yellow (2.5 Y 8/4, 10 YR 8/3), towards base sometimes slightly more brown, occasionally slightly glutinous and with attached sandgrains, slightly fibrillose, at apex pubescent, often with white rhizomorphs. Context 2 mm thick in pileus, whitish to pale yellow in pileus, in cortex of stipe pale brown, in centre of stipe with white fibrils. Smell weakly to strongly farinaceous, especially when cut. Taste farinaceous, rarely slightly bitter.

Spores (6.5)7.0–10.0(11.5) × (4.0)4.5–6.0(6.5) µm, on average 8.0–9.5 × 5.0–5.5(6.0) µm, Q = 1.40–1.95(2.05), Qav = 1.60–1.80, ellipsoid to oblong, amygdaliform, thick-walled up to 1.0 µm, without germ pore, sometimes with thin-walled apical spot, usually with 1–2 oil drops; pale yellow-brown with light microscope. Basidia 25–40 × 7.0–9.0 µm, 4-spored. Lamella edge sterile. Cheilocystidia variable, usually irregularly lageniform, 20–60(75) × 7.0–16 × (1.5)2.5–8.0 µm, often (sub)capitate, sometimes multi-apiculate, mixed with clavate elements of 30–50 × 7.0–14(30) µm, often with slimecap or attached crystals at apex, thin-walled, colourless or with brown contents. Pleurocystidia scarce to scattered, 30–60 × 9.0–20 × 3.0–16 µm, less variable of form than cheilocystidia, usually lageniform to utriform, rarely fusiform, sometimes subcapitate, sometimes with attached mucilaginous matter at apex, slightly thick-walled, colourless or with brown-yellow contents. Pileipellis a 50–65 µm thick hymeniderm of erect, clavate, 20–35 × 10–14 µm elements, with intracellular, brown pigment, covered by a gelatinous amorphous layer of 4.0–15 µm; subpellis composed of rectangular elements of 6.0–20 × 4.5–9.0 µm, downwards gradually passing into pileitrama. Pileocystidia especially in young specimens abundant, 40–45 × 7.5–8.5 µm, usually lageniform, thin-walled, with brown contents. Stipitipellis a gelatinised cutis of unbranched, 3.0–4.0 µm wide hyphae with cylindrical elements, with recurved, often differentiated terminal elements with pale yellowish intracellular pigment. Caulocystidia predominantly at apex of stipe present, usually irregular, varying from clavate and of 25–30 (9–11 µm to lageniform and of 32–40 × 9.0–11 × 5.0–8.0 µm, thin-walled, sometimes with yellow-brown contents. Clamp-connections abundant in stipitipellis and pileitrama, sometimes present in stipititrama and at base of basidia.

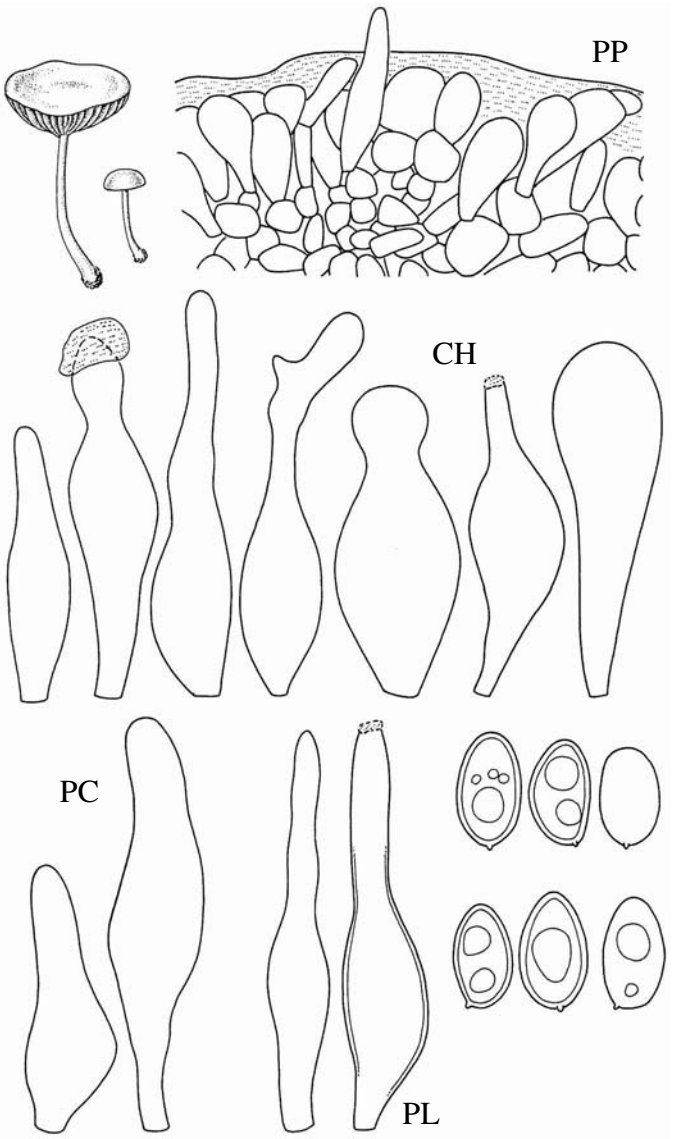


Fig. 215. *Agrocybe pusiola*

HABITAT & DISTR. — Solitary to gregarious, saprotrophic; terrestrial in windblown sand with scarce vegetation of grass in the dunes, also at verges of roadsides, rarely in woods. Often attached to dead grass or buried rabbit dung. Moderately common and widespread in the Netherlands, common in the dune area. Oct.–Nov. Widespread but rare in western Europe.

Index

Illustrations are indicated by an asterisk (*) added to the page number

Index to the genera in Volumes 1–6

Volume numbers are given in Roman numerals; accepted names are printed in bold.

The **Flora Agaricina Neerlandica** series provides original descriptions and illustrations of agarics and boleti (Agaricales sensu lato, Boletales, and Russulales) occurring in the Netherlands and neighboring regions. The series provides identification keys, correct names, extensive descriptions, and illustrations of all taxa, as well as data on relevant ecology and distribution patterns. Based upon herbarium specimens, the authors' collected samples, and observations made over the past 50 years, this collection delivers a comprehensive study of the region's flora.

Volume 6 covers the families Coprinaceae and Bolbitiaceae and the genera *Coprinus, Bolbitius, Conocybe, Pholiotina,* and *Agrocybe*. This volume describes 126 species within Coprinaceae, and 140 species within Bolbitiaceae, with several of these species only recently discovered by science. The information found in this text is of major importance to scientists studying the flora of northwestern Europe and the boreal temperate regions of North America.

Features:

- Examines the history of agaricology in the Netherlands, the ecology and distribution of agarics and boletes, specific and infraspecific delimitation, generic concepts, orders and families of the agarics and boletes, and nomenclature
- Contains new observations made specifically for this series
- Provides extensive notes on ecology and geographical distribution both within and outside of the Netherlands
- Illustrates all species with line-drawings of basidiocarps, spores, and cystidia (if present), supplemented by drawings of other microscopical characters when these are diagnostic

Taylor & Francis
Taylor & Francis Group
A CRC PRESS BOOK
www.taylorandfrancisgroup.com

SW1198
ISBN 9-0541-0496-1
90000
9 789054 104964