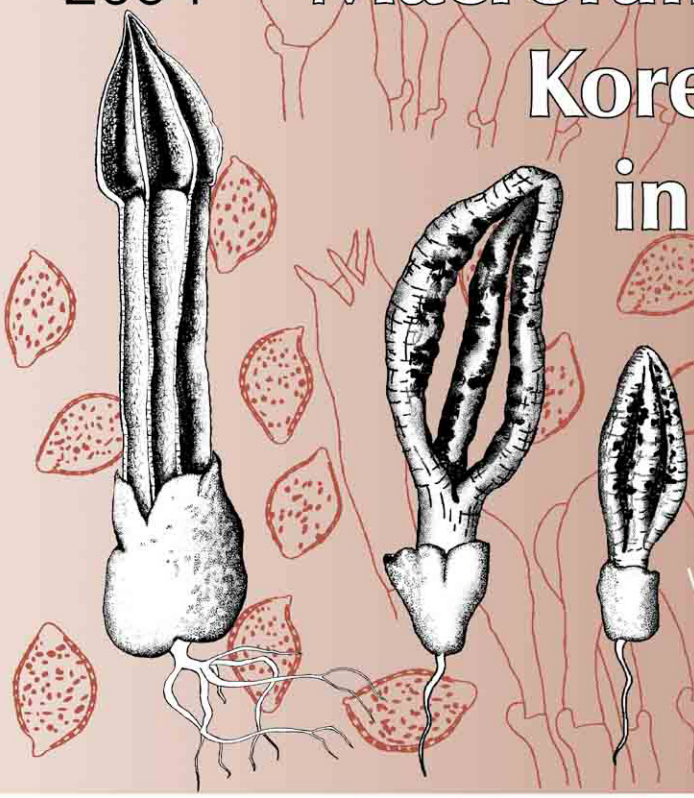
POLISH BOTANICAL STUDIES

18

2004

Macrofungi of North Korea collected in 1982-1986



Władysław Wojewoda
Zofia Heinrich
Halina Komorowska

POLISH ACADEMY OF SCIENCES
W. SZAFER INSTITUTE OF BOTANY

P O L I S H B O T A N I C A L S T U D I E S

Vol. 18 **2004**

Polish Botanical Studies is a companion series of *Polish Botanical Journal* publishing monographs and more comprehensive papers longer than 50 printed pages covering various aspects of vegetation science, plant and fungi biodiversity, biosystematics (including plant anatomy, cytology and embryology), phytogeography, evolution and ecology. The series appears at irregular intervals.

Editorial Office: W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL-31-512 Kraków, Poland
Tel. [+48 12] 42 41 711; Fax: [+48 12] 42 19 790; e-mail: wojcicki@ib-pan.krakow.pl

Published, sold and distributed by
W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL-31-512 Kraków, Poland
Tel. [+48 12] 42 41 731, Fax: [+48 12] 42 19 790, e-mail: ed-office@ib-pan.krakow.pl

This volume is published with the financial support of the State Committee for Scientific Research (KBN grant 6 P04C 00 318)

Copy editing: Michael JACOBS *Typesetting and page layout*: Marian WYSOCKI
Cover design: Maciej PIERZCHAŁA

Issued: 29 October 2004 **ISSN: 0867-0730**
Printed in Poland: Drukarnia Kolejowa "Kraków" sp. z o.o., 31–505 Kraków, ul. Bosacka 6 **ISBN: 83-89648-17-2**

Polish Bot. Stud. 18: 1–289, 2004

MACROFUNGI OF NORTH KOREA COLLECTED IN 1982–1986

WŁADYSŁAW WOJEWODA, ZOFIA HEINRICH & HALINA KOMOROWSKA

Abstract: In this paper, 429 species of macrofungi and 2 species of microfungi (Asco- and Basidiomycota), together with distribution notes, are reported from specimens collected in North Korea (Democratic People's Republic of Korea) at 65 sites, especially in mountains: Kumgang-san Mts, mountains near Kaesong city, Myohyang-san Mts, Paekdu-san Mts, Ryongak-san Mt., Suian-san Mts and Taesong-san Mts. The paper includes 259 species of fungi reported for the first time from North Korea. The material was collected during five expeditions to Korea in 1982–1986. For each species the information given includes short descriptions of its macro-and microscopic features, sites and substrate, accepted name and synonyms with its basionym, and references concerning its taxonomy and geographical distribution, especially in Asia. Microscopic elements of some species are illustrated in 152 figures. Characteristics of North Korean mycobiota are given. This is the first paper on North Korean fungi published in English, except for some short articles by mycologists from the Institute of Botany of the Polish Academy of Sciences in Kraków published in 1990–2002. Previous North Korean mycological papers were published only in Korean, and are practically inaccessible outside of North Korea. The mycobiota and diversity of the fungi of this country were also unknown outside of North Korea.

Key words: Asia, Democratic People's Republic of Korea, North Korea, fungi, macrofungi, Ascomycota, Ascomycetes, Basidiomycota, Basidiomycetes, Urediniomycetes, taxonomy, ecology, geographical distribution.

Władysław Wojewoda, Zofia Heinrich & Halina Komorowska, W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL-31-512 Kraków, Poland

CONTENTS

INTRODUCTION

The fungi of North Korea have been rather little studied. Information on the fungi of this country is published exclusively in Korean. The mycobiota of North Korea are described in two books and a few other papers accessible only in the Institute of Botany of the Korean Democratic People's Republic in Pyongyang (Anonymous 1978, 1980, 1982a–c, 1983a, b).

This book is the result of our mycological investigations in North Korea during 1982–1986. Material was collected during five expeditions in those years by Dr. Zofia Heinrich, Dr. Halina Komorowska, Prof. Władysław Wojewoda, Prof. Kazimierz Zarzycki and Dr. Barbara Zarzycka. This is the first so comprehensive publication on the fungi of this country in English. Previously the macrofungi of North Korea have been mentioned in a few short articles in English or in Polish with an English summary (Wojewoda *et al*. 1990, 1993; Stuchlik & Komorowska 1997; Wojewoda 2000, 2001, 2002a–d; Wojewoda *et al*. 2002a, b) and in Czech and Latin (Pilát 1958a).

STUDY AREA

North Korea occupies 55% of the land area of the Korean peninsula, around 122,700 sq km. It is divided from China to the north by the Amnok-gang (Amur) and Tuman-gang (Tumen) Rivers, and from a slight sliver of Russia to the extreme northeast by the Tuman-gang. An electrified fence marks the border with South Korea (Fig. 1).

The population of North Korea is approximately 22.2 million. Around 2.2 million people are estimated to live in the capital Pyongyang. North Korea is estimated to be 80% uninhabitable mountains. The northern and eastern regions of North Korea are mostly rugged mountains with dense forest, not suited to agriculture.

The climate is similar to South Korea's, but colder and drier in winter. There are four distinct seasons. The spring months of April, May and June are generally pleasant, before the summer monsoon rains. The summer is warm and wet. Autumn is delightfully cool and dry. Winter, from November to March, sees temperatures hovering either side of 0°C, but it can be bitter in the mountains, with temperatures down to -15°C.

The climate of the southern part of North Korea and of its seaside lowlands is warm-temperate and monsoonal. In the northern part of the country, in the mountains the climate is cold-temperate, continental. The mean January temperature in the mountains in the north of the country is -20°C (minimum even below -40°C), at the seaside -10°C, and in the south of the country at the seaside -4.5°C (minimum -20°C). Mean July and August temperatures in the northern part are 18–20°C, and in the southern part 23–25°C (maximum more than 30°C).

Annual rainfall on the lowlands averages (600) 800–1000 mm, and in the mountains 1000–1500 mm. Over 60% of the annual rainfall falls from July to September.

The vegetation season in the northern part of the country lasts 5–6 months in the lowlands and 4–5 months in the mountains. In the southern part of North Korea the season lasts 7–8(9) months in lowlands.

North Korea boasts a diverse range of plants and animals, especially in the northern, more mountainous regions of the country. The varying climatic regions have created environments that are home to subarctic, alpine and even subtropical plant and tree species.

In North Korea the zones of vegetation are as follows: alpine zone, zone of coniferous forests, zone of mixed forests, and zone of deciduous forests.

The flora of the Korean Peninsula includes more than 3860 species. The woody flora of the whole of Korea includes about 600 species. A large number of them, no less than 50 species, are endemic Korean plants. There are about 280 species of trees and shrubs occurring in North Korea, of which 16 are endemic to that country (Anonymous 1982a; Bojarczuk & Boratyński 1985; Boratyński 1984; Pews 1987; Staszkiewicz 1992a, b; Storey & Park 2001).

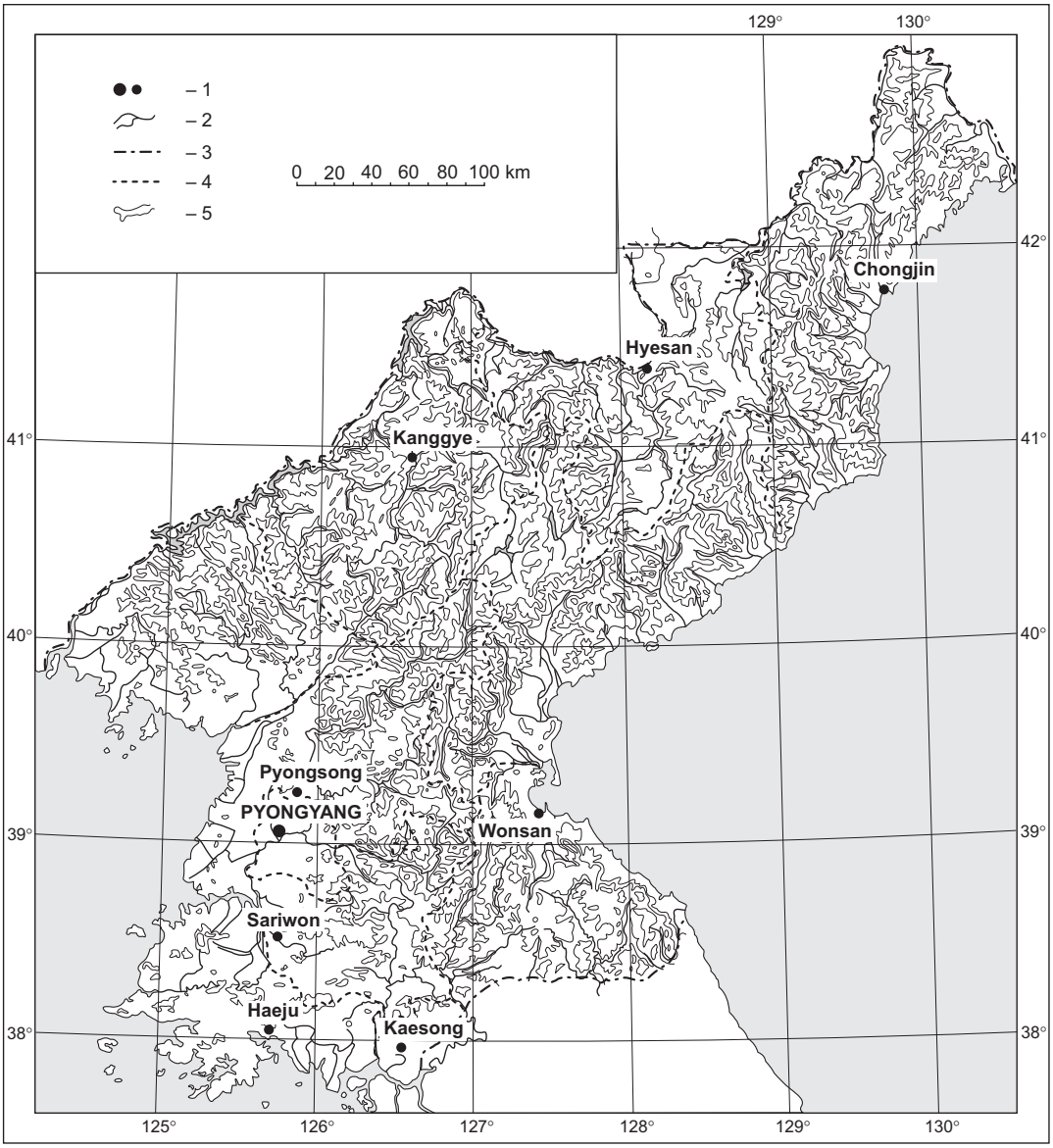


Fig. 1. Administrative Units of North Korea: 1 – capital and seats of Province, 2 – rivers, 3 – boundaries of North Korea, 4 – boundaries of Provinces or City under Direct Jurisdiction, 5 – contour lines.

MATERIAL AND METHODS

MATERIAL

The investigated material included macrofungi from Asco- and Basidiomycota of the orders Helotiales, Pezizales, Hypocreales, Xylariales, Platygloeales, Agaricales, Auriculariales, Boletales, Cantharellales, Ceratobasidiales, Dacrymycetales, Hymenochaetales, Phallales, Polyporales Russulales, Thelephorales and Tremellales, and only two species of microfungi, *Hypomyces chrysospermus* and *Colacogloea peniophorae*.

COLLECTORS

The material for the present study was collected by Dr. Barbara Zarzycka, Professor Kazimierz Zarzycki and the authors during five expeditions to North Korea: Z. Henrich, 24 June – 28 July 1986 (35 days); H. Komorowska, 24 June – 28 July 1986 (35 days); W. Wojewoda, 1 Aug. – 12 Sept. 1983 (43 days), 11 Sept. – 8 Oct. 1984 (28 days), 24 June – 28 July 1986 (35 days); B. Zarzycka, 2 June – 10 July 1985 (40 days); K. Zarzycki, 29 Aug. – 28 Sept. 1982 (31 days), 2 June – 10 July 1985 (40 days).

MAIN COLLECTING SITES

Collections were made from 65 localities (Fig. 2). The localities (1–65) are numbered in the complete list of collecting sites visited on the expeditions in 1982–1986 given below.

Buddhist Monastery in Kaesong (63) – old Buddhist monastery in center of Kaesong town (North Hwanghae Province).

Buddhist School in Kaesong (63) – old school (now museum) in center of Kaesong town (North Hwanghae Province).

Central Botanical Garden in Pyongyang (36) – central botanical garden of North Korea in N part of Pyongyang city, at foot of Taesong-san Mts (Pyongyang city).

Central Zoological Garden in Pyongyang (37) – zoological garden in N part of Pyongyang town, at foot of Taesong-san Mts (Pyongyang city).

Changsu Mt. (33) – little mountain in Taesong-san Mts, in N part of Pyongyang town (Pyongyang city).

Chanto Forest (61) – forest with *Pinus densiflora* and *Quercus mongolica*, between Onjong-ri village and Okryu-dong Valley in Kumgang-san Mts, *ca* 5 km SW of Kosong town, alt. *ca* 150 m (Kangwon Province).

Chongbong Mt. (9) – mount in Paekdu-san Mts, W of Rimyong-su, *ca* 40 km N of Hyesan town, alt. *ca* 1300–1400 m (Ryanggang Province).

Chonson-dae Rock (57) – rock in Kumgang-san Mts, between Samson-dae Rock and Mammulsang-dae Rocks, *ca* 6 km SW of Kosong town, *ca* 12 km of Onjong-ri village, alt. *ca* 936 m (Kangwon Province).

Chonsokjong Beach (53) – beach on Sea of Japan coast, between Wonsan town and Kosong town, *ca* 45 km SE of Wonsan (Kangwon Province).

Chontae Falls (28) – waterfall in Myohyang-san Mts, *ca* 15 km SE of Hyangsan town, alt. *ca* 250 m (Pyongan Province).

Chujak Mt. (35) – little mountain in Taesong-san Mts in N part of Pyongyang town (Pyongyang city).

DPRK – Democratic People's Republic of Korea – North Korea, 122,762 sq km.

Habiro Temple (27) – Buddhist temple in Myohyang-san Mts, *ca* 15 km E of Hyangsan town, alt. *ca* 200 m (North Pyongan Province).

Haeju (46) – town on coast of Yellow Sea, at foot of Suian-san Mts, *ca* 110 km S of Pyongyang city (South Hwanghae Province).

Hyangsan-gang River (16–20) – river in Myohyang-san Mts, flowing into Chongchon-gang River in Hyangsan town (North Pyongan Province).

Hyangsan-gang Valley (16, 20) – valley of Hyangsan-gang River in Myohyang-san Mts (North Pyongan Province).

Hyangsan town – town on bank of Chongchon-gang River, *ca* 120 km NE of Pyongyang town, at foot of Myohyang-san Mts (North Pyongan Province).

Hyesan (15) – town in Paekdu-san Mts, at Chinese border, on Amnok-gang River, *ca* 350 km NE of Pyongyang city, alt. *ca* 1000 m (Ryanggang Province).

Isonnam Falls (29) – waterfall in Myohyang-san Mts, *ca* 15 km SE of Hyangsan town, alt. *ca* 300 m (North Pyongan Province).

Sea of Japan (50–53) – ('East Sea,' 'East Sea of Korea'), sea at E part of Korea (Kangwon Province).

Kaesong (63) – town (200,000 residents) near border with South Korea, *ca* 130 km SE of Pyongyang town; the ancient capital of the Goryeo (Koryo) kingdom (North Hwanghae Province). Some plants collected: in park *Asplenium incisum, Athyrium niponicum* and *A. wardii*; in vicinity of town *Botrychium ternatum* and *Castanea crenata*.

Kaesong city (63–65) – administrative region around Kaesong town (North Hwanghae Province).

Kangwon – province of North Korea in southeastern part of country.

Kosong (near 60–62) – town on coast of Sea of Japan, at foot of Kumgang-san Mts, *ca* 80 km SE of Wonsan town (Kangwon Province).

Kuchung Falls (26) – waterfall in Myohyang-san Mts, in Manpok Valley, *ca* 10 km E of Hyangsan town, alt. *ca* 850 m (North Pyongan Province).

Kumgang Falls (17) – waterfall in Myohyang-san Mts, on tributary of Hyangsan-gang River, below Sangwon-am Buddhist monastery, *ca* 10 km E of Hyangsan town, alt. *ca* 250–300 m (North Pyongan Province).

Kumgang-mun Gate (59) – rock gate at mouth of Okryu-dong Valley in Kumgang-san Mts, alt. *ca* 250 m (Kangwon Province).

Kumgang-san Mts (54–62) – ('Diamond Mts'), mountains in SE part of DRPK, on Sea of Japan, 400 sq km, the highest peak Piro Mt., alt. 1639 m (Kangwon Prov-

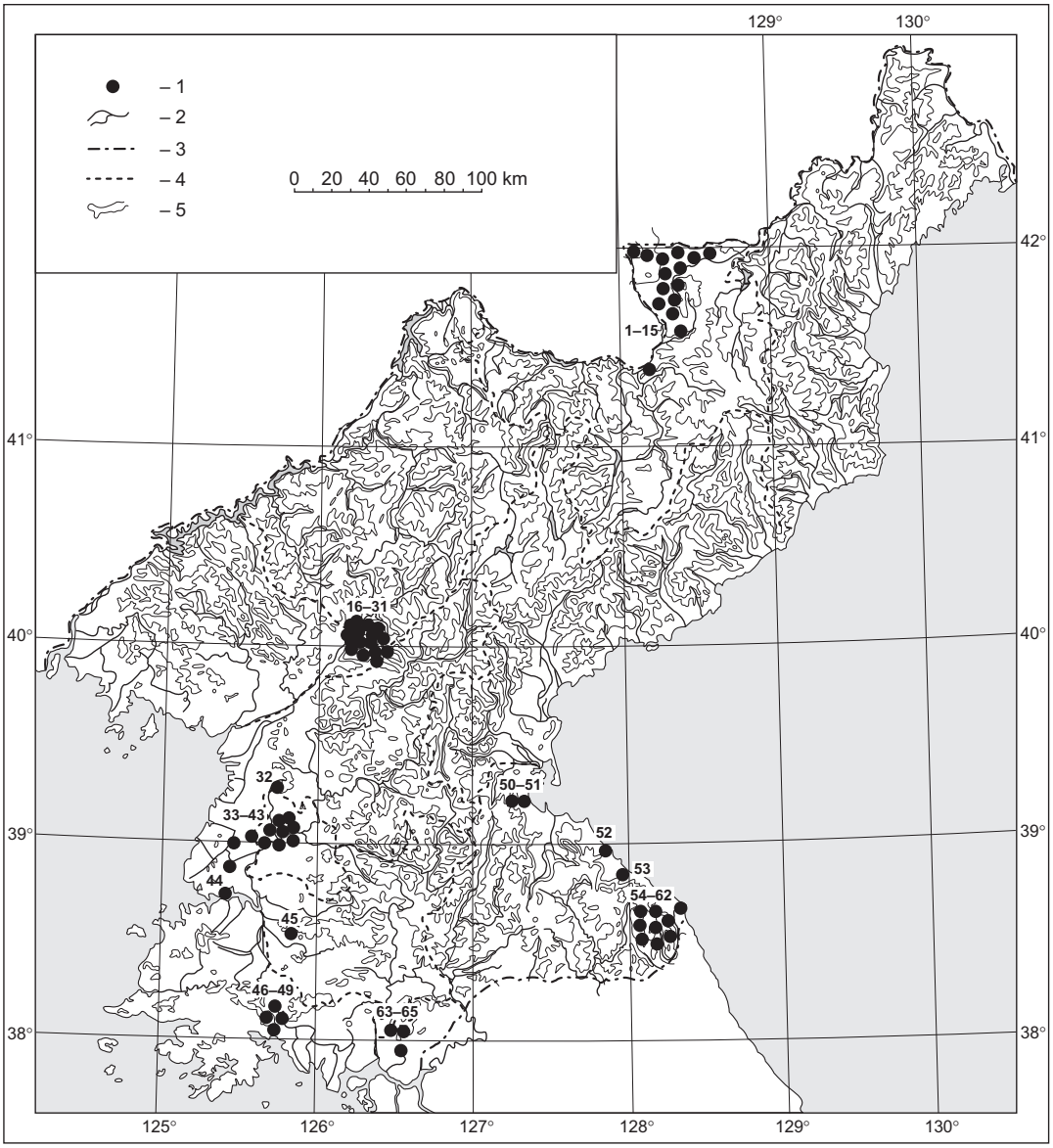


Fig. 2. Localities of fungi of North Korea: 1 – localities of fungi, 2 – rivers, 3 – boundaries of North Korea, 4 – boundaries of Provinces or city under Direct Jurisdiction, 5 – contour lines.

ince). Plants (especially trees and shrubs) known from these mountains: *Acer mono*, *A. palmatum*, *A. pseudosieboldianum*, *A. tschonoski*, *Actinidia arguta*, *Artemisia japonica*, *Benzoin obtusilobum*, *Betula chinensis*, *B. gmelini*, *B. saitoana*, *B. schmidtii*, *Callicarpa japonica*, *Carpinus laxiflora*, *Castanea crenata*, *C. mollissima*, *Celastrus orbiculatus*, *Clematis heracleifolia*, *Clerodendron trichotomum*, *Cocculus trilobatus*, *Cornus controversa*, *Corylus mandshurica*, *Deutzia glabrata*, *Euonymus maximowiczianus*, *E. oxyphyllus*, *E. pauciflorus*, *Forsythia ovata*, *Fraxinus mandshurica*, *F. rhynchophylla*, *Indigofera kirilowii*, *Juniperus rigida* = *J. coreana* var. *rigida* = *J. utilis*, *Kalopanax septemlobus* = *K. pictus*, *Lespedeza bicolor*, *L. cyrtobotrya*, *L. maxi-*

mowiczii, *L. thunbergii*, *Lindera obtusiloba* = *Benzoin obtusilobum*, *Lonicera japonica*, *L. praeflorens*, *Maackia amurensis*, *Magnolia sieboldii*, *Morus bombycis*, *Osmunda japonica*, *Parthenocissus tricuspidata*, *Picrasma quassioides*, *Philadelphus schrenkii*, *Pinus densiflora*, *P. koraiensis*, *Populus davidiana*, *P. koreana*, *Prunus padus*, *P. serrulata*, *Pteridium aquilinum*, *Pueraria lobata*, *Pyrus ussuriensis*, *Quercus crispula*, *Q. dentata*, *Q. glandulifera*, *Q. mongolica*, *Q. variabilis*, *Rhododendron mucronatus*, *R. yedoense*, *Rhus javanica*, *R. sylvestris*, *R. verimiciflora*, *Rosa multiflora*, *Rubus triphyllus*, *Salix graciliglans*, *S. koriyanagi*, *S. pierotii*, *S. rorida*, *S. taraikensis*, *Sasafrax purpurascens*, *Sasamorpha purpurascens var. borealis*, *Smilax china*, *Sorbaria sorbifolia*, *Sorbus alnifolia*, *S. aucuparia*, *S. commixta*, *Spiraea blumei*, *S. japonica*, *S. prunifolia*, *Staphylea bumalda*, *Stephandra incisa*, *Styrax obassia*, *Symplocos paniculata*, *Syringa velutina*, *Thuja koraiensis*, *Tilia amurensis*, *T. mandshurica*, *T. rufa*, *Tripteryngium regelii*, *Ulmus davidiana*, *Vaccinium koreanum*, *Viburnum wrightii*, *Vitis amurensis*, *Weigela florida* and *Zanthophyllum schinifolium*.

Kuryong Falls (59) – ('Nine Dragons'), largest waterfall in Kumgan-san Mts, on Okryu-dong Stream, *ca* 5 km SW of Onjong-ri village, *ca* 10 km SW of Kosong town, alt. *ca* 700 m (Kangwon Province).

Mangyongdae (41) – village *ca* 15 km SW of Pyongyang town centre, on right bank of Taedong-gang River (Pyongyang city).

Manmulsang (Manmulsang-dae) Rocks (55) – ('Rocks of Ten Thousand Features'), rocky peak in Kumgang-san Mts near Onjong-gang Stream Valley, *ca* 5 km NW of Onjong-ri village, *ca* 5 km SW of Kosong town, alt. *ca* 1000 m (Kangwon Province).

Manpok Valley (21–26) – valley in Myohyang-san Mts, with 7 waterfalls: Sogok, Murung, Unson, Yuson, Pison, Kuchung and Unha, *ca* 15 km E of Hyangsan town, alt. *ca* 400–850 m (North Pyongan Province).

Morangbong Hills (38) – ('Peony Hills'), hills in center of Pyongyang city, with forested town park (Pyongyang city).

Morangbong Park (38) – forested town park in Morangbong Hills in center of Pyongyang town (Pyongyang city).

Mubong (3) – (Mubongu), village in Paekdu-san Mts, *ca* 30 km NE of Samji-yon town, *ca* 75 km NE of Hyesan, *ca* 75 km E of Paekdu-san Mt. peak, alt. *ca* 1200 m (Ryanggang Province).

Mupo (4) – place in taiga on Tuman-gang River, at Chinese border, *ca* 75 km NE of Hyesan town, alt. *ca* 1400 m (Ryanggang Province).

Murung Falls (22) – waterfall in Manpok Valley in Myohyang-san Mts, *ca* 15 km E of Hyangsan town, alt. *ca* 400 m.

Myohyang-san Hotel (20) – hotel in Myohyang-san Mts, on Hyangsan-gang River, *ca* 10 km E of Hyangsan town, alt. *ca* 100 m (North Pyongan Province).

Myohyang-san Mts (16–31) – ('Mountains of Mysterious Fragrance'), third most famous mountains in North Korea (after Kumgang-san Mts and Paekdu-san Mts), *ca* 375 sq km, *ca* 120 km NE of Pyongyang city, highest peak Piro Mt., alt. 1909 m (North Pyongan Province). Plants (especially trees and shrubs) known from these mountains: *Abies nephrolepis*, *Acer ginnala*, *A. mono*, *A. palmatum*, *A. pseudosieboldianum*, *A. tegmentosum*, *A. triflorum*, *A. tschonoski*, *Aconitum villosum*, *Actinidia arguta*, *A. colomicta*, *A. polygama*, *Adiantum pedatum*, *Admetum extremiorientale*, *Alanyium platanifolium*, *Alnus crispa*, *A. japonica*, *Angelica gigas*, *Aralia elata*, *Asparagus oligochnos*, *Asplenium trichomanes*, *A. viride*, *Aster tataricus*, *Betula ermanii*, *B. schmidtii*, *Callicarpa japonica*, *Camptosorus sibiricus*, *Carex lanceolata*, *Carpinus cordata*, *Castanea crenata*, *C. mollissima*, *Celtis aurantiaca*, *Chrysanthemu sibiricum*, *Cornus controversa*, *Corylus heterophylla*, *C. mandshurica*, *Crataegus platanifida* var. *major*, *Deutzia glabrata*, *D. parviflora*, *D. pruniflora*, *Discorea japonica*, *Dryopteris carthusiana*, *D. crassirhizoma*, *D. pacifica*, *D. saxifraga*, *Euonymus alatus*, *E. maacki*, *E. pauciflorus*, *Fraxinus mandshurica*, *F. rhynchophylla*, *Gentiana axilliariflora* var. *coreana*, *Gnaphalium japonicum*, *Juglans mandshurica*, *Kalopanax septemlobus* = *K. pictus*, *Lepisorus thunbergianus*, *Lespedeza cyrtobotrya*, *L. maximowiczii*, *Lonicera praeflorens*, *Lycopodium serratum*, *Lysimachia barystachys*, *Maackia amurensis*, *Magnolia sieboldii*, *Marlea macrophylla*, *Morus bombycis*, *Neoniphopsis linearifolia* = *Pyrrhosia linearifolia* = *Palura paniculata*, *Paeonia obovata* var. *typical*, *Paraixeris denticulate*, *Parnassia palustris* var. *multiseta*, *Parthenocissus tricuspidata*, *Phegopteris connectilis* = *P. polypodioides*, *Phlomis koraiensis*, *Photinia villosa*, *Picea jezoensis*, *Pinus densiflora*, *P. koraiensis*, *P. pumila*, *Polystichum braunii* *Populus koreana*, *Prunus maackii*, *Ptilopetris triptera*, *Pueraria lobata*, *P. thunbergiana*, *Pyrus ussuriensis*, *Quercus aliena*, *Q. dentata*, *Q. mongolica*, *Rhododendron mucronulatum*, *R. schlippenbachii*, *R. yedoense*, *Rhus javanica*, *Rosa koraiensis*, *Rubia akane*, *Sabina sargentii*, *Salix caprea*, *S. graciliglans*, *S. kangensis*, *S. rorida*, *Sambucus sieboldiana*, *Sanicula chinensis*, *Saussurea umbrosa*, *Saxifraga fortunei*, *Scabiosa japonica*, *Securinega suffruticosa*, *Sedum koraiense*, *Selaginea involven*, *Smilax oldhamii*, *Sorbaria sorbifolia*, *Sorbus alnifolia*, *Staphylea bumalda*, *Stephandra*

incisa, *Styrax obassia*, *Syringa dilatata*, *S. velutina*, *Taxus cuspidate*, *Thuja koraiensis*, *Tilia amurensis*, *T. mandshurica*, *Tripteryngium regelii*, *Ulmus davidiana*, *U. macrocarpa*, *U. macrophylla*, *Vaccinumm koreanum*, *Veratrum patulum*, *Viola variegata*, *Vitis amurenis*, *V. flexuosa*, *Weigela florida*, *Woodsia manchuriensis* = *Physematium manchuriense*, *Woodsia polystichoides* and *Zanthophyllum schinifolium*.

Myonggyong-dae Ravine (56) – ravine (valley) in Kumgang-san Mts, alt. *ca* 800 m (Kangwon Province).

Myonggyong-dae Rock (58) – rock in Kumgang-san Mts, near Manmulsang Rocks, alt. *ca* 1000 m (Kangwon Province).

Naegok (13) – village in Paekdu-san Mts, near Onsupyong village, *ca* 10 km NE of Pochonbo town, *ca* 30 km of Hyesan town, alt. *ca* 1000 m (Ryanggang Province).

Nampo (44) – port town on Yellow Sea coast, *ca* 45 km SW of Pyongyang city (South Pyongan Province).

North Hwanghae – province of North Korea in southern part of country.

North Pyongan – province of North Korea in northwestern part of country.

Okryu-dong Valley (59) – valley with Kumgangmun Gate and Kuryong Falls in Kumgang-san Mts, *ca* 10 km SW of Kosong town, below alt. 700 m (Kangwon Province).

Onjong-gang (54, 60) – (Nam-gang), stream flowing into Sea of Japan, in Kumgang-san Mts, between Onjong-ryong Pass and Onjong-ri village, alt. *ca* 0–850 m (Kangwon Province).

Onjong-ri (60) – village in Kumgang-san Mts, *ca* 5 km S of Kosong town, alt. *ca* 50–100 m (Kangwon Province).

Onjong-ryong Pass (54) – pass in Kumgang-san Mts, *ca* 7 km NW of Onjong-ri village, *ca* 7 km SW of Kosong town, alt. 858 m (Kangwon Province).

Paegu Hill (30) – hill in Myohyang-san Mts, near Hyangsan town (North Pyongan Province).

Paekdu-san Mt. peak (1) – ('White Head Mt.'), highest peak of Paekdu-san Mts and of the whole Korean Peninsula, an extinct volcano covered by whitish pumice and snow, *ca* 75 km N of Hyesan town, on border with China, alt. 2744 m; since the 15th century this volcano has erupted four times: A.D. 1413, 1597, 1668 and 1702. The last eruption caused large-scale forest devastation. Remnants of buried forest trees *Larix olgensis*, *Picea* spp., *Pinus* spp. and broadleaf trees (Šrůtek & Lepš 1994), (Ryanggang Province).

Paekdu-san Mts (1–15) – ('White Head Mts'), mountains in north part of Korea, at border with China (Ryanggang Province); the entire Paekdu-san region has an area of about 22,000 sq km. The upper border of the larch forest zone is at alt. *ca* 2300 m. Alpine meadows with *Rhododendron aureum* and *R. parviflora* appear above alt. 2300 m, up to the peak of Paekdu-san Mt. at alt. 2744 m. Plants (especially trees and shrubs) known from these mountains: *Abies nephrolepis*, *Acer barbinerve*, *A. tegumentosum*, *A. ukurunduense*, *Actinidia giraldi*, *Adiantum pedatum*, *Anemone narcissiflora*, *Betula microphylla*, *B. ovalifolia*, *B. platyphylla*, *Caltha palustris*, *Clematis fusca*, *C. koreana*, *C. ochotnensis*, *Corylus heterophylla*, *C. mandshurica*, *Crataegus maximowiczii*, *Cypripedium thunbergii*, *Daphne kamtschatica*, *Diphasiatrum complanatum*, *Dryas octopetala*, *Empetrum nigrum*, *Euonymus pauciflorus*, *E. sieboldianus*, *E. ussuriensis*, *Gentiana jamesii*, *Hololeion maximowiczii*, *Juniperus communis* subsp. *nana* = *J. sibirica*, *Larix olgensis*, *Ledum palustre*, *Lespedesa bicolor*, *Ligularia stenocephala*, *Lilium concolor*, *Linnaea borealis*, *Lonicera caerulea*, *L. maacki*, *L. sachalinensis*, *Malus baccata*, *Oxytropis anertii*, *Pedicularis verticillata*, *Philadelphus koreanus*, *Phyllodoce caerulea*, *Picea jezoensis* = *P. ajanensis*, *P. koraiensis*, *Pinus koraiensis*, *P. pumila*, *Potentilla fruticosa*, *Populus davidiana*, *P. koreana*, *Prunus maximowiczii*, *P. padus*, *Quercus mongolica*, *Rheum coreanum*, *Rhododendron aureum*, *R. caeruleum*, *R. parviflorum*, *Ribes distans*, *R. horrdidum*, *R. mandshuricum*, *R. procumbens*, *Rosa acicularis*, *R. amblyotis*, *R. koreana*, *R. marretii*, *Salix berberifolia*, *S. brachypoda*, *S. caprea*, *S. cinerea*, *S. myrtilloides*, *S. pentandroides*, *S. rotundifolia*, *S. taraikensis*, *S. udensis*, *Sambucus latipinna*, *S. sieboldiana*, *Saussurea maximowiczii*, *Sinomalus komarowii*, *Sorbaria sorbifolia*, *Sorbus amurensis*, *Spiraea media*, *S. salicifolia*, *S. sericea*, *Stellera chamaejasme*, *Stylax japonica*, *Syringa amurensis*, *S. wolfii*, *Tilia mandshurica*, *Tofieldia nuda*, *Tripteryngium regelii*, *Vaccinium microcarpum*, *V. oxycoccus*, *V. uliginosum*, *V. vitis-idaea* and *Zanthophyllum piperitum*.

Pagyon Falls (65) – ('Pakyon Falls'), waterfalls in Pagyon ('Pakyon') ravine between Chonma Mt. and Songgo Mt., near Sansong-ri village, *ca* 24 km N of Kaesong town, at border with South Korea, alt. *ca* 300 m. Some collected plants: *Cammelina communis*, *Davallia mariesii*, *Pirus ussuriensis* and *Quercus acutissima* (Kaesong city).

Pagyon Ravine (65) – ('Pakyon Ravine'), ravine (valley) between Chonma Mt. and Songgo Mt., in mountains (unknown name), *ca* 24 km N of Kaesong town, at border with South Korea, alt. *ca* 200–500 m (Kaesong city).

Pison Falls (25) – waterfall in Manpok Valley in Myohyang-san Mts, *ca* 10 km E of Hyangsan town, alt. *ca* 700 m (North Pyongan Province).

Pochonbo (14) – town in Paekdu-san Mts, *ca* 20 km NE of Hyesan town, on Amnok-gang River, alt. *ca* 500–1000 m (Ryanggang Province).

Pohyon Temple (16) – Buddhist temple in Myohyang-san Mts in Hyangsan-gang River Valley, *ca* 10 km E of Hyangsan town, alt. *ca* 50 m (North Pyongan Province).

Poso-ri (12) – village in Paekdu-san Mts, *ca* 30 km NE of Heysan town, alt. *ca* 1400 m (Ryanggang Province).

Potae-gu (11) – village in Paekdu-san Mts, *ca* 35 km NE of Heysan town, alt. *ca* 1000–1500 m (Ryanggang Province).

Potong-gang River (39) – river in Pyongyang town center, flowing into Taedong-gang River (Pyongyang city).

Pyongyang city (33–40) – administrative region around Pyongyang town.

Pyongyang town (33–40) – capital town of North Korea (DPRK), 2.2 million residents (Pyongyang city).

Rimyongsu (10) – village in Paekdu-san Mts (Ryanggang Province).

Ryanggang – province of North Korea in north part of country.

Ryongak-san Mt. (42) – mountain *ca* 20 km W of Pyongyang town, alt. 294 m (South Pyongan Province). Plants (especially trees and shrubs) known from this place: *Acer mono*, *Actinidia arguta*, *Artemisia japonica*, *Aster scaber*, *Benzoin obtusifolium*, *Carex sideristicta*, *C. lanceolata*, *Castanea crenata*, *Chimaphila japonica*, *Convallaria keiskei*, *Corylus heterophylla*, *Euonymus alatus*, *Fagara schinifolia*, *Fraxinus mandshurica*, *Galium trifloriforme*, *Indigofera kirilowii*, *Lespedeza bicolor*, *Magnolia sieboldii*, *Philadelphus schrenkii*, *Pinus densiflora*, *Polygonatum odoratum* var. *pluriflorum*, *Potentilla sprengeliana*, *Prunus leveilleana* ssp. *spontanea*, *Pueraria lobata*, *Quercus dentata*, *Rhododendron mucronatum*, *Smilax china*, *S. oldchami*, *S. sieboldii*, *Stefandra dilatata* and *Vitis* sp.

Samil-po Lake (62) – lake at foot of Kumgan-san Mts, *ca* 2 km SW of Sea of Japan coast, *ca* 10 km SE of Kosong town, *ca* 10 km E of Onjong-ri village, alt. *ca* 100 m (Kangwon Province).

Samji-yon Hotel (7) – hotel in Paekdu-san Mts, in taiga, *ca* 5 km N of Samji-yon town, *ca* 50 km NE of Heysan town, alt. *ca* 1400 m (Ryanggang Province).

Samji-yon Lake (7) – lake in Paekdu-san Mts, in taiga, *ca* 5 km N of Samji-yon town, *ca* 50 km NE of Heysan town, alt. 1400 m (Ryanggang Province).

Samji-yon town (8) – town in Paekdu-san Mts, in taiga, *ca* 45 km NE of Heysan town, alt. *ca* 1500 m (Ryanggang Province).

Samson-am Rocks (56) – rocky ridge in Kumgang-san Mts, in north part of Onjong-gang River Valley, *ca* 12.5 km of Onjong-ri village, alt. *ca* 650 m (Kangwon Province).

Sangwon-am (19) – Buddhist monastery in Myohyang-san Mts, *ca* 10 km E of Hyangsan town, alt. *ca* 600 m (North Pyongan Province).

Sariwon (45) – town *ca* 60 km S of Pyongyang city (North Hwanghae Province).

Sijung-ho Lake (52) – ('Shijung-ho') lake *ca* 2 km W of Sea of Japan coast, *ca* 40 km NW of Kosong town, *ca* 35 km SE of Wonsan town (Kangwon Province).

Sinmusong village (2) – village in Paekdu-san Mts, between Paekdu-san Mt. peak and Mubong village (Ryanggang Province).

Sinwon (49) – town *ca* 20 km NE of Haeju (South Hwanghae Province).

Sogok Falls (21) – waterfall in Myohyang-san Mts, *ca* 15 km of Hyangsan town, alt. *ca* 300 m (North Pyongan Province).

Soham-ho Lake (32) – lake *ca* 30 km N of Pyongyang town (South Pyongan Province). On shore, forest with *Alnus* sp., *Pinus densiflora*, *Populus* sp., *Quercus dentata* and *Q. mongolica*.

Sohung-ho Lake (45) – lake, *ca* 20 km SE of Sariwon town (North Hwanghae Province).

Sokdamgukok (47) – village, *ca* 15 km NW of Haeju town, *ca* 30 km E of Yellow Sea coast (South Hwanghae Province).

Somun Mt. (34) – little mountain in Taesong-san Mts, in N part of Pyongyang town (Pyongyang city).

Sondowon Beach (51) – beach in Wonsan town, on Yellow Sea coast (Kangwon Province).

South Hwanghae – a southwestern province of North Korea.

South Pyongan – a west-central province of North Korea.

Suian-san Mts (48) – mountains, *ca* 5 km N of Haeju town, alt. *ca* 150–950 m (South Hwanghae Province). Deciduous and mixed forest with *Carpinus*, *Castanea*, *Quercus*, *Zelkova* and other tree species. Plants (especially trees and shrubs) known from these mountains: *Acanthopanax sessiliflorus*, *Acer formosum* var. *koreanum*, *A.ginnala*, *A. mono*, *A. palmatum*, *A. pseudosieboldianum*, *Actinidia arguta*, *Aralia elata*, *Alnus japonica*, *Artemisia japonica*, *Aster*, *scaber*, *Athyrium japonicum*, *Benzoin obtusilobum*, *Betula gmelinii*, *Callicarpa japonica*, *Carex sideristicta*, *Carpinus laxiflora*, *Castanea crenata*, *C. mollisima*, *Celastrus orbiculatus*, *Clematis maximowicziana*, *Clerodendron trichotomum*, *Cornus koreana*, *Corylus heterophylla*, *C. manshurica*, *Crataegus pinnatifolia*, *Deutzia pruniflora*, *Eleagnus umbellata*, *Euonymus alatus*, *Fagara schinifolia*, *Frax-*

inus mandshurica, *F. rhynchophylla*, *Galium triflori-forme*, *Gymnocarpium dryopteris*, *Hemerocallis disti-cha*, *Indigofera kirilowii*, *Juniperus rigida* = *J. utilis*, *Kalopanax septemlobus* = *K. pictus*, *Lespedeza bicolor*, *L. cyrtobotrya*, *L. maximowiczii*, *Ligustrum ibota*, *Lin-dera obtusiloba* = *Benzoin obtusilobum*, *Lonicera japonica*, *L. maackii*, *Magnolia sieboldii*, *Micrama alnifolia*, *Miscanthis sinensis*, *Parthenocissus tricuspi-data*, *Picrama quassioides*, *Pinus densiflora*, *Polygo-natuim odoratum*, *Potentilla sprengeliana*, *Prunus ja-ponica*, *P. leveilleana*, *P. serrulata*, *P. tomentosa*, *Pteridium aquilinum*, *Pueraria lobata*, *P. thunbergiana*, *Quercus acutissima*, *Q. aliena*, *Q. dentata*, *Q. glandu-lifera*, *Q. mongolica*, *Q. variabilis* = *Q. serrata*, *Rham-nus davurica*, *R. diamantica*, *R. koraiensis*, *Rhododen-dron mucronulatum*, *R. schlippenbachii*, *R. yedoense*, *Rhus javanica*, *Rhus sylvestris*, *Rosa multiflora*, *Rubus crataegifolius*, *Salix caprea*, *S. graciliglans*, *S. integra*, *S. kangensis*, *Securinega suffruticosa*, *Smilax sieboldii*, *Stephandra incisa*, *Styrax obassia*, *Symplocos panicu-lata*, *Ulmus davidiana*, *U. macrocarpa*, *Vaccinum kore-anum*, *Viburnum opulus* var. *calvescens*, *V. pubinerve*, *V. wrightii*, *Viola collina*, *V. chaerophyllides*, *V. diaman-tica*, *Vitis amurensis*, *Weigela florida*, *Zanthophyllum schinifolium* and *Zelkova serrata*.

Taedong-gang River (40) – river in center of Pyon-gyang town, flowing into Yellow Sea (Pyongyang city).

Taedong-gang Pleasure Park (40) – park in center of Pyongyang town, on right bank of Taedong-gang River (Pyongyang city).

Taeha Falls (18) – waterfall below Sangwon-am Monastery, in Myohyang-san Mts, *ca* 8 km of Hyang-san town, alt. *ca* 450 m (North Pyongan Province).

Taehong-dan (6) – village in Paekdu-san Mts, *ca* 30 km NE of Samji-yon town, *ca* 70 km NE of Hyesan town, alt. *ca* 1500 m (Ryanggang Province).

Taesong-ho Lake (43) – artificial lake, *ca* 30 km SW of Pyongyang town, *ca* 5 km W of Kangso town, alt. *ca* 80–100 m (South Pyongan Province).

Taesong-san Mts (33–37) – little mountains in north part of Pyongyang town, with 5 peaks: Changsu, Chu-jak, Kuksa, Somun and Ulji (Pyongyang city). Plants (especially trees and shrubs) known from these moun-tains: *Acer mono*, *Artemisia japonica*, *Benzoin obtusifo-lius*, *Corylus heterophylla*, *Dendranthema zawadzkii*, *Fraxinus mandshurica*, *Lespedeza bicolor*, *L. maximo-wiczii*, *Magnolia sieboldii*, *Pinus densiflora*, *Pueraria lobata*, *Quercus acutissima*, *Q, dentata*,*Q. serrata*, *Rho-dodendron mucronatum*, *Smilax china*, *S. oldhami*, *S. sieboldi*, *Stephandra incisa*, *Syringa dilata*, and *Vitis amurensis*.

Tomb of King Kongmin (64) – tomb near Haeson-ri village, *ca* 13 km W of Kaesong city center, at border with South Korea (Kaesong city).

Tuman-gang River (5) – river in Paekdu-san Mts, along border with China, 548 km long, in NE North Korea (Ryanggang Province and North Hamgyong Province).

Unson Falls (23) – waterfall in Myohyang-san Mts, in Manpok Valley, *ca* 15 km NE of Hyangsan town, alt. *ca* 500 m (North Pyongan Province).

Wonman Mt. (31) – mount in Myohyang-san Mts, *ca* 15 km NE of Hyangsan town, alt. *ca* 1500 m (North Pyongan Province).

Wonsan town (50) – port town on coast of Sea of Japan, in east part of North Korea, *ca* 140 km E of Pyongyang town (Kangwon Province).

Yellow Sea (44) – ('West Sea', 'West Sea of Korea'), sea in western part of Korea.

Yuson Falls (24) – waterfall in Manpok Valley in Myohyang-san Mts, *ca* 15 km E of Hyangsan town, alt. *ca* 600 m (North Pyongan Province).

HERBARIUM

Specimens collected in North Korea (1460 numbers) are deposited in KRAM-F (Herbarium of the W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków).

METHODS

The fungi were precisely described after collecting in North Korea, and then were identified in Poland: Hydnangiaceae, Marasmiaceae, Pleurotaceae and Tricholomataceae by H. Komorowska (genera *Camaro-phyllus*, *Hygrophorus* and *Phyllotopsis* by W. Wojewoda), Bolbitiaceae, Coprinaceae, Cortinariaceae, Entolomata-ceae and Strophariaceae by Z. Heinrich (genus *Clitopi-lus* by W. Wojewoda), and all the other groups by W. Wojewoda.

TAXONOMY AND NOMENCLATURE OF FUNGI

Systematic groups are mainly according to Kirk *et al*. (2001), Hymenochaetales *pro parte* according to Fias-son & Niemelä (1984), nomenclature of genera and species of other groups according to Antonín & Noor-deloos (1993, 1997), Arnolds & Bas (1990), Bas (1983a), Bigelow (1982, 1985), Boekhout (1999), Cor-ner (1968), Demoulin (1968, 1969), Dring (1980), El-borne (1995), Eriksson & Ryvarden (1973, 1975, 1976), Eriksson *et al*. (1981, 1984), Gilliam (1975, 1976), Ginns (1982), Ginns & Freeman (1994), Ginns & Lefebvre (1993), Gulden (1980, 1987), Guzmán (1970), Hallenberg (1985), Halling (1983), Hansen & Knudsen (1992, 1997, 2000), Harmaja (1969, 2002),

Hesler (1969), Hjortstam *et al*. (1988), Horak (1971), Jacobsson (1990), Jülich (1972), Kits van Waveren (1985), Kotiranta & Saarenoksa (2002), Kuyper (1986, 1995a, b), Kytövuori (1988), Langer E. (1994), Langer G. (1994), Maas Geesteranus (1975, 1992a, b), McNabb (1965a–c, 1973), Mueller (1992), Niemelä (1972, 1987, 1998), Noordeloos (1980, 1983, 1988, 1992, 1999), Noordeloos & Christensen (1999), Noordeloos & Kuyper (1995), Norstein (1990), Núñez & Ryvarden (1995, 1997, 2001), Orton (1960, 1969), Orton & Watling (1979), Parmasto (1970, 2001), Peintner & Horak (2002), Pouzar (2001), Reid (1974), Roberts (1999), Ryvarden & Gilbertson (1993, 1994), Senn-Irlet (1995), Smith (1947), Stangl (1989), Sunhede (1990), Thorn & Barron (1986), Vellinga (1990, 1995a, b), Watling (1982), Watling & Gregory (1987, 1989), Wu (1990) and others.

NOMENCLATURE OF PLANTS

Nomenclature of plants (most often trees and shrubs) follows Anonymous (1964), Bojarczuk and Boratyński (1985), Boratyński (1984), Staszkiewicz (1992a, b), and information from botanists from the Institute of Botany, Korean Academy of Sciences in Pyongyang.

CHARACTERISTICS OF MYCOBIOTA

NUMBER OF FUNGI

In 1982–1986, 430 species of fungi were found in North Korea (see: List of fungi).

SPECIES RECORDED FOR THE FIRST TIME FROM NORTH KOREA

There are 259 species of fungi recorded for the first time from North Korea. These fungi were not mentioned hitherto in the mycobiota of North Korea (Anonymous 1983a).

FUNGI IN SOME MOUNTAINS OF NORTH KOREA

Material was collected mainly in some Korean mountains: Kumgang-san Mts, mountains near Kaesong town (Pagyon Ravine), Myohyang-san Mts, Paekdu-san Mts, Ryongak-san Mt., Suian-san Mts and Taesong-san Mts.

Kumgang-san Mts

In the Kumgang-san Mts (Anonymous 1980) 125 species of fungi were found, including the lignicolous *Aleurodiscus cerussatus*, *Dacrymyces chrysospermus* (in these mountains at alt. *ca* 800 m), *Irpicodon pendulus*, *Podostroma alutaceum*, *Punctularia strigosozonata*, *Pycnoporus sanguineus*, *Scotomyces subviolaceus* and *Xylobolus frustulatus*; entomophilous *Cordyceps militaris*; mycophilous *Colacogloea peniophorae* and *Hypomyces chrysospermus*; terrestrial mycorrhizal *Albatrellus confluens*, *A. cristatus*, *Boletus impolitus*, *Gomphidius roseus*, *Hebeloma mesophaeum*, *Hydnum rufescens*, *Inocybe lacera*, *Laccaria laccata* var. *pallidifolia*, *L. ohiensis*, *Strobilomyces strobilaceus*, *Tricholoma nauseosum* and *Tylopilus plumbeoviolaceus*; terrestrial saprobic *Marasmius siccus*; and hypogeous *Rhizopogon roseolus*.

Mountains Near Kaesong town (Pagyon Ravine)

In the Pagyon Ravine in the mountains near Kaesong town *ca* 30 species of fungi were found, including the lignicolous *Daedalea quercina*, *Daedaleopsis tricolor*, *Daldinia concentrica*, *Dentipellis fragilis*, *Hyphoderma mutatum*, *Hypochnicium lundelii*, *Lopharia mirabilis*, *Mycena chlorophos* and *Pycnoporus sanguineus*; and terrestrial saprobic *Coprinus urticicola* (on rotting plant debris) and *Marasmius siccus*.

Myohyang-san Mts

In the Myohyang-san Mts (Anonymous 1982b) *ca* 160 species of fungi were found, including the lignicolous *Clavicorona pyxidata*, *Clavulinopsis laeticolor*, *Clitopilus rhodophyllus*, *Dacrymyces chrysospermus* (in these mountains at alt. 200–1000 m), *Erythricium laetum*, *Gloeoporus taxicola*, *Guepiniopsis buccina*, *Hymenochaete corrugata*, *H. cruenta*, *H. tabacina*, *Hypochnicium globosum*, *Inonotus hispidus*, *Intextomyces contiguus*, *Phyllotopsis nidulans*, *Polyporus arcularius*, *Punctularia strigosozonata*, *Pycnoporus sanguineus*, *Resupinatus striatulus*, *Scotomyces subviolaceus*, *Sistotrema raduloides*, *Tubulicium vermiferum* and *Xylobolus frustulatus*; terrestrial mycorrhizal *Amanita caesarea*, *Astraeus hygrometricus*, *Boletus reticulatus*, *Descolea flavoannulata*, *Gomphus floccosus*, *Hydnellum aurantiacum*, *Inocybe calida*,

Laccaria trichodermophora and *Tylopilus plumbeoviolaceus*; and terrestrial saprobic *Geastrum fimbriatum*, *Marasmius siccus*, *Mutinus bambusinus*, *Pleuroflammula flavomarginata* and *Spathularia flavida*.

Paekdu-san Mts

In the Paekdu-san Mts (Anonymous 1982c) *ca* 200 species of fungi were found. According to Vasilkov (1955), for Asiatic taiga forest with *Larix* the characteristic fungi are *Boletinus asiaticus*, *B. cavipes*, *B. paluster*, *B. spectabilis*, *Gomphidius maculatus*, *Hygrophorus lucorum*, *Suillus aeruginascens* and *S. grevillei*. There are terrestrial mycorrhizal fungi, associated most often with *Larix olgensis* in these mountains. Among the fungi observed on wood of *Larix olgensis* were *Oligoporus obductus*, *Inonotus tomentosus* and *Phellinus* cfr. *laricis*, on *Betula platyphylla* were *Ochroporus laevigatus* and *O. lundelii*. According to Parmasto (1970), *Vararia borealis* frequently occurs in taiga forests.

Other lignicolous fungi observed in these mountains included *Aleurocystidiellum subcruentatum*, *Aleurodiscus amorphus*, *Amphinema byssoides*, *Amylostereum chailletii*, *Athelia bombacina*, *A. fibulata*, *Basidioradulum radula*, *Boreostereum radiatum*, *Botryobasidium candicans*, *B. medium*, *Coniophora olivacea*, *Cytidia salicina*, *Exidiopsis calcea*, *Gloeocystidiellum ochraceum*, *Hyphodontia aspera*, *H. crustosa*, *H. pallidula*. *Leptosporomyces fuscostratus*, *L. galzinii*, *Paxillus panuoides*, *Phaeolus schweinitzii*, *Phlebia fuscoatra*, *Piloderma byssinum*, *Psilocybe capnoides*, *P. elongata*, *Punctularia strigosozonata*, *Resinicium bicolor*, *Tomentellina fibrosa* and *Tylospora fibrillosa*.

Dacrymyces chrysospermus is not rare here. In the Paekdu-san Mts it was noted at alt. 1200–1900 m.

Some species of *Galerina* grow among mosses, such as *G. calyptrata*, *G. clavata*, *G. sphagnorum*, *G. tundrae* and *Hebeloma alpinum*. On the ground occur terrestrial saprobic fungi such as *Clitocybe bresadolana*, *Cystoderma amianthinum* and *Geastrum quadrifidum*.

Tremella encephala is a mycophilous fungus parasitizing *Stereum sanguinolentum*.

Cordyceps sphecocephala is an entomophilous fungus occurring on wasps.

Ryongak-san Mt.

On Ryongak-san Mt. 40 species of fungi were found. *Astraeus hygrometricus*, *Clavulinopsis corniculata*, *Inocybe flavella*, *Lactarius quietus* and *Phylloporus rhodoxanthus* are among the species occurring on the ground, and *Hypochnicium caucasicum* and *Tremella fuciformis* among those occurring on wood.

Suian-san Mts

In the Suian-san Mts *ca* 60 species of fungi were found, including the coprophilous *Cyathus stercoreus*; lignicolous *Basidiodendron caesiocinereum*, *Daedaleopsis tricolor*, *Dendrothele alliacea*, *Hyphoderma cremeoalbum*, *Hypochnicium globosum*, *H. punctulatum*, *Mucronella calva*, *Phyllotopsis nidulans*, *Pluteus podospileus* for. *minutissimus*, *Ramaria obtusissima*, *Sistotrema-strum suecicum*, *Terana caerulea*, *Tubulicium vermiferum*, *Tubulicrinis borealis* and *T. calothrix*; mycophilous *Asterophora lycoperdoides*; terrestrial mycorrhizal *Albatrellus cristatus*, *Inocybe fuscomarginata* and *Laccaria ohiensis*; and terrestrial saprobic *Agrocybe sphaleromorpha*, *Geastrum mirabile* and *Ramaria obtusissima*.

Taesong-san Mts

In the Taesong-san Mts only 16 species of fungi were found, including the lignicolous *Dacryopinax spathularia*, *Hericium erinaceus*, *Irpex lacteus* and *Tubulicrinis calothrix*; and terrestrial saprobic *Marasmius siccus*.

BIOGEOGRAPHIC AND ECOLOGICAL CHARACTERISTICS OF FUNGI

According to Wu and Mueller (1997) the macrofungi of East Asia consist of the following major elements: cosmopolitan, circumpolar, north temperate, Eurasian, eastern North American and eastern Asian disjunct, western North American and eastern Asian disjunct, Sino-Japanese,

Sino-Himalayan, tropical southeast Asian, and endemic.

COSMOPOLITAN FUNGI

In North Korea the cosmopolitan fungi include *Albatrellus confluens*, *Astraeus hygrometricus*, *Bjerkandera adusta*, *Boletus edulis*, *Byssomerulius corium*, *Camarophyllus pratensis*, *Cerrena unicolor*, *Chondrostereum purpureum*, *Clavulina coralloides*, *Geastrum fimbriatum*, *Gloeophyllum trabeum*, *Gloeoporus dichrous*, *Hyphodontia paradoxa*, *Irpex lacteus*, *I. nitidus*, *Laetiporus sulphureus*, *Lenzites betulinus*, *Macrolepiota procera*, *Oligoporus caesius*, *Phaeolus schweinitzii*, *Polyporus arcularius*, *Porostereum crassum*, *Punctularia strigosozonata*, *Resinicium bicolor*, *Rhizopogon roseolus*, *Schizophyllum commune*, *Skeletocutis amorpha*, *Stereum hirsutum*, *Thelephora terrestris*, *Trametes hirsuta*, *T. ochracea*, *T. versicolor* and *Trichaptum biforme*.

CIRCUMPOLAR FUNGI

The circumpolar species include *Coriolopsis trogii*, *Daedaleopsis confragosa*, *Oligoporus obductus*, *Piptoporus betulinus*, *Trametes pubescens*, *Trichaptum abietinum* and *T. fuscoviolaceum*.

CIRCUMBOREAL FUNGI

The circumboreal fungi include *Albatrellus cristatus*, *Fomitopsis pinicola* and *Trichaptum laricinum*.

BOREAL-MONTANE FUNGI

The boreal-montane fungi in North Korea include *Ochroporus lundellii* and *Phellinus* cfr. *laricis*.

NORTH TEMPERATE FUNGI

The north temperate fungi include *Gloeophyllum abietinum*, *Mycena oregonensis*, *Ochroporus lundellii*, *Oxyporus populinus*, *Thelephora palmata* and *Trichaptum laricinum*, also occurring in Eurasia and North America.

EURASIAN FUNGI

The mycobiota in Europe and Asia are similar in many respects. Many macrofungi are common to both continents. Eurasian fungi (known only from Asia and Europe) include *Daedaleopsis confragosa*, *Phanerochaete calotricha*, *Trametes gibbosa*, *Clitocybe bresadolana* and *Macrocystidia cucumis* (Harmaja 1969; Urbonas 1997).

ASIATIC-AMERICAN FUNGI

The Asiatic-American fungi in North Korea include *Gomphus floccosus*, *Gymnopus subnudus*, *Marasmius pallidocephalus*, *M. pulcherripes*, *Phanerochaete viticola* and *Tylopilus plumbeoviolaceus*.

Pleuroflammula flavomarginata is known from India and Sri Lanka in Asia and from Columbia in South America.

ASIATIC FUNGI

The Asiatic fungi in North Korea include *Boletinus asiaticus* and *Lysurus mokusin*. *Boletinus asiaticus* is known in Europe only from Finland, probably introduced to Europe from Asia. *Lysurus mokusin* (type locality: Mokusin Province, China) is known also from Australia and North America, but Lloyd (1909) recorded the species from a California glasshouse, doubtless introduced accidentally with plants or soil brought from the Orient. Possibly the species was introduced to Australia in a similar manner (Cunningham 1944).

Hitherto, *Hypochnicium globosum* was recorded only in Asia from China, Japan and Taiwan. Other Asiatic fungi are *Descolea flavoannulata*, *Phallus rugulosus* and *Radulomyces copelandii*.

TROPICAL, SUBTROPICAL AND WARM-TEMPERATE FUNGI

Dacryopinax spathularia is widely distributed in the tropics of America, Africa, Oceania and Southern Asia, but also grows in subtropical and warm-temperate regions of Asia and even in some frigid temperate zones, for example in the Paekdu-san Mts of North Korea and in the Russian Far East. *Pycnoporus sanguineus* is a widely distributed pantropical fungus, and is also common in subtropical and warm-temperate areas. It occurs abundantly in almost all tropical countries of the world, but occurs also in Paekdu-san and the Russian Far East.

Other tropical, subtropical and warm-temperate fungi include *Lysurus mokusin*, *Mutinus bambusinus*, *Phallus rugulosus*, *Pleuroflammula flavomarginata* and *Pseudocolus fusiformis*, and according to Anonymous (1983a) *Microporus affinis = M. flabelliformis* as well. *Tremella fuciformis* is a pantropical fungus, but is also known from temperate areas of the northern hemisphere, such as the Russian Far East. *Lopharia mirabilis* is a paleotropical fungus (Davydkina 1980). *Inonotus hispidus* is a thermophilic species known mainly in the southern part of the Holarctic.

Warm-temperate fungi include *Amanita caesarea*, *Gomphus floccosus*, *Hypochnicium globosum*, *Marasmius siccus*, *Pleuroflammula flavomarginata*, *Polyporus alveolaris* and *Terana caerulea*.

FUNGI ASSOCIATED WITH CERTAIN TREES

Abies: *Aleurodiscus amorphus* and *Hymenochaete cruenta*.

Betula: lignicolous: *Gloeoporus dichrous* and *Piptoporus betulinus*; terrestrial, mycorrhizal: *Lactarius pubescens*, *L. torminosus* and *Russula aeruginea*.

Larix: lignicolous: *Oligoporus obductus*, *Phaeolus schwenitzii*, *Phellinus* cfr. *laricis* and *Trichaptum laricinum*; terrestrial, mycorrhizal: *Boletinus asiaticus*, *B. cavipes*, *B. paluster*, *B. spectabilis*, *Gomphidius maculatus*, *Hygrophorus lucorum*, *Suillus aeruginascens* and *S. grevillei*.

Picea: lignicolous: *Gloeophyllum odoratum*.

Pinus (most often with *P. densiflora*): lignicolous: *Gloeophyllum abietinum*, *Gloeoporus taxicola*, *Irpicodon pendulus*, *Oligoporus leucomallellus* and *Porodaedalea pini* (parasite); fungi growing on cones: *Auriscalpium vulgare*; terrestrial, mycorrhizal: *Albatrellus confluens*, *A. cristatus*, *Astraeus hygrometricus*, *Coltricia perennis*, *Russula emetica*, *Suillus bovinus*, *S. granulatus*, *S. luteus* and *Tricholoma nauseosum*.

Populus: lignicolous: *Peniophora polygonia*.

Quercus: lignicolous: *Daedalea quercina*, *Peniophora quercina* and *Xylobolus frustulatus*; terrestrial, mycorrhizal: *Lactarius quietus* and *L. subdulcis*.

Salix: lignicolous: *Cytidia salicina*.

MYCOPHILOUS FUNGI

The saprobic fungus *Asterophora lycoperdoides* occurs on old basidiocarps of agarics (especially *Lactarius* and *Russula*). *Hypomyces chrysospermus*, also saprobic, grows on old basidiocarps of agarics and boletes. *Tremella encephala* is a parasite of *Stereum sanguinolentum*, and *Colacogloea peniophorae* parasitizes *Hyphoderma praetermissum*.

FUNGI GROWING TOGETHER WITH OTHER FUNGI

Gomphidius roseus is commonly (always?) associated with *Suillus bovinus* (Breitenbach & Kränzlin 1991). These two fungi were found growing together on shore of Samil-po Lake in the Kumgang-san Mts.

COPROPHILOUS FUNGI

Cyathus stercoreus is a terrestrial coprophilous fungus growing on the dung of herbivores. It was found in a garden in the Suian-san Mts near Haeju.

ENTOMOPHILOUS FUNGI

Zoophilic, entomophilous fungi in North Korea include *Cordyceps militaris* occurring on pupae of Lepidoptera and *C. sphecocephala* occurring on wasps.

SYNANTHROPIC FUNGI

Synanthropic fungi grow especially in towns and villages, in parks, gardens and squares, near buildings and by streets. For example, *Lysurus mokusin* was noted by a boulevard, on the bank of the Taedong River in the center of Pyongyang, and *Phallus rugulosus* was recorded in Mangyongdae, near Pyongyang and in the Central Botanical Garden in Pyongyang.

COMMON FUNGI

Common or very common fungi in North Korea include *Astraeus hygrometricus*, *Irpex lacteus*, *Schizophyllum commune*, *Stereum hirsutum*, *S. sanguinolentum*, *S. subtomentosum* and *Trametes versicolor*.

EDIBLE FUNGI

Edible fungi in North Korea include *Auricularia auricula-judae*, *Hygrophorus lucorum* and *Tri-*

choloma nauseosum. The latter species is traditionally a highly esteemed edible fungus in Japan and Korea. In the Paekdu-san Mts, in the vicinity of Samji-yon town, fungi of the Boletaceae family, *Boletinus asiaticus*, *B. cavipes*, *Suillus aeruginascens* and *S. grevillei*, are not considered edible.

POISONOUS FUNGI

Some poisonous fungi have been found in North Korea: *Amanita citrina*, *A. muscaria*, *A. pantherina*, *A. phalloides*, *Clitocybe candicans*, *Galerina marginata*, *Megacollybia platyphylla*, *Psilocybe fascicularis* and *Tricholoma virgatum*.

ACKNOWLEDGEMENTS. We are grateful to Professor Kazimierz Zarzycki and Dr. Barbara Zarzycka, for specimens of Korean fungi collected in 1982 and 1985; Professor Kwak Tyong Son, Director of the Institute of Botany of the Korean Academy of Sciences in Pyongyang, for inviting us to North Korea in 1982–1986; the botanists of this Institute for identification of Korean plants; Barbara Pleban for organizing the Korean herbarium materials and for help in preparing this manuscript for publication; Małgorzata Matyjaszkiewicz for drawing the illustrations and maps; the Polish State Committee for Scientific Research for financial support provided in grant no. 6 P04C 00 318; and Michael Jacobs for checking the English.

LIST OF FUNGI

ASCOMYCOTA
ASCOMYCETES
LEOTIOMYCETIDAE
Helotiales Nannf. 1932

Bulgariaceae Fr. 1849

Bulgaria inquinans (Pers.): Fr.

Syst. Mycol. 67. 1823.

Peziza inquinans Pers., Disp. Meth. Fung. 33. 1797. – *Bulgaria polymorpha* (Lightfoot 1777) Wettst., Zool.-Bot. Verhandl. 595. 1886.

Apothecia 25–40 mm in diam., 10–20 mm high, at first turbinate, then expanded and shallow cup-shaped, gelatinous, short-stipitate. Flesh ochre-brownish. Hymenophore granular-rough, black to black-brown. Margin whitish. Outer surface blackish brown, covered with cluster of hairs.

Paraphyses *ca* 1 μm thick, filiform, curved at tip. Asci 80–160 × 9–13 μm, cylindric-clavate to subclavate, long-stipitate, 8-spored, uniseriate. Pore of ascus amyloid. Ascospores 8.7–15.5 × 4.8–7.8 μm, broadly elliptic, lemon-shaped to almost reniform, dark brown to black-brown, smooth, thin-walled, with 1 large oil-drop. Spore-print black (Fig. 3).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, deciduous forest, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28856; mixed forest, 13 July 1986, *leg. W. Wojewoda*,

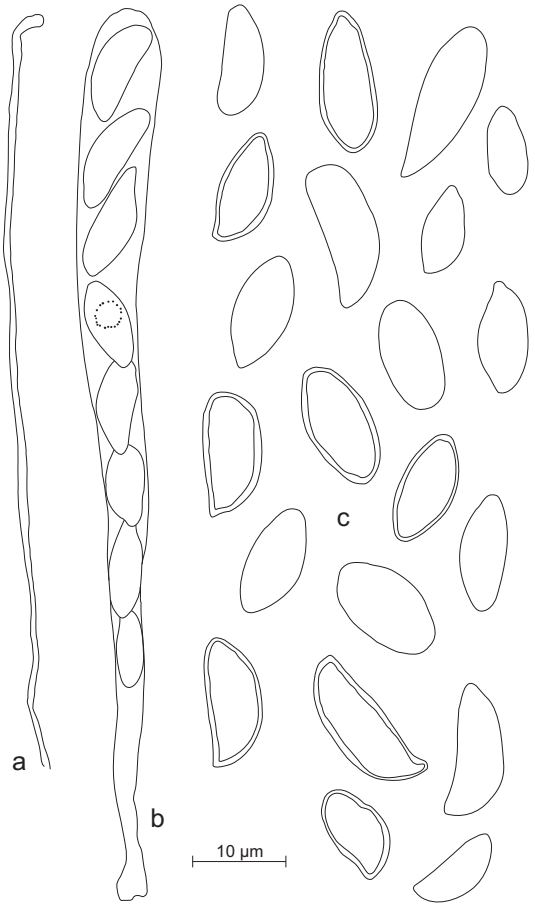


Fig. 3. *Bulgaria inquinans* (Pers.): Fr.: a – paraphysa, b – ascus, c – ascospores (KRAM-F 28703).

KRAM-F 28703; near Kuchung Falls (26), alt. *ca* 800 m, deciduous forest, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28855. – On bark of fallen dead trunks of *Quercus mongolica.*

DISTRIBUTION IN ASIA. China and Korea.

REFERENCES. Anonymous (1983a: 95); Breitenbach & Kränzlin (1984: 156, Pl. 170); Cetto (1980b: 679, Pl. 827); Dennis (1968: 111, Pl. XVH); Hansen & Knudsen (2000: 138); Jahn (1979: 44, Pl. 6); M. Lange & Hora (1963: 44–45); Michael *et al*. (1986: 162, 406, Pl. 268); Moser (1963: 43); Naumov (1964: 105, Fig. 50); Teng (1996: 179, Fig. 174).

Cudoniaceae P. F. Cannon 2001

Spathularia flavida Pers.: Fr.

Syst. Mycol. **1**: 491. 1821.

S. flavida Pers., Neues Mag. Bot. **1**: 116. 1794. – *S. clavata* (Schaeff.) Sacc., Michelia **2**: 77. 1882. – *S. flava* Swartz, Vetensk. Akad. Handlingar. 10. 1812.

Ascocarps 20–60 × 10–20 mm, consisting of head and stalk, fleshy, gregarious. Head 5–15 mm high, spatulate, compressed and flattened, bright yellow, sharply delimited from stipe. Hymenophore irregularly folded. Stipe 5–15 mm high, compressed and flattened, whitish to yellowish.

Paraphyses 2–3 µm wide, filiform, septate. Asci 77.0–97.0 × 10.0–13.5 µm, clavate to cylindric-clavate, 8-spored. Ascospores 35–60 × 2–3 µm, cylindric, with blunt ends, hyaline, smooth, thin-walled, septate (Fig. 4).

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on ground, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52921.

DISTRIBUTION IN ASIA. China, Korea, Mongolia and Russia (e.g. North Altai and Far East).

REFERENCES. Anonymous (1978: 196; 1983a: 96); Azbukina *et al*. (1984: 27); Breitenbach & Kränzlin (1984: 136, Pl. 141); Cetto (1980a: 613, Pl. 355); Dennis (1968: 90, Pl. X); Gorbunova (1997: 15); Hansen & Knudsen (2000: 183); M. Lange & Hora (1963: 44–45); Michael *et al*. (1986: 402–403, Pl. 264); Naumov (1964: 227, Fig. 110); Petrov & Belova (1999: 25); Teng (1996: 176, Fig. 164).

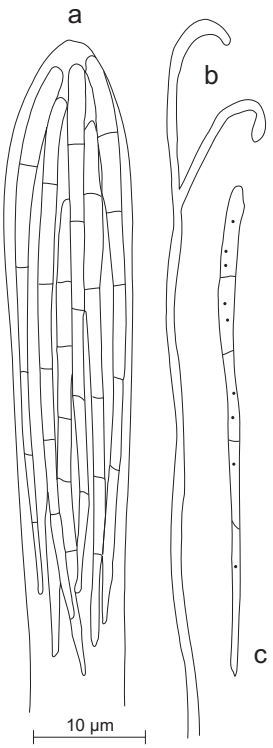


Fig. 4. *Spathularia flavida* Pers.: Fr.: a – ascus with ascospores, b – paraphyses, c – ascospores (KRAM-F 52921).

PEZIZOMYCETIDAE
Pezizales J. Schröt. 1897

Helvellaceae Fr. 1823

Helvella bulbosa (Hedwig: Fr.) Kreisel

Boletus **1984**(1): 29. 1984.

Peziza macropus Pers., Obs. Mycol. **1**: 26. 1786. – *Octospora bulbosa* Hedwig, Descr. Musc. Frond. **2**: 34. 1789. – *Peziza bulbosa* Hedw.: Fr., Syst. Mycol. **2**: 57. 1822. – *Macropodia macropus* (Pers.: Fr.) Fuckel, Symb. Mycol. 331. 1869. – *Helvella macropus* (Pers.: Fr.) P. Karst., Mycol. Fenn. **1**: 37. 1871. – *Cyathipodia macropus* (Pers.: Fr.) Dennis, British Cup Fungi and their allies. Ed. 1. 7. 1960.

Cup 30–40 mm across, thin-fleshed, grey, downy beneath, seated on long slender stalk which tapers slightly upwards, solid, sometimes furrowed below, grey, covered throughout with downy grey hairs that cohere in minute tufts. Flesh white.

Paraphyses up to 10 μm broad at tip, cylindric, rather sharply enlarged. Asci up to 350 × 20 μm. Ascospores 20–30 × 10–12 μm, elliptic-fusiform, distinctly more pointed at each end, usually with a large central oil-drop and a smaller one at each end.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), alt. *ca* 1400 m, taiga with *Larix olgensis*, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28852; Myohyang-san Mts: near Kuchung Falls (26), alt. *ca* 1400 m, deciduous forest, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28853; Kumgang-san Mts: Okryu-dong Valley (59), deciduous forest, 20 July 1986, *leg. H. Komorowska* & *W. Wojewoda*, KRAM-F 28298; W of Onjong-ri (60), mixed forest, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 27774; mixed forest with *Pinus* and *Quercus*, 18 July 1986, *leg. W. Wojewoda*, KRAM-F 28696. – On ground.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan, Korea and Russia (e.g. Primorski Krai).

REFERENCES. Anonymous (1978: 201; 1983a: 96); Azbukina *et al*. (1984: 28); Breitenbach & Kränzlin (1984: Pl. 22); Cetto (1980a: 613, Pl. 356); Dähncke & Dähncke (1980: 647); Dennis (1968: 10, Pl. Ic); Gorlenko *et al*. (1980: 83); Hansen & Knudsen (2000: 73, Fig. 71); Imazeki & Hongo (1975, **1**: 126, Pl. 59); M. Lange & Hora (1963: 38–39); Michael *et al*. (1986: 386, Pl. 229); Naumov (1964: 212, Fig. 100); Teng (1996: 203, Fig. 192).

Helvella crispa (Scop.): Fr.

Syst. Mycol. **2**: 14. 1822.

Phallus crispus Scop., Fl. Carniol. **2**: 475. 1772.

Ascocarp 60–100 mm high, consisting of head and stalk. Head 30–50 mm in diam., undulating, wrinkled, irregularly 2–3-lobed. Hymenophore smooth, when young whitish, then pale ochraceous, dry pale brown-ochraceous. Stalk 40–70 × 5–10 mm, subcylindric, deeply furrowed longitudinally and somewhat anastomosing, whitish when fresh, pale ochraceous when dry.

Asci 116.0–280.0 × 11.0–19.4 μm. Paraphyses up to 4.8–8.0 μm at the tip, cylindric, rather sharply enlarged at the tip, hyaline, thin-walled, smooth. Ascospores 13.5–15.5 × 9.7–11.6 μm, broadly elliptic, smooth, hyaline, thin-walled, usually with a large central oil-drop (Fig. 5).

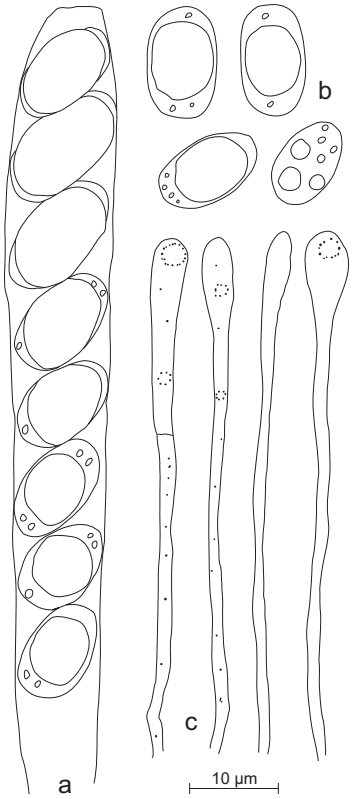


Fig. 5. *Helvella crispa* (Scop.): Fr.: a – ascus, b – ascospores, c – paraphyses (KRAM-F 27767).

SPECIMEN EXAMINED. Kumgang-san Mts: near Onjong-ri (60), alt. *ca* 100 m, mixed forest, on ground, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 27767.

DISTRIBUTION IN ASIA. China, Korea, Mongolia and Russia (e.g. North Altai and Far East).

REFERENCES. Anonymous (1978: 205; 1983a: 97); Azbukina *et al*. (1984: 28); Breitenbach & Kränzlin (1984: 52, Pl. 14); Cetto (1980b: 667, Pl. 814); Dennis (1968: 8, Pl. 4B); Gorbunova (1997: 15); Hansen & Knudsen (2000: 73); M. Lange & Hora (1963: 38–39); Michael *et al*. 1986: 380, 428, Pl. 222); Petrov & Belova (1999: 26); Teng (1996: 214).

Helvella elastica Bull.: Fr.

Syst. Mycol. **2**: 21. 1822.

Helvella elastica Bull., Herb. Fr. Pl. 242. 1785. – *Leptopodia elastica* (Bull.: Fr.) Boud., Hist. Class. Discom. D'Europe. 37. 1907.

Ascocarp up to 70 mm high, consisting of head and stalk. Head 15–25 mm in diam., irregularly inflated, with 2–3 lobes, thin-fleshed. Hymenophore yellowish-grey, grey or pale grey-brown. Stalk 30–50 × 3–5 mm, cylindric, sometimes sinuous, hollow, smooth, without distinct longitudinal ribs, whitish or pale ochraceous.

Asci 250–300 × 12–15 µm, cylindric, hyaline, smooth, thin-walled. Paraphyses up to 4–7 µm at tip, cylindric, thickened toward tips, hyaline, with septa. Ascospores 16–20 × 9–12 µm, elliptic, hyaline, smooth, thin-walled, with a large central oil-drop.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), deciduous forest, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52911; Ryongak-san Mt. (42), alt. *ca* 230 m, mixed forest, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52912; Suian-san Mts (48): alt. *ca* 200 m, deciduous forest, 5 July 1986, *leg. W. Wojewoda*, KRAM-F 52910. – On ground.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (e.g. Primorski Krai).

REFERENCES. Anonymous (1978: 206, 1983a: 97); Azbukina *et al*. (1984: 28); Breitenbach & Kränzlin (1984: 56, Pl. 20); Cetto (1980a: 621, Pl. 363); Dennis (1968: 9, Pl. IA); Hansen & Knudsen (2000: 76); Imazeki & Hongo (1975, **1**: 126, Pl. 59: 330); M. Lange & Hora (1963: 38–39); Michael *et al*. (1986: 382, Pl. 223); Naumov (1964: 238, Fig. 117); Teng (1996: 215, Fig. 207).

Helvella lacunosa Afz.: Fr.

Syst. Mycol. **2**: 15. 1822.

H. lacunosa Afz., Sv. Vet. Akad. Handl. 304. 1783.

Ascocarp consisting of head and stalk. Head 30 × 20 mm, irregularly inflated, hollow, with lobes, thin-fleshed. Hymenophore grey-brown-black. Stalk 50 × 20 mm, pale brownish-ochraceous, solid, furrowed longitudinally.

Asci 220–340 × 20 µm, cylindric-clavate, hyaline, smooth, thin-walled. Paraphyses 4–6 µm wide, cylindric, thickened toward the tips, hyaline to brown, with septa. Ascospores 14–20 × 9–12 µm, broadly elliptic, hyaline, smooth, thin-walled, with a large central oil-drop.

SPECIMEN EXAMINED. Sokdamgukok (47), mixed forest, on ground, 7 July 1986, *leg. W. Wojewoda*, KRAM-F 52909.

DISTRIBUTION IN ASIA. China, Japan, Korea and Mongolia.

REFERENCES. Anonymous (1978: 207, 1983a: 97); Breitenbach & Kränzlin (1984: 54, Pl. 16); Cetto (1980b: 663, Pl. 811); Dennis (1968: 8, Fig. 4B); Hansen & Knudsen (2000: 77); Imazeki & Hongo (1975, **2**: 174, Pl. 58: 342); M. Lange & Hora (1963: 38–39); Michael *et al*. (1986: 380, Pl. 219); Naumov (1964: 236, Fig. 116); Petrov & Belova (1999: 26); Teng (1996: 214).

SORDARIOMYCETIDAE

Hypocreales Lindau 1897

Clavicipitaceae (Lindau) O. E. Erikss. 1982

Cordyceps militaris (L.: Fr.) Link

Handb. **3**: 347. 1833.

Clavaria militaris L., Sp. Pl. 1182. 1753. – *Sphaeria militaris* (L.): Fr., Syst. Mycol. **2**: 322. 1823.

Stromata solitary, up to 50 mm high, with slender flexuous stalk passing into cylindric-fusiform fertile head, the latter about 5 mm thick and minutely roughened with perithecial ostioles, red or orange-red throughout. Perithecia completely immersed.

Asci up to 100 µm long, about 4 µm wide, 8-spored, apex thick-walled. Ascospores 3.5–6.0 × 1.0–1.5 µm, thread-like, as long as the ascus, breaking up into part-spores which become slightly bassel-shaped.

SPECIMENS EXAMINED. Kumgang-san Mts: below Onjong-ryong Pass (54), alt. *ca* 700 m, mixed forest, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52924; at foot of Manmulsang Rocks (55), deciduous forest, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 25493; near Onjong-ri village (60), alt. *ca* 100 m, mixed forest, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52925. – On pupes of Lepidoptera, buried in soil.

DISTRIBUTION IN ASIA. China, Japan, Korea, Russia (e.g. Primorski Krai) and Taiwan.

REFERENCES. Anonymous (1978: 195; 1983a: 95); Azbukina *et al*. (1984: 26); Breitenbach & Kränzlin (1984: 250, Pl. 311); Cetto (1980a: 638, Pl. 381); Chen

(1978: 155, Pls. I: 3; II: 9–12); Dennis (1968: 227, Pl. XXVIA); Imazeki & Hongo (1975, **1**: 129, Pl. 60); M. Lange & Hora (1963: 48–49); Munk (1957: 77); Park & Cho (1985: 107); Teng (1996: 107, Fig. 123j); Zang & Kinjo (1998: 216).

Cordyceps sphecocephala (Klotzsch) Sacc.

Michelia **1**: 321. 1879.

Sphaeria sphecocephala Klotzsch, *in* Berk., Lond. Jour. Bot. **2**: 206. 1843.

Stromata solitary, up to 50 mm high, with slender flexuous stalk passing into cylindric-fusiform fertile head, the latter about 5 mm thick and minutely roughened with perithecial ostioles, red or orange-red throughout. Perithecia completely immersed.

Asci 100 × 4 μm, 8-spored, the apex thick-walled. Ascospores 3.5–6.0 × 1.0–1.5 μm, thread-like, as long as the ascus, breaking up into part-spores which become slightly bassel-shaped.

SPECIMENS EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga with *Larix olgensis*, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 52923; 29 June 1986, *leg. W. Wojewoda*, KRAM-F 52922; *ca* 25 km N of Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix olgensis* and *Picea*, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28615; near Naegok (13), alt. *ca* 800 m, mixed forest, 27 June 1986, *leg. Z. Heinrich*, KRAM-F 27899. – On dead wasps lying on ground, among mosses.

DISTRIBUTION IN ASIA. China.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1984: 252, Pl. 313); Dennis (1968: 228, Pl. XXVIF); Michael *et al*. (1986: 408, Pl. 272); Teng (1996: 105, Fig. 123k); Zang & Kinjo (1998: 216).

Hypocreaceae De Not. 1844

Hypomyces chrysospermus Tul.

Ann. Sci. Nat., Sér. 4, **13**: 16. 1860

Reticularia chrysosperma Bull., Herb. Fr. Pl. 476, Fig. 4. 1789 (anamorph). – *Sepedonium chrysospermum* (Bull.) Fr., Syst. Mycol. 3: 348. 1832 (anamorph). – *Apiocrea chrysosperma* (Tul.) H. Syd. & P. Syd., Ann. Mycol. 18: 187. 1920.

Teleomorph, ascocarp, asci and ascospores absent. Anamorph present as a powdery, golden yellow mycelial state.

Hyphae loose, cobwebby, septate, branched. Conidiophores arising as short, lateral branches of hyaline hyphae 2–3 μm broad, branched. Numerous conidia (chlamydospores) (9.7–7.0)11.6–19.4 μm in diam., globose, 1-celled, roughly spinulosopunctate, golden yellow. Spines 1–2 μm long (Fig. 6).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), mixed forest, on old pileus of boletoid fungus totally destroyed by *Hypomyces*, growing on ground, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53279; Kumgang-san Mts: shore of Samil-po Lake (62), forest with *Pinus densiflora* and *Quercus mongolica*, on lower part of stipe of living young basidiocarp of *Gomphidius roseus*, growing together with *Suillus bovinus*, on ground, under *Pinus densiflora*, 19 July 1986, *leg. W. Wojewoda*, KRAM-F 53346.

DISTRIBUTION IN ASIA. China, India and Russia (e.g. Far East).

NOTES. New to North Korea. Mycophilous parasite.

REFERENCES. Arnold (1969: 41); Bitner (1953: 703, Fig. 7); Dennis (1968: 240, Pl. XXXIA); Gorlenko *et al*. (1976: 159, Fig. 105); Koval' (1974: 204); Morochkovs'kiy *et al*. (1969: 183, Fig. 104); Moser (1963: 19); Munk (1957: 70, Fig. 14f); Teng (1996: 541, Fig. 389); Vasilyeva (1998: 159); Vasudeva (1962: 22).

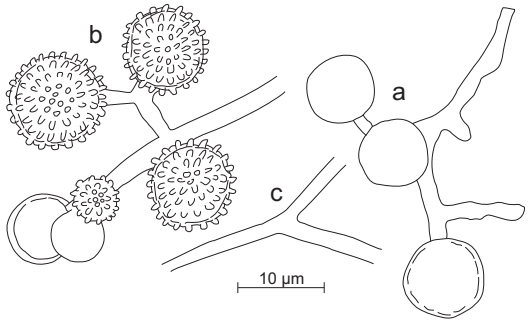


Fig. 6. *Hypomyces chrysospermus* Tul.: a – young conidia (chlamydospores), b – mature conidia, c – hyphae of conidiophores (KRAM-F 53346).

Podostroma alutaceum (Pers.: Fr.) Atk.

Bot. Gaz. **40**: 416. 1905.

Sphaeria alutacea Pers., Obs. Mycol. **2**: 66. 1797. – *Sphaeria alutacea* Pers.: Fr., Syst. Mycol. **2**: 325. 1823. – *Hypocrea alutacea* (Pers.: Fr.) Tul. & C. Tul., Sel. Fung. Carp. 1: 62. 1861. For further synonyms see Vasilyeva (1998: 163).

Stromata young, 15–30 × 5 mm, erect, clavarioid, subcylindric, solid, consisting of fertile upper part and sterile lower part. Surface of fertile part cream-coloured to pale ochraceous, smooth, minutely punctate, with ostioles of embedded perithecia. Flesh whitish. Short sterile part whitish, tomentose, covered with white hairs.

Young perithecia globose. Asci and ascospores not seen.

SPECIMEN EXAMINED. Kumgang-san Mts: near Kuryong Falls (59), alt. *ca* 600 m, mixed forest, on fallen branch of deciduous tree, 20 July 1986, *leg. W. Wojewoda*, KRAM-F 53231.

DISTRIBUTION IN ASIA. China and Russia (Far East: Primorski Krai and Sakhalin).

NOTES. New to North Korea. In China and Russia observed on ground, in Europe (e.g. Switzerland) among needle litter, on rotting wood of conifers and deciduous trees (e.g. *Fagus*), also on roots. Probably rare species.

REFERENCES. Breitenbach & Kränzlin (1984: 254, Pl. 316); Dennis (1968: 234, Pl. XXVIIc); Gorlenko *et al.* (1976: 166, Fig. 106: 4–5); Hansen & Knudsen (2000: 229); Moser (1963: 18); Munk (1957: 66, Fig. 11b); Teng (1996: 111, Fig. 125), Vasilyeva (1998: 163).

Xylariales Nannf. 1932

Xylariaceae Tul. & C. Tul. 1861

Daldinia concentrica (Bolton: Fr.) Ces. & de Not.

Comm. Soc. Critt. Ital. **1**(4): 198. 1863.

Sphaeria concentrica Bolton, Hist. Fung. Halif. App. 180. 1791. – *S. concentrica* Bolton: Fr., Syst. Mycol. **2**: 331. 1823. For further synonyms see Vasilyeva (1998: 176).

Stromata (5–)10–30 mm in diam., hemispherical to globose, sessile to substipitate, solitary or coalescing. Base somewhat incurved, at first reddish brown, soon becoming black, smooth, dotted with minute pores formed by ostioles; flesh dark purplish brown, then blackish, fibrous, with darker concentric zones. Perithecia small, crowded, in single layer beneath thin crust.

Asci 75–200 × 8–12 µm, cylindric, 8-spored, with stalk about 60 µm long. Paraphyses filiform, with septa. Ascospores 9.7–19.4 × 5.8–7.7(–8.7) µm, uniseriate, elliptic-fusiform with one flattened side, brown to blackish brown, some with 1 or 2 oil-drops. Spore-print black.

SPECIMENS EXAMINED. Paekdu-san Mts: Chongbong Mt. (9), W of Rimyongsu, alt. *ca* 1400 m, taiga, on fallen trunk of deciduous trees, 31 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28854; 1 July 1986, *leg. W. Wojewoda*, KRAM-F 52920; Myohyang-san Mts: near Isonnam Falls (29), alt. *ca* 300 m, deciduous forest, on trunk of *Acer* sp., 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28701; on slope of Wonman Mt. (31), alt. *ca* 700 m, mixed forest, on a stump of ?*Acer* sp., 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28700; Suian-san Mts (48), alt. *ca* 200 m, deciduous forests, on fallen dead trunks of trees, e.g. of *Acer* sp., 25 Aug. 1983, *leg. W. Wojewoda*., KRAM-F 52918; 6 July 1986, *leg. W. Wojewoda*, KRAM-F 52916; Kumgang-san Mts: near Manmulsang Rocks (55), deciduous forest, on dead trunk of deciduous tree, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52917; between Samson-am Rocks (56) and Chonson-dae Rock (57), alt. *ca* 800 m, deciduous forest, on dead fallen trunk of *Prunus* sp., 3 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28698; W of Onjong-ri (60), mixed forest with *Pinus koraiensis* and *Quercus* sp., on dead fallen trunk of deciduous tree, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 28697; near Pagyon Falls (65), alt. *ca* 300 m, deciduous forest, on fallen trunk of deciduous tree, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28699.

DISTRIBUTION IN ASIA. China, India, Korea, and Russia (e.g. Far East).

REFERENCES. Anonymous (1983a: 93); Azbukina *et al.* (1984: 26); Breitenbach & Kränzlin (1984: 274, Pl. 346); Cetto (1980b: 681, Pl. 628); Dennis (1968: 284, Pl. XXXIIJ); Hansen & Knudsen (1992: 239); Imazeki & Hongo (1975, **2**: 180, Pl. 59: 359); Jahn (1979: 64, Pl. 29); M. Lange & Hora (1963: 46–47); Michael *et al.* (1986: 412, Pl. 277); Munk (1957: 128, Fig. 44); Phillips (1981: 280); Teng (1996: 129, Fig. 139); Vasilyeva (1987: 213; 1998: 176); Vasudeva (1962: 26).

Xylaria longipes Nitschke

Pyr. Germ. 14. 1867.

Xylosphaera longipes (Nitschke) Dennis, Kew Bull. **13**: 104. 1958.

Stromata 30–120 × 4–7 mm, unbranched, divided into fertile head and sterile stipe. Head cylindric or slenderly clavate, apex obtuse, rounded, surface dark brown to almost black, rugulose, reticulate-rimose, black punctate from papilliform ostiola. Stipe 15–90 × 10–30 mm long, cylindric, with pannose base. Perithecia 560–650 μm in diam., immersed, globose.

Paraphyses 1.5–5.0 μm broad, filiform, numerous. Asci 80–100 × 6–9 μm, cylindric, 8-spored, spores uniseriate. Ascospores 7.7–12.6 × 3.8–5.8(–6.7) μm, elliptic, dark brown, smooth, with 2 (rarely 1) large, greenish oil-drops.

SPECIMEN EXAMINED. Myohyang-san Mts: on slope of Wonman Mt. (31), alt. *ca* 1000 m, deciduous forest, on ?*Acer* stump, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28702.

DISTRIBUTION IN ASIA. China, Korea and Russia (e.g. Far East).

NOTES. New to North Korea. Species known from the Northern Hemisphere.

REFERENCES. Breitenbach & Kränzlin (1984: 276, Pl. 350); Cetto (1983: 569, Pl. 1229); Dennis (1968: 284, Fig. 19c); Hansen & Knudsen (2000: 250, Fig. 245); Lee *et al*. (2000: 91); Munk (1957: 140, Fig. 49b); Teng (1996: 142); Vasilyeva (1998: 206).

Xylaria polymorpha (Pers.: Fr.) Grev.

Fl. Edin. 355. 1824.

Sphaeria polymorpha Pers., Comm. Fung. Clav. 17. 1797. – *Xylosphaera polymorpha* (Pers.) Dumort., Comment. Bot. 91. 1822. – *Sphaeria polymorpha* Pers.: Fr., Syst. Mycol. **2**: 326. 1823.

Stromata 20–120 mm long, 95–20 mm thick, solitary, or two or more cespitose-connected at the base. Head clavate, cylindric, elliptic or subglobose or otherwise irregular in shape, slightly or much compressed, attenuated upwards or both ways, simple or variously divided. Inside white, solid, surface dark brown or black, much wrinkled. Stipe variable in length. Perithecia 500–800 μm in diam., subglobose to ovate, immersed, with papilliform ostiolum.

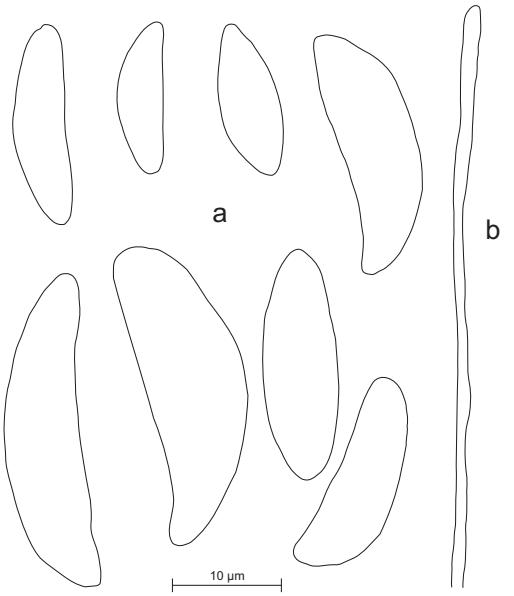


Fig. 7. *Xylaria polymorpha* (Pers.: Fr.) Grev.: a – ascospores, b – paraphysa (KRAM-F 28864).

Paraphyses filiform. Asci 130–160 × 8–9 μm, cylindric, long-stipitate, 8-spored, spores uniseriate. Ascospores (16.4–)23.0–31.0 × 6.7–10.6 μm, fusoid, irregularly almond- to lemon-shaped, smooth, brown to black, sometimes with an oil-drop (Fig. 7).

SPECIMEN EXAMINED. Myohyang-san Mts: in Hyang-san River Valley near Myohyang-san Hotel (20), alt. *ca* 100 m, mixed forest, on stump of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28864.

DISTRIBUTION IN ASIA. China, India, Korea and Russia (e.g. Far East).

REFERENCES. Anonymous (1978: 194; 1983a: 93); Breitenbach & Kränzlin (1984: 276, Pl. 351); Cetto (1980a: 615, Pl. 358); Dennis (1968: 284, Fig. 12A); Hansen & Knudsen (2000: 250); Imazeki & Hongo (1975, **2**: 178, Pl. 59); Jahn (1979: 52, Pl. 15); Michael *et al*. (1986: 410, Pl. 276); Munk (1957: 141, Fig. 49d); Teng (1996: 141); Vasilyeva (1998: 207); Vasudeva (1962: 27).

BASIDIOMYCOTA
UREDINIOMYCETES
Platygloeales R. T. Moore 1990

Platygloeaceae Racib. 1909; according to Kirk *et al.* (2001: 625), *familia incertae sedis*, according to Jülich (1982: 314), invalid name

Colacogloea peniophorae (Bourdot & Galzin) Oberw. & Bandoni

Can. J. Bot. **68**: 2534, Figs 12–16, 19–21. 1990.

Platygloea peniophorae Bourdot & Galzin, var. *peniophorae*, Bull. Soc. Mycol. Fr. **25**: 17. 1909. – *Achroomyces peniophorae* (Bourdot & Galzin) Wojewoda p.p. *in* J. Kochman & A. Skirgiełło, Grzyby (Mycota) **8**: 246, Fig. 94. 1977.

Basidiocarp absent, fungus parasitizing in basidiocarp of *Hyphoderma praetermissum*.

Hyphal system monomitic. Hyphae with clamps. Basidia 4-celled, cylindric, with 4 sterigmata. Basidiospores 6.0–8.4 × 3.6–5.4 µm, ovate or obovate, hyaline, smooth, thin-walled, with apiculus, germinating in hymenium by repetition. Conidia 4.8–7.2 × 3.6–4.8 µm, subglobose, globose or elliptic, thick-walled, smooth, hyaline (Fig. 8).

SPECIMEN EXAMINED. Kumgang-san Mts: Chanto Forest (61), alt. *ca* 100 m, in forest with *Pinus densiflora* and *Quercus mongolica*, on basidiocarp of *Hyphoderma praetermissum* growing on decayed stump, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29308.

DISTRIBUTION. Reported e.g. from Europe and North America.

NOTES. New to North Korea.

REFERENCES. Dueñas (2002: 40); Ginns & Lefebvre (1993: 130); Piątek (2001: 203–209, Fig. 1); Wojewoda (1981: 200, Pl. LXXII; 1993: 125).

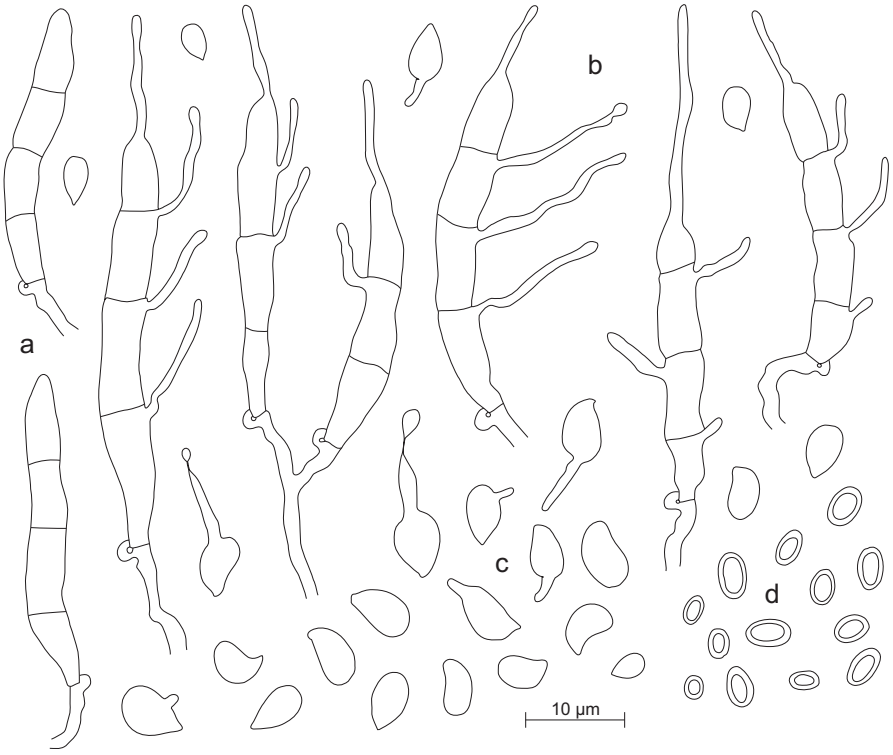


Fig. 8. *Colacogloea peniophorae* (Bourdot & Galzin) Oberw. & Bandoni: a – young basidia, b – mature basidia, c – basidiospores, d – conidia (KRAM-F 29308).

Helicobasidium purpureum Pat.

Bull. Soc. Bot. France **32**: 172. 1885.

Rhizoctonia violacea Tul & C. Tul., Fungi Hypog. 188. 1862 (anamorph). – *Helicobasidium brebissonii* (Desm.) Donk, Taxon **7**: 164. 1958. For further synonyms see Donk (1966: 156) and Roberts (1999: 157).

Teleomorph absent, present only sterile, corticioid anamorph, hypochnoid, membranaceous, purple, smooth, similar to the teleomorph.

Hyphae 4.8–12.0 µm wide, smooth, purple, thick-walled, without clamps (Fig. 9).

SPECIMEN EXAMINED. Myohyang-san Mts: on slope of Wonman Mt. (31), alt. *ca* 1000 m, mixed forest, on dead trunk of deciduous tree, near ground, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29231.

DISTRIBUTION IN ASIA. China, India, Japan, Philippines, Russia (e.g. Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1967: Map 275); Breitenbach & Kränzlin (1986: 54, Pl. 9); Donk (1966: 156); Ginns & Lefebvre (1993: 72); Martin (1952: 98, Fig. 31); Roberts (1999: 157, Fig. 82); Teng (1996: 265); Wojewoda (1977: 228, Fig. 86; 1981: 190, Pl. 59: 7–11).

BASIDIOMYCETES
AGARICOMYCETIDAE
Agaricales Clem. 1909

Agaricaceae Chevall. 1826

Agaricus sylvicola (‘***silvicola***’) (Vittad.) Peck

Bull. Forrey Club. 10. 1883.

A. campestris var. *sylvicola* Vittad., Fung. Mang. 43. 1835. – *Psalliota sylvicola* (Vittad.) Fr., Epicr. Syst. Mycol. 213. 1836. – *A. abruptibulbus* Peck, N. Y. State Mus. Bull. **94**: 35. 1905.

Pileus 50–80 mm in diam., obtusely conic. Upper surface white to cream-coloured, with yellowish tone to ochraceous with age, smooth to radially finely fibrillose. Flesh white. Smell like anise. Taste mild, pleasant. Lamellae free, grey-white when young, grey-pink, grey-violet to grey-black with age. Stipe 50–70 × 5–10 mm, cylindric, at base clavate to bulbous, solid to hollow, whitish, grey-violet to pink-violet, slightly longitudi-

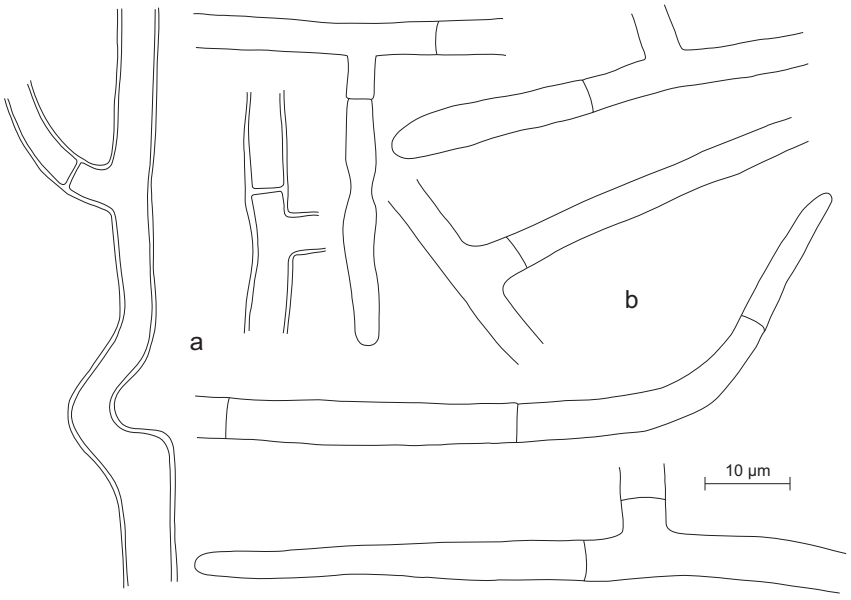


Fig. 9. *Helicobasidium purpureum* Pat.: a – thick-walled hyphae, b – thin-walled hyphae (KRAM-F 29231).

nally fibrillose, strongly yellowish when touched, with membranaceous, white annulus.

Hyphae of pileipellis 2.0–8.0(–7.7) µm, wide, smooth, hyaline, thin-walled, without clamps. Cheilocystidia 12–25 × 9–17 µm, oval, thin-walled. Basidia 18.0–25.0 × 7.0–8.5 µm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 5.8–9.7(–12.6) × 3.8–4.8 µm, elliptic or ovoid, smooth, brown, thin-walled, with oil-drops. Spore-print purple-brown (Fig. 10).

SPECIMEN EXAMINED. Pagyon Ravine (65), alt. *ca* 300 m, deciduous forest, on ground, 26 July 1986, *leg. W. Wojewoda*, KRAM-F 52966.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, Caucasus, China, Georgia, Israel, Japan, Korea, Philippines and Russia (e.g. Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 118); Azbukina *et al*. (1984: 50); Breitenbach & Kränzlin (1995: 178, Pl. 194); Capelli (1984: 42, Pl. 42); Hansen & Knudsen (1992: 213, Fig. 412); Melik-Khachatrian (1980: 305); Michael *et al*. (1983a: 172, Pls. 26a–b); Pilát (1951: 90, Figs 49–53); Quimio & Opinia (1978: 852, Fig. 1); Teng (1996: 484); Vasilyeva (1973: 174); Vasser (1980: 157, Fig. 77; 1985: 69, Pl. V: 2a–b, 4a–b).

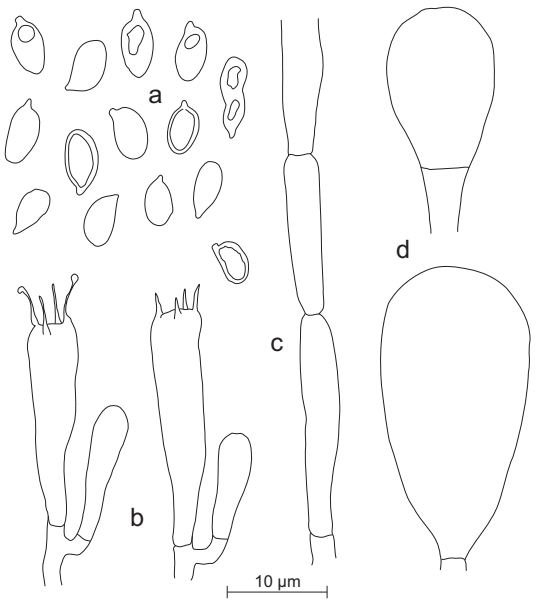


Fig. 10. *Agaricus sylvicola* (Vitt.) Peck: a – basidiospores, b – basidia, c – hyphae of pileipellis, d – cheilocystidia (KRAM-F 52966).

Lepiota cristata (Bolton: Fr.) P. Kumm.

Führ. Pilzk. 137. 1871.

Agaricus cristatus Bolton, Hist. Fung. **1**: 7. 1788. – *A. cristatus* Bolton: Fr., Syst. Mycol. **1**: 22. 1821.

Pileus 15–35 mm in diam., thin. Upper surface with concentric, small, reddish brown scales or granules on white backgrund. Flesh grey-white. Smell strong, unpleasant, of lighting gas. Lamellae free, crowded, white, then cream-coloured. Stipe 35–50 mm long, whitish, with scales. Ring membranaceous, loose, whitish.

Pileipellis hymeniform, composed of cylindric to clavate cells. Cheilocystidia 20–40 × 10–13 µm broadly clavate, pyriform to vesicular, smooth, hyaline, thin-walled. Basidia 15–20 × 5–7 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5.8–6.7 × 2.5–3.8 µm, projectile-shaped, smooth, hyaline, thin-walled, with lateral apiculus, dextrinoid, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Kuchung Falls (26), alt. *ca* 850 m, grassy thicket, on ground, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53134.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, India, Israel, Japan, Kazakhstan, Kirghizia, Mongolia, Russia (e.g. Altai Mts, Siberia and Far East), Tadzhikistan, and Turkey.

NOTES. New to North Korea. Species known also from Europe and North America (United States and Canada), South America (Argentina, Chile), Africa and Australia.

REFERENCES. Breitenbach & Kränzlin (1995: 196, Pl.221); Hansen & Knudsen (1992:217, Fig. 452); Melik-Khachatrian (1980: 308); Michael *et al*. (1983a: 182, Pl. 32); Syarzhanina (1994: 252); Teng (1996: 455); Vasilyeva (1973: 178); Vasser (1980: 244, Figs 126–127, Pl. XV: 2; 1985: 94, Pls. X: 8a–e; XXIII: 36).

Macrolepiota procera (Scop.: Fr.) Singer

Pap. Mich. Acad. Sci. Arts Lett. **32**: 141. 1948.

Agaricus procerus Scop., Fl. Carniol. **2**: 418. 1772. – *A. procerus* Scop.: Fr., Syst. Mycol. **1**: 20. 1821. – *Lepiota*

procera (Scop.: Fr.) Gray, Natural arrang. of British plants **1**: 601. 1821.

Pileus 150 mm in diam., campanulate. Upper surface squarrose on cream-white background, brown in centre. Flesh white, not discoloring when cut. Smell faint, pleasant, fungous. Taste mild. Hymenophore lamellate. Lamellae broad, at first white, then cream-coloured. Stipe 100 × 5–10 mm, cylindric, hollow, pale-brown flocculose. Annulus movable.

Hyphae smooth, hyaline, thin-walled, without clamps. Pileipellis composed with cylindric cells 4–10 μm wide, with brown pigmentation, thin-walled, without clamps. Cheilocystidia 20–40 × 10–21 μm, irregularly clavate, smooth, hyaline, thin-walled. Basidia 30–45 × 10–15 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores (9.7–)11.6–21.3 × (7.7–)9.7–13.5 μm, elliptic, smooth, hyaline, thick-walled, non-amyloid, with germ-pore. Spore-print pink-cream (Fig. 11).

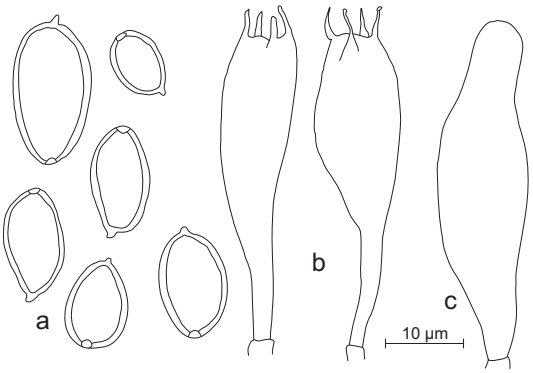


Fig. 11. *Macrolepiota procera* (Scop.: Fr.) Singer: a – basidiospores, b – basidia, c – cheilocystidium (KRAM-F 53126).

SPECIMENS EXAMINED. Suian-san Mts (48), scattered mixed forest, at forest road, among grass, 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53126; Pagyon Ravine (65), mixed forest with *Pinus densiflora*, 26 July 1986, *leg*. *W. Wojewoda*, KRAM-F 53347. – On ground.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, India, Iran, Kazakhstan, Kirghizia, Korea, Japan, Mongolia, Russia (e.g. Siberia and Far East) and Turkey.

NOTES. Cosmopolitan species, known also from Europe, North America (Cuba, Mexico, United States and Canada), South America (e.g. Chile), Africa and Australia.

REFERENCES. Anonymous (1978: 76; 1983a: 118); Azbukina *et al*. (1984: 50); Breitenbach & Kränzlin (1995: 218, Pl. 284); Candusso & Lanzoni (1990: 510, Pl. 63); Hansen & Knudsen (1992: 226, Figs 468 & 495); Melik-Khachatrian (1980; 294); Moser (1983: 244); Syarzhanina (1994: 246); Teng (1996: 454, Fig. 307); Vasilyeva (1973: 170), Vasser (1980: 293, Fig. 155, Pl. XXVI; 1985: 111, Pls XV: 2a–e, XXX: 54).

Bolbitiaceae Singer 1948

Agrocybe semiorbicularis (Bull.) Fayod

Ann. Sci. Natur. Ser. 7, **9**: 358. 1889.

Agaricus semiorbicularis Bull., Herb. Fr. Pl. 422/1. 1789. For further synonyms see Pegler (1986: 402) and Kreisel (1987: 17).

Pileus 10–25 mm, semiglobate, convex to slightly expanded, yellowish to greyish ochraceous, smooth, slightly wrinkled at disc, ± viscid. Lamellae adnate, broad, not crowded, pale sepia to snuff brown. Stipe 25–50 × 1–2 mm, equal or slightly swollen, cream to pale ochraceous, pruinose at first, then smooth and shining. Context ivory in cap and stipe. Smell and taste very mealy.

Pileipellis a poorly developed hymeniform layer of elliptic cells. Stipitipellis a cutis of cylindric, hyaline hyphae. Clamps present. Cheilocystidia 35–48 × 10–12 μm, lageniform with subcapitate or slightly pointed apex. Pleurocystidia rare or absent. Basidia with 2(–4) sterigmata, hyaline. Basidiospores 10.5–14.0 × 7.0–8.0(–9.5) μm, elliptic to ovoid or slightly sublimoniform, thick-walled, fulvous in water and alkali. Germ-pore large, very distinct. Spore-print snuff brown.

SPECIMEN EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, on ground, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28645.

DISTRIBUTION IN ASIA. Armenia, Azerbaijdan, Georgia, India, Israel, Japan, Kazakhstan, Kirghi-

zia, Korea, Mongolia, Russia (e.g. Siberia and Primorski Krai), Sri Lanka and Turkmenia.

REFERENCES. Anonymous (1983a: 119); Breitenbach & Kränzlin (1995: 294, Pl. 369); Imazeki & Hongo (1975, **1**: 58, Pl. 26: 144); J. E. Lange (1939: 23, Pl. 126H); Melik-Khachatrian (1980: 342); Michael *et al.* (1985: 392, Pl. 224); Pegler (1986: 402, Fig. 90A–F); Petrov & Belova (1999: 28); Phillips (1981: 168); Vasilyeva (1973: 199).

Agrocybe sphaleromorpha (Bull.: Fr.) Fayod

Ann. Sci. Natur. Ser. 7, **9**: 358. 1889.

Agaricus sphaleromorphus Bull., Herb. Fr. Pl. 540: 1. 1792. – *A. sphaleromorphus* Bull.: Fr., Epicr. Syst.. Mycol. 163. 1838. – *Pholiota sphaleromorpha* (Bull.: Fr.) Quél., Champ. Jura Vosges. 124. 1872. For further synonyms see Watling (1982: 17).

Pileus 18–35 mm, convex, buff-tinged pale hazel, olivaceous buff in centre, margin vinaceous buff, striate. Context pale cream in pileus, slightly darker in stipe, with darker line over lamellae. Smell strongly mealy when pileus cut. Taste mealy. Lamellae adnate, crowded, milky coffee, sometimes olivaceous clay buff, margin concolorous or paler. Stipe 40–80 × 2–3 mm, equal or slightly thickened at base, cream to yellowish cream, finally silky-striate, ring apical.

Pileipellis a hymeniform layer of elliptic to pyriform cells 12–20 µm broad. Stipitipellis of parallel hyphae supporting at stipe apex caulocystidia similar to those in cheilocystidia. Veil of filamentous cylindric hyphae. Clamps present. Cheilocystidia 40–55 × 15–20 µm, hyaline, vesiculose to lageniform or utriform, head 8–10 µm wide. Pleurocystidia sparse, fusiform, inflated below, ± lemon-shaped. Basidia cylindric to clavate, with 4 sterigmata. Basidiospores 9.0–11.0 (–11.5) × 5.0–7.0(–8.0) µm, broadly ellipsoid or slightly mitriform, fulvous in water, darker in alkali. Germ-pore prominent. Spore-print umber (Fig. 12).

SPECIMENS EXAMINED. Paekdu-san Mts: valley of stream near Naegok village (13), vicinity of Onsupyong, alt. *ca* 1000 m, mixed forest, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28451; Suian-san Mts (48), alt. *ca* 200 m, mixed forest with *Pinus densiflora* and *Quercus* sp., 5 and 6 July 1986, *leg. Z. Heinrich*, KRAM-F 28129, 28144. – On ground.

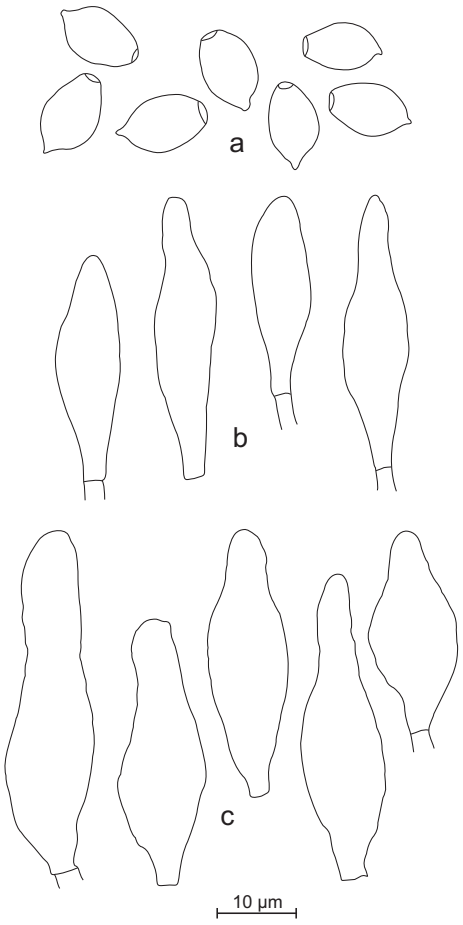


Fig. 12. *Agrocybe sphaleromorpha* (Bull.: Fr.) Fayod: a – basidiospores, b – cheilocystidia, c – pleurocystidia (KRAM-F 28129).

DISTRIBUTION. Known from Europe and North America (e.g. Western Europe, Belarus, Ukraine and European part of Russia).

NOTES. New to North Korea. This species is hardly worth separating from *A. paludosa* (J. E. Lange) Bon & Courtecuisse.

REFERENCES. Bon (1974: 51); Bresadola (1930: Pl. 692); Konrad & Maublanc (1929: Pl. 67); Kreisel (1987: 17); J. E. Lange (1938: 62, Pl. 106E); Syarzhanina (1994: 307), Watling (1982: 17, Figs 46–47 & 53).

Agrocybe subpediades (Murrill) Watling

Kew Bull. **31**: 592. 1977.

Naucoria subpediades Murrill, Lloydia **5**: 150. 1942. – *Agrocybe arvalis* (Fr.) Singer ss. Singer (1936) and ss. Heim & Romagnesi (1934). – *Naucoria vervacti* (Fr.) P. Kumm. ss. Ricken (1915).

Pileus 3–15 mm, convex, campanulate to semiglobate, ochre to ochraceous with saffron tinge, sienna at disc. Lamellae adnate, pale brown, finally snuff brown. Stipe 12–30 × 1–2 mm, slightly inflated at apex, pale ochraceous above, dark sienna below. Context white in pileus, pale ochraceus in stipe. Smell and taste strongly mealy.

Pileipellis a cutis with poorly developed hymeniform layer of elliptic to pedicellate cells. Stipitipellis of cylindric cells supporting irregularly shaped vesiculose to lageniform hyaline cells at stipe apex. Cheilocystidia 35–45 × 10–12 µm, hyaline, lageniform to ampulliform. Pleurocystidia sparse, lageniform. Clamps present. Basidia 25–35 × 10–12 µm, cylindric-clavate, hyaline, with 2(–4) sterigmata. Basidiospores 13.0–15.0 (–16.5) × 8.0–10.0 µm, broadly elliptic, thick-walled, strongly pigmented (fulvous) in water and alkali, germ-pore large, prominent. Spore-print snuff brown (Fig. 13).

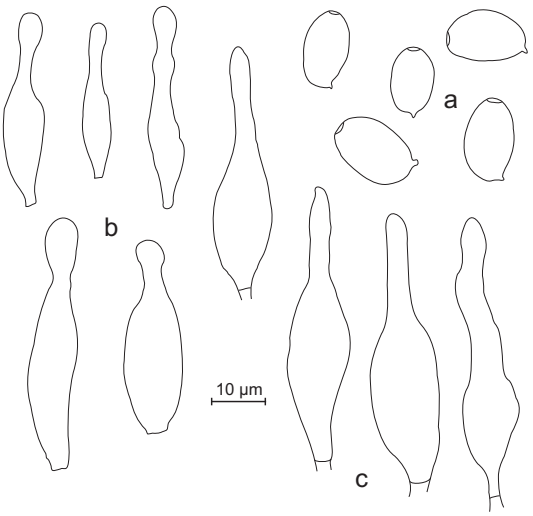


Fig. 13. *Agrocybe subpediades* (Murrill) Watling: a – basidiospores, b – cheilocystidia, c – pleurocystidia (KRAM-F 27915).

SPECIMEN EXAMINED. Paekdu-san Mts: Taehong-dan (6), alt. *ca* 1500 m, taiga with *Larix olgensis*, on ground, 29 June 1986, *leg. Z. Heinrich*, KRAM-F 27915.

DISTRIBUTION IN ASIA. Japan and Korea.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 290, Pl. 361); Cooke (1884: Pl. 506(479) as *Agrocybe arvalis*); Imazeki & Hongo (1975, **2**: 66, Pl. 19: 123); Park & Cho (1985: 106); Watling (1982: 21, Figs 14, 25, 26 and 59).

Bolbitius titubans (Bull.: Fr.) Fr.

Epicr. Syst. Mycol. 254. 1838.

Agaricus titubans Bull., Herb. Fr. Pl. 425, Fig. 1. 1789. – *Agaricus titubans* Bull.: Fr., Syst. Mycol. **1**: 304. 1821. – *Bolbitius flavidus* (Bolt.) Massee, Brit. Fungus Fl. **2**: 205. 1893. – *B. fragilis* (L.: Fr.) Fr., Epicrisis. 254. 1838. – *Agaricus vitellinus* Pers., Syn. Meth. Fung. 402. 1801. – *Agaricus vitellinus* Pers.: Fr., Syst. Mycol. **1**: 303. 1821. – *Bolbitius vitellinus* (Pers.: Fr.) Fr., Epicr. Syst. Mycol. 254. 1838. For further synonyms see Watling (1982: 33).

Pileus 10–35 mm, campanulate or convex, then broadly convex, viscid, bright lemon or luteous, margin striate at first, then sulcate. Smell and taste indistinct. Lamellae free or almost so, rather narrow, straw to deep tawny rust. Stipe 30–65 × 2–5 mm, slightly swollen in lower part, pale lemon yellow, minutely flocculose, hollow.

Pileipellis a cutis to a hymeniform layer of vesiculose, hyaline, smooth, pedicellate elements, 25–50 × 10–15 µm, embedded in thick, gelatinized layer. Stipitipellis a cutis of cylindric hyphae covered with groups of hyaline, elongate-clavate to lageniform elements. Cheilocystidia 30–50 × 15–20 µm, utriform to lageniform. Pleurocystidia rare, lageniform. Clamps not seen. Basidia 20–40 × 10–15 µm, clavate, hyaline, with 4 sterigmata. Basidiospores 12.0–13.0(–14.5) × 6.0–7.0 µm, elliptic, sienna in water, tawny rust in alkali, germ-pore large. Spore-print sienna to rust (Fig. 14).

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 12 km NE of Pochonbo (14), above on brushwood zone, on ground, 1 July 1986, *leg. Z. Heinrich*, KRAM-F 28102.

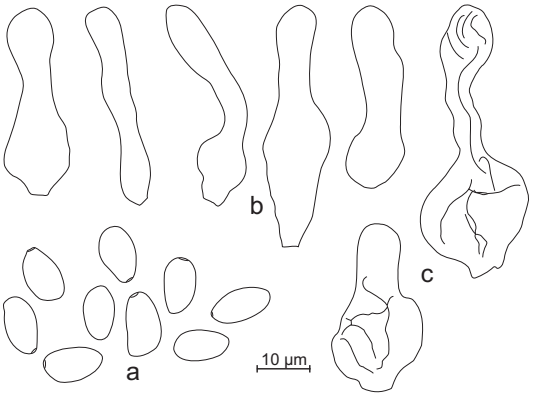


Fig. 14. *Bolbitius titubans* (Bull.: Fr.) Fr.: a – basidiospores, b – cheilocystidia, c – pleurocystidia (KRAM-F 28102).

DISTRIBUTION IN ASIA. Armenia, China, India, Israel, Japan, Kazakhstan, Kirghizia, Korea and Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. Very common, cosmopolitan species.

REFERENCES. Anonymous (1983a: 119), Azbukina *et al*. (1984: 51); Breitenbach & Kränzlin (1995: 298, Pl. 373); Dähncke & Dähncke (1980: 340); Dennis (1986: 28); Gorbunova (1997: 17); Imazeki & Hongo (1975, **1**: 58); Konrad & Maublanc (1927: Pl. 171: II); J. E. Lange (1939: 42 Pl. 132A); Melik-Khachatrian (1980: 339); Michael *et al*. (1985: 390, Pl. 219); Morris (1990: 355); Park & Cho (1985: 106); Ricken (1915: 70, Pl. 23: 9); Syarzhanina (1994: 303–304); Teng (1996: 476); Vasilyeva (1973: 198); Watling (1982: 33, Figs 1, 3, 7, 69); Wen & Sun (1999: 363).

Conocybe fragilis (Peck) Singer

Acta Bot. Komarov. Inst. Acad. Sci. URSS Ser. 2, **6**: 438.1950.

Galera fragilis Peck, Bull. Torrey Bot. Club **24**: 144. 1897. – *Conocybe siliginea* var. *fragile* (Peck) Kühner, Genre *Galera*. 112. 1935. – *Galera incarnata* Jul. Schäff., Z. Pilzk. **9**: 165. 1930. For further synonyms see Watling (1982:17) and Kreisel (1987: 51).

Pileus 10–18 mm, obtusely conic to elongate conic, fresh chestnut or dark brick, drying deep clay pink or vinaceous, striate at first but rapidly becoming non-striate. Context thin, concolorous with surface of pileus and stipe. Smell and taste indistinct. Lamellae adnate, slightly ventricose, crowded, yellowish, becoming strongly rust, edge serrate-flocculose. Stipe 25.0–55.0 × 0.5–1.0 mm, equal or attenuated upwards from small bulb, concolorous with pileus, apex pale cinnamon, pruinose striate throughout.

Pileipellis a hymeniform layer of pyriform to spheropedunculate elements up to 35–40 µm broad. Stipitipellis of parallel, cylindric hyphae, at the stipe apex covered with groups or clusters, cylindric to irregularly swollen elements intermixed with filamentous, flexuose cells. Clamps absent. Cheilocystidia lecythiform, 17.0–24.0 × 5.5–7.5 µm, head 3.5–4.5 µm broad. Pleurocystidia absent. Basidia 16–24 × 6–9 µm, with 4 sterigmata. Basidiospores 8.0–10.5 × 5.0–6.0 µm, elliptic. Germ-pore large. Spore-print fulvous (Fig. 15).

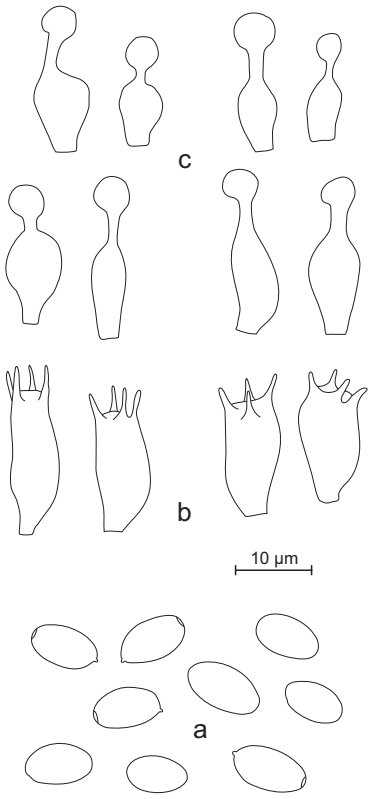


Fig. 15. *Conocybe fragilis* (Peck) Sing.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 27924).

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100 m, forest with *Pinus densiflora*, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 30930; Suian-san Mts: Sokdamgukok village (47), mixed forest, 7 July 1986, *leg. Z. Heinrich*, KRAM-F 27924. – On ground.

DISTRIBUTION IN ASIA. Japan.

NOTES. New to North Korea.

REFERENCES. Imazeki & Hongo (1975, **2**: 63, Pl. 19: 118); Kreisel (1987: 51); Kühner (1935: 112, Fig. 26F); Michael *et al*. (1985: 380, Pl. 206 b); Watling (1982: 76).

Conocybe kuehneriana Singer

Beih. Nova Hedwigia **29**: 212. 1969.

C. siliginea var. *ochracea* Kühner, 'récoltes macrospores', Genre *Galera*. 104. 1935 (*nom. nud*.).

Pileus 10–20 mm, campanulate or hemispherical expanding, slightly conic, ochraceous to sienna, when fresh slightly striate, soon non-striate. Context thin, concolorous with pileus and stipe. Smell and taste indistinct. Lamellae adnate, slightly ventricose, fairly crowded, ochre to sienna, edge almost concolorous. Stipe 25.0–80.0 × 0.5–1.5 mm, filiform, slighty swollen base, whitish at apex, slightly fulvous or sienna below.

Pileipellis a hymeniform layer of both spheropedunculate and long flexuose elements. Clamps present. Cheilocystidia 15–25 × 7–12 µm, lecythiform, head 2.5–4.5(–5.0) µm broad. Pleurocystidia absent. Stipitipellis of cylindric hyphae covered with bunches of variously shaped, noncapitate cells intermixed with long, flexuose, filamentous hairs. Basidia 17–27 × 9–11 µm, with 4 strigmata. Basidiospores 9–13 × 6–8 µm, ovate, strongly pigmented in water and alkali, thick-walled. Germ-pore large, prominent. Spore-print sienna.

SPECIMEN EXAMINED. Kaesong town: near Buddhist school and temple (63), on ground, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28122.

DISTRIBUTION. Reported e.g. from Europe.

NOTES. New to North Korea.

REFERENCES. Kreisel (1987: 51); Kühner (1935: 104, Fig. 29); Watling (1982: 72, Fig. 111).

Conocybe pubescens (Gill.) Kühner

Genre *Galera*. 85. 1935 (non ss. Kühner 1935, ss. Kühner & Romagn., Fl. Anal. Champ. Sup. 346. 1953, and ss. Moser, Röhrlinge Blätterpilze 281. 1983).

Galera pubescens Gill., Hyménomycètes. 553. 1876. For further synonyms see Watling (1982: 66) and Kreisel (1987: 52).

Pileus 7–13 mm, conico-convex to campanulate, deep sienna to ochre, strongly pubescent especially on drying. Context pale ochraceous in pileus, paler in upper part of stipe, darkening downwards to sienna in lower part of stipe. Smell indistinct. Taste not unpleasant. Lamellae adnate, slightly ventricose, ± crowded, pale ochraceous buff, to sienna-tinged rust; edge paler, slightly flocculose. Stipe 65–120 × 2–3 mm, equal, slightly thickened downwards to a small, distinct bulb, pale ochre at apex, sienna to tawny rust below, entirely and prominently pruinose to floccose-striate.

Pileipellis a hymeniform layer of spheropedunculate elements with slightly coloured walls, intermixed with long, filiform, flexuose hairs. Clamps present. Cheilocystidia 15–30 × 6–8 µm, lecythiform, head small, 3–4 µm broad. Pleurocystidia absent. Stipitipellis a cutis of cylindric, parallel hyphae covered with mixture of lecythiform, noncapitate cystidia and hairs. Basidia with 4 sterigmata, clavate, hyaline. Basidiospores (13.0–) 14.0–18.0(–20.0) × 7.0–9.5(–10.0) µm, elliptic, sienna to deep ochre in water, slightly fulvous in alkali, thick-walled. Germ-pore large, prominent. Spore-print rust (Fig. 16).

SPECIMEN EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), Hyangsan-gang River Valley, alt. *ca* 100 m, 12 July 1986, *leg. Z. Heinrich*, KRAM-F 27931.

DISTRIBUTION IN ASIA. Israel and Russia (e.g. North Altai).

NOTES. New to North Korea.

REFERENCES. Cetto (1980b: 89, Pl. 436); Dennis (1986: 35); Gorbunova (1997: 17); Kühner (1949: 276,

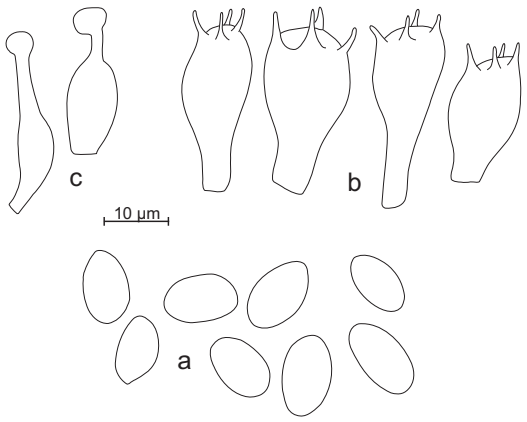


Fig. 16. *Conocybe pubescens* (Gill.) Kühner: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 27931).

Figs 3–7); Kühner & Romagnesi (1953: 346); Michael *et al*. (1985: 378, Fig. 203); Watling (1982: 66, Figs 77 & 116).

Hebeloma alpinum (Favre) Bruchet

Bull. Mens. Soc. Linnée. Lyon **39**, Suppl. **6**: 68. 1970.

H. crustuliniforme (Bull.) Quél. var. *alpinum* Favre, Champ. Sup. Zone Alpine. 121. 1955.

Pileus 35–40 mm, fleshy, broadly campanulate with low, broad umbo, young with involute, crenulate and pubescent margin, later expanded and smooth, slightly viscid, ivory to pale ochre, without veil remnants. Context of pileus firm, white, then pale ochraceous. Smell raphanoid to fruity. Taste raphanoid. Lamellae segmentiform to ventricose, adnate, fairly crowded, edge fimbriate, whitish, fresh with watery droplets, then brown-spotted, whitish, later pale ochraceous. Stipe 25–35 × 10–15 mm, equal, slightly enlarged towards base, densely pubescent-flocculose, towards base more fibrillose-flocculose.

Pileipellis a thin ixocutis of cylindric, hyaline hyphae 2–3 µm broad. Subcutis of yellow polymorphic cells. Caulocystidia similar to cheilocystidia, somewhat more variable in size and shape. Clamp connections present. Cheilocystidia (40.0–)55.0–74.0(–110.0) × 6.0–9.5 µm, hyaline, cylindric, clavate. Pleurocystidia absent. Basidia 30.0–40.0 × 7.3–10.3 µm, clavate to cylindric, hyaline, with 4 (rarely 2) sterigmata. Basidiospores 10.3–12.5 × 6.0–7.3 µm, amygdaliform to ovoid, walls medium brown, punctate, with one guttule, at least some spores with a distinct perispore. Spore-print yellow brown (Fig. 17).

SPECIMEN EXAMINED. Paekdu-san Mts: between Taehong-dan (6) and Samji-yon town (8), alt. *ca* 1400 m, taiga with *Larix olgensis*, on ground, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 30282.

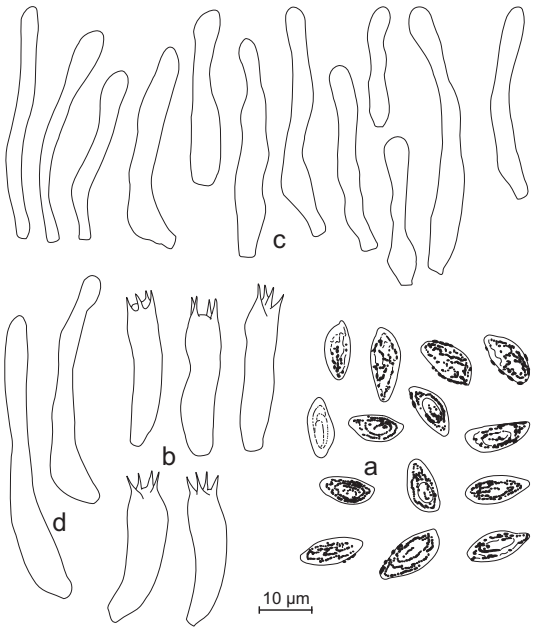


Fig. 17. *Hebeloma alpinum* (Favre) Bruchet: a – basidiospores, b – basidia, c – cheilocystidia, d – caulocystidia (KRAM-F 30282).

DISTRIBUTION. Europe (France, Switzerland, Scandinavia: Svalbard).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 106, Pl. 97; Bruchet (1970: 68, Pl. 18); Senn-Irlet *et al*. (1990: 51).

Hebeloma fastibile (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 80. 1871 ss. J. E. Lange, Fl. Agar. Dan. 3: 92. 1938.

Agaricus fastibilis Pers., Syn. Meth. Fung. 326. 1801. – *A. fastibilis* Pers.: Fr., Syst. Mycol. 1: 249. 1821. For further synonyms see Kreisel (1987: 105).

Pileus 30–65 mm, fleshy, convex, dirty whitish, buff, beige, plieus centre darker, margin white. Lamellae whitish, argillaceous brownish, exuding droplets, siccous brunneous spot, rounded adnate, nearly free (approximate). Stipe 40–50 × 7–8 mm, subequal, slightly fusiform to clavate toward base. Context withish, thick in centre of pileus, thin toward margin. Smell raphanoid. Taste slightly bitter, raphanoid.

Pileipellis a thin ixocutis composed of hyaline hyphae 1.5–4.5 μm broad, septa with clamps, all gelatinized, subcutis composed of light yellow polymorphic cells. Cheilocystidia 36.0–56.0 × 4.5–11.0 μm, fusiform with a ventricose base.

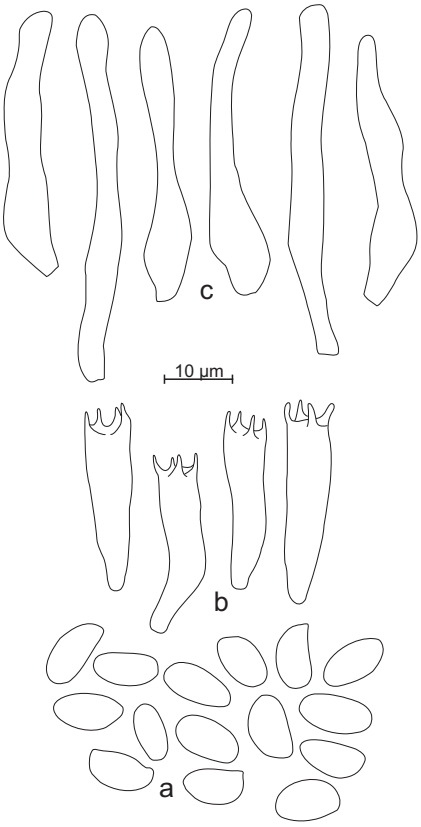


Fig. 18. *Hebeloma fastibile* (Pers.: Fr.) P. Kumm.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 30281).

Pleurocystidia absent. Stipitipellis a cutis of cylindric hyphae 2.5–4.0 μm broad. Caulocystidia present in clusters at apex of stipe, similar to cheilocystidia. Basidia 25.0–40.0 × 7.3–8.6(–9.0) μm, cylindric, with 4 sterigmata. Basidiospores 7.3–10.3 × 4.3–6.4 μm, broadly elliptic to oval, almost smooth to mottled or finely verrucose, light yellow. Spore-print olive-brown (Fig. 18).

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), taiga, on ground, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 30281.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Kazakhstan and Russia (e.g. Siberia).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 112, Pl. 106); Bruchet (1970: 40, Fig. 9); J. E. Lange (1938: 92, Pl. 118F); Melik-Khachatrian (1980: 385); Syarzhanina (1994: 360); Teng (1996: 470).

Hebeloma mesophaeum (Pers.) Quél.

Mém. Soc. Emul. Montbéliard, Sér. II, **5**: 128. 1872 (Champ. Jura Vosges 1).

Agaricus fastibilis var. *mesophaeus* Pers., Mycol. Eur. **3**: 173. 1828. – *Hebeloma strophosum* (Fr.) Sacc., ss. J. E. Lange, Fl. Agar. Dan. 3: 92. 1938. – *H. verispelle* (Fr.) Gill. subsp. *mesophaeum* (Pers.) Konr. & Maubl., Ic. Sel. Fung. 1: Pl. 78: 2. 1929. For further synonyms see Kreisel (1987: 106).

Pileus 15–35 mm, hemispherical when young, later convex to conic or campanulate, plane and usually umbonate. Upper surface smooth, centre rufous to date brown, viscid, margin covered by whitish to ochraceous, woolly to fibrillose remnants of veil. Context light grey-brown, thick. Smell faintly raphanoid. Taste bitterish, raphanoid. Lamellae whitish when young, later grey-beige to ochre-brown, narrow. Stipe 20–50(–70) × 3–4(–5) mm, cylindric, surface longitudinally whitish fibrillose, later slightly browning from the base upward and dingy beige to brownish fibrillose, sometimes with fugacious annular zone.

Pileipellis an ixocutis composed of hyaline hyphae 1.7–5.0 μm broad, all gelatinized, subcutis composed of yellow polymorphic cells. Clamps present. Cheilocystidia 30.0–60.0 × 6.0–10.3 μm,

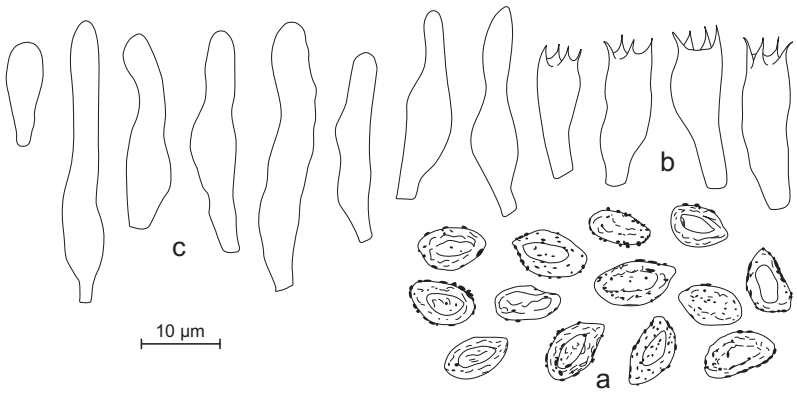


Fig. 19. *Hebeloma mesophaeum* (Pers.) Quél.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28334).

cylindric with slightly ventricose base. Pleurocystidia absent. Stipitipellis a cutis of narrow, cylindric, 2–8 µm wide hyphae. Caulocystidia at apex of stipe, similar to cheilocystistidia. Basidia 26–38 × 8–10 µm, clavate, with 4 sterigmata. Basidiospores 8.0–10.0 × 4.4–6.0 µm, elliptic, weakly verrucose, light yellow. Spore-print olive-ochre (Fig. 19).

SPECIMEN EXAMINED. Kumgang-san Mts: near Samil-po Lake (62), mixed forest, on ground, 19 July 1986, *leg. H. Komorowska*, KRAM-F 28334.

DISTRIBUTION IN ASIA. Armenia, Georgia, Kazakhstan and Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 55); Breitenbach & Kränzlin (2000: 116, Pl. 113); Bresadola (1930: Pl. 712); Bruchet (1970: 47, Fig. 11); Dähncke & Dähncke (1980: 399); J. E. Lange (1938: 92, Pl. 118 D, as *Hebeloma strophosum*); Melik-Khachatrian (1980: 386); Michael *et al*. (1985, 214, Pl. 28); Syarzhanina (1994: 360); Vasilyeva (1973: 223).

Hebeloma pumilum J. E. Lange

Fl. Agar. Dan. 5: IV. 1940.

Pileus 10–25 mm broad, hemispherical, later campanulate, strongly convex to applanate, viscid, clay to ochre brown, sometimes with reddish tint in centre, paler towards margin. Context whitish, thin. Smell faintly raphanoid. Taste mild to bitterish. Lamellae broad, narrowly attached, cream-coloured, later increasingly cinnamon brown, edges finely whitish ciliate. Stipe 30–40 × 2–4 mm, cylindric, somewhat thickened and fusiform-rooting towards at base, rigid, surface longitudinally white-fibrillose, later light brown from base upward, apex white pruinose to squamulose.

Pileipellis ixocutis composed of hyaline hyphae 1.5–5.5 µm broad, all gelatinized, subcutis composed of yellow cylindric to polymorphic cells. Clamps present. Cheilocystidia 20–30 × 5–6 µm, cylindric to slightly flexuous. Pleurocystidia absent. Stipitipellis composed of cylindric hyphae 3.0–6.4 µm broad, caulocystidia at stipe apex, similar to cheilocystidia. Basidia 21.0–27.0 × 6.5–9.0 µm, clavate, with 4 sterigmata. Basidiospores 7.7–10.7 × 4.7–6.4 µm, amygdaliform, verrucose, light yellow, perispore tends to loosen. Spore-print ochre-brown (Fig. 20).

SPECIMEN EXAMINED. Paekdu-san Mts: near Taehongdan (6), alt. *ca* 1500 m, taiga, on ground, 29 June 1986, *leg. Z. Heinrich*, KRAM-F 27911.

DISTRIBUTION IN ASIA. Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 118 Pl. 117); Gorbunova (1997: 18); J. E. Lange (1938: 93, Pl. 119E) Michael *et al*. (1985: 216, Pl. 29); Syarzhanina (1994: 361); Vasilyeva (1973: 223).

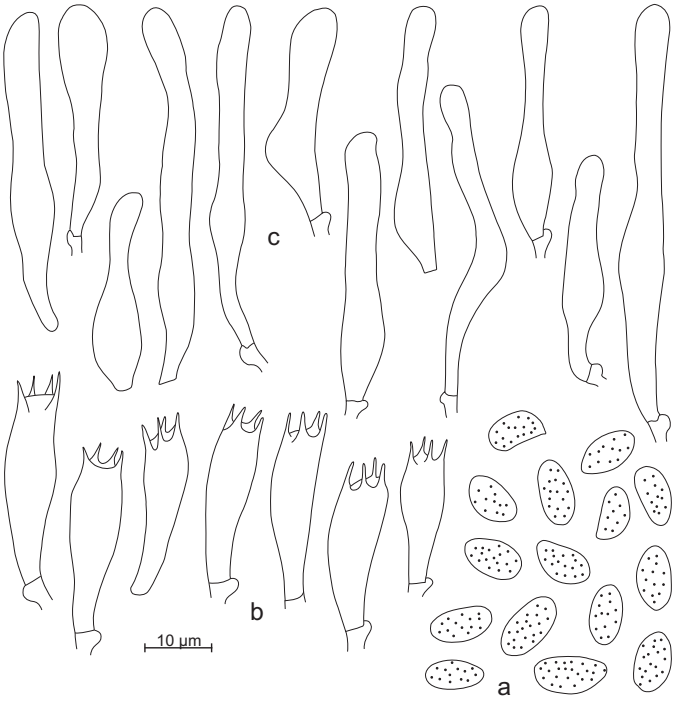


Fig. 20. *Hebeloma pumilum* J. E. Lange: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 27911).

Panaeolus caliginosus (Jungh.) Gillet

Hyménomycètes. 623. 1874, ss. Cooke 1890.

Agaricus caliginosus Jungh., Linnaea **5**: 405. Pl. 6, Fig. 13. 1830. – *Panaeolus rickenii* Hora, Trans. Brit. Mycol. Soc. **43**: 454. 1960. For further synonyms see Watling & Gregory (1987: 88).

Pileus 20–35 mm, semiglobate, ± constricted above middle, with apex pointed or rounded, dark brown to vinaceous buff, margin slightly crenulate. Context vinaceous buff, slightly darker in stipe base. Smell and taste indistinct. Lamellae narrowly adnate, violaceous black with white edge. Stipe 50–90 × 1–3 mm, equal, attenuated upwards, clay-buff above, purplish date or chestnut from base, upwards pruinose.

Pileipellis a cutis of orbicular, elliptic-subglobose cells 15–20 µm, intermixed with polymorphic cells similar to those on lamella edge. Clamps present. Cheilocystidia 25–40 × 8–12 µm, numerous, polymorphic, filamentous-terete, slightly swollen towards apex, hyaline, thin-walled. Pleurocystidia absent. Stipitipellis of filamentous, cylindric, hyaline or slightly coloured, parallel hyphae. Basidia 25.5–35.0(–42.0) × 8.0–13.0 µm, cylindric-clavate to subclavate, hyaline, with 4 sterigmata,. Basidiospores 12.0–15.5 × 9.0–11.0 × 7.0–9.0 µm, limoniform, purple chestnut in water and alkali, thick-walled. Germ-pore central. Spore-print violaceous-black.

SPECIMEN EXAMINED. Pyongyang town (39), park, on ground, 15 July 1986, *leg. Z. Heinrich*, KRAM-F 27965.

DISTRIBUTION IN ASIA. Russia (e.g. Siberia).

NOTES. New to North Korea. Known e.g. from Europe (Shetland Islands), North Africa, North America, and Faeroes.

REFERENCES. Breitenbach & Kränzlin (1995: 256, Pl. 310); Bresadola (1931: Pl. 895); Dennis (1986: 67); Hora (1960: 454); Pegler (1977: 411, fig. 92: 3 a, b, c, d, e); Ricken (1915: 268, Pl. 69: 5); Syarzhanina (1994: 291); Watling & Gregory (1987: 88, Fig 74.).

Clavariaceae Chevall. 1926

Clavulinopsis corniculata (Schaeff.: Fr.) Corner

Monogr. of *Clavaria* and allied genera. 362, Pl. 10: 1. 1950.

Clavaria corniculata Schaeff., Fung. Bavar. **4**: 117, Pl. 173. 1770. – *C. corniculata* Schaeff.: Fr., Syst. Mycol. **1**: 471. 1821.

Basidiocarp 20–60 mm high, clavarioid, branched one to several times, bifurcate at apex, yellow to egg yellow. Flesh yellowish, fragile. Stipe short, 10–35 mm high.

Hyphal system monomitic. Hyphae 3.0–11.6 µm wide, smooth, hyaline, thin-walled, with clamps. Basidia 35.0–55.0 × 6.7–8.7 µm, slenderly clavate, with 2–4 long sterigmata and basal clamp. Basidiospores 5.8–7.7(–11.6) µm in diam., subglobose to globose, smooth, hyaline, slightly thick-walled, non-amyloid, with prominent apiculus and a large oil-drop (Fig. 21).

SPECIMENS EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, in forest with *Pinus densiflora* and *Quercus mongolica*, 10 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53198. Stipes of basidiocarps of *C. corniculata*, near ground covered with resupinate basidiocarps of *Tomentella* sp., with hyphae brown, with clamps, basidia and basidiospores absent; Suian-san Mts (48), alt. *ca* 200 m, among mosses, 5 July 1986, *leg. W. Wojewoda*, KRAM-F 53133. – In mixed forests, on ground.

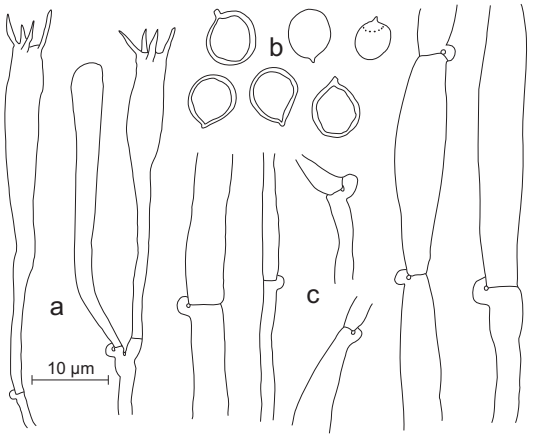


Fig. 21. *Clavulinopsis corniculata* (Schaeff.: Fr.) Corner: a – basidia, b – basidiospores, c – hyphae (KRAM-F 53133).

DISTRIBUTION IN ASIA. China, Georgia, India, Japan, Kazakhstan, Korea and Russia (e.g. Primorski Krai).

NOTES. Common species in Europe, Asia, America (Canada, United States) and Australia.

REFERENCES. Anonymous (1983a: 98); Breitenbach & Kränzlin (1986: 346, Pl. 446); Domański (1984: 59, Pl. CLVIII); Hansen & Knudsen (1997: 250, Fig. 507); Jülich (1984: 77); Parmasto (1965: 98, Fig. 71); Pilát (1958b: 236, Pls XLVIIIa-b); Shvarstman (1964: 106, Fig. 31); Teng (1996: 305).

Clavulinopsis laeticolor (Berk. & M. A. Curtis) R. H. Petersen

Mycologia Mem. **2:** 1–39. 1968.

Clavaria laeticolor Berk. & M. A. Curtis, Journ. Linn. Soc. Bot. **10**: 338. 1867. – *Clavulinopsis pulchra* (Peck) Corner, Monogr. of *Clavaria* and allied genera. 384, Fig. 146d, Pl. 8: 4–5. 1950.

Basidiocarp 20–50 × 2–3 mm, clavarioid, cylindric to slenderly clavate, slightly applanate, straight to somewhat sinuous, simple, not branched, with obtuse apex, sometimes spatulate, gold, bright yellow to orange-yellow, dark orange when dry. Surface smooth. Flesh light yellow, soft. Smell absent. Taste mild. Stipe short 2–20 × 1–2 mm.

Hyphal system monomitic. Hyphae 2.0–9.8 µm wide, smooth, hyaline, thin-walled, with clamps. Basidia 35.0–55.0 × 5.8–6.7 µm, slenderly clavate, sinuous, with 2–4 long sterigmata (up to 7.7 µm) and basal clamp. Basidiospores 5.8–7.7(–9.7) × 3.8–4.8(–6.7) µm, broadly elliptic, oblong-ovoid to subglobose, smooth, hyaline to yellowish, thin- or slightly thick-walled, with prominent most, often sublateral or lateral apiculus up to 2 µm long and 1–2 oil-drops, non-amyloid (Fig. 22).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, on fragments of wood lying on ground, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53200; near Habiro Temple (27), alt. *ca* 200 m, on ground, 8 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53133. – In mixed forests.

DISTRIBUTION IN ASIA. Caucasus, China, India, Malaysia and Russia (e.g. Primorski Krai).

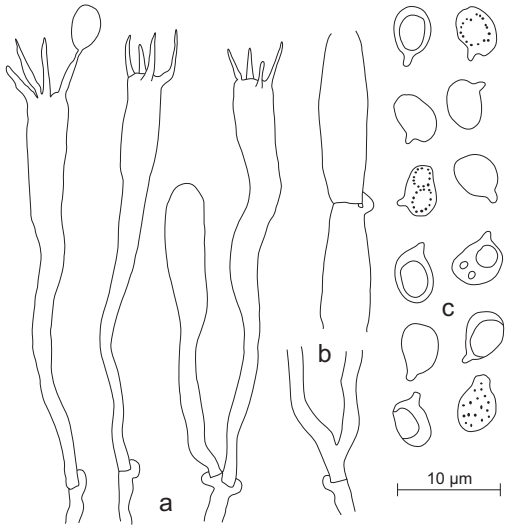


Fig. 22. *Clavulinopsis laeticolor* (Berk. & M. A. Curtis) R. H. Petersen: a – basidia, b – hyphae, c – basidiospores (KRAM-F 53197).

NOTES. New to North Korea. Known also from North America (United States).

REFERENCES. Anonymous (1983a: 99); Breitenbach & Kränzlin (1986: 348, Pl. 449); Cetto (1984: 563, Pl. 1621); Domański (1984: 54, Pls. CLVII: 7; CCXXIV: 1); Hansen & Knudsen (1997: 251, Fig. 511); Jülich (1984: 78); Parmasto (1965: 95, Fig. 68); Pilát (1958b: 240, Figs 26–287); Teng (1996: 305).

Coprinaceae Overeem & Weese 1924

Coprinus comatus (Müll.: Fr.) Pers.

Tent. Disp. Meth. Fung. 62. 1797.

Agaricus comatus Müll., Fl. Dan. 834. 1780. – *A. comatus* Müll.: Fr., Syst. Mycol. **1**: 307. 1821.

Pileus up to 50 mm broad, 50–160 mm high, cylindric or elongate-ovoid, later cylindric-campanulate, surface silky fibrillose, white to whitish, later with white to pale brownish scales. Context white. Smell and taste absent. Lamellae white, later pinkish, vinaceous, finally black. Stipe 100–250 × 10–30 mm, attenuated upwards, the base thickened or slightly bulbous, surface white. Ring white.

Pileipellis composed of radially hyphae 5–15 µm broad, hyaline or brownish pigmented. Clamps present. Cheilocystidia 20–84 × 15–40 µm, spheropedunculate, vesiculose or pyriform. Pleurocystidia absent. Basidiospores 10.0–14.0 × 6.5–8.0 µm, elliptic-amygdaliform, blackish brown, thick-walled. Germ-pore central, truncate. Apiculus prominent. Spore-print black.

SPECIMENS EXAMINED. Paekdu-san Mts: railway station, Wi-Bong near Hyesan town, (15), on Amnok-gang River, alt. *ca* 1000 m, 2 July 1986, *leg. H. Komorowska*, KRAM-F 50402; Myohyang-san Mts: near Myohyang-san Hotel (20), on Hyangsan-gang River, alt. *ca* 100 m, deciduous forest, in grass, 15 July 1986, *leg. W. Wojewoda*, KRAM-F 30949; near Soham-ho Lake (32), near road and skirt of mixed forest, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 50397. – On ground.

DISTRIBUTION IN ASIA. Armenia, China, Israel, Japan, Kazakhstan, Korea, India, Nepal, Russia (e.g. Kamchatka, Primorski Krai, West and East Siberia) and Turkmenistan.

REFERENCES. Anonymous (1978: 87; 1983a: 118); Breitenbach & Kränzlin (1995: 228, Pl. 270); Bresadola (1931: Pl. 874); Imazeki & Hongo (1975, **1**: 54, Pl. 24: 133); J. E. Lange (1939: 108, Pl. 156DE); Melik-Khachatrian (1980: 315); Michael *et al*. (1983a: 188, Pl. 37); Orton & Watling (1979: 29, Figs 12–13, 37, 45); Ricken (1915: 56, Pl. 20: 1); Syarzhanina (1994: 272); Teng (1996: 478); Vasilyeva (1973: 187; 1978: 155, Pl. 128); Ying *et al*. (1983: 154, Pl. 25: 1; 157).

Coprinus disseminatus (Pers.: Fr.) Gray

Nat. Arr. Brit. Pl. **1**: 634. 1821.

Agaricus disseminatus Pers., Syn. Meth. Fung. 403. 1801. – *A. disseminatus* Pers.: Fr., Syst. Mycol. **1**: 305. 1821. – *Coprinarius disseminatus* (Pers.: Fr.) P. Kumm., Führ. Pilzk. 68. 1871. – *Psathyrella disseminata* (Pers.: Fr.) Quél., Mém. Soc. Émul. Montbéliard Sér. II, **5**: 153. 1872 (Champ. Jura Vosges. **1**). – *Pseudocoprinus ctenodes* (Pers.: Fr.) Kühner, Botaniste **20**: 156. 1928. For further synonyms see Kreisel (1987: 54) and Pegler (1986: 367).

Basidiocarp not deliquescent. Pileus 6–15 mm, ovoid then expanded convex or campanulate, pale buff or cream-buff with buff or pale fulvous centre, minutely pubescent and mealy scurf when young, becoming smooth except for centre of pileus, becoming plicate-striate from margin. Context in pileus thin, whitish. Smell and taste indis-

tinct. Lamellae whitish, soon grey then pale violaceous umber, finally fuscous black, not deliquescent. Stipe 15.0–40.0 × 0.5–2.5 mm, equal or slightly thickened downwards, white or pale grey, almost translucent, glabrescent.

Pileipellis an epithelium of globose to pyriform elements 30–35 × 15–30 µm, hyaline, thin-walled, with numerous pileocystidia 70–200 × 20–35 µm, inflated below, with obtuse apex, 8–15 µm broad, hyaline or slightly encrusted at base. Cheilocystidia 40–80 × 10–18 µm, lageniform with long cylindric neck, thin-walled, hyaline. Pleurocystidia absent. Stipitipellis a cutis of cylindric hyphae, with caulocystidia similar to pileocystidia, scattered over stipe length. Clamps present. Basidia 10.0–20.0 × 4.5–6.0 µm, short-clavate to cylindric, with 4 sterigmata. Basidiospores 7.0–9.5 × 4.0–5.0 µm, elliptic or slightly ovoid, amygdaliform, pale brown. Germ-pore central, large and truncate. Spore-print dark brown.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, 13 July 1986, *leg. H. Komorowska*, KRAM-F 28524; *leg. W. Wojewoda*, KRAM-F 50398; near Habiro Temple (27), alt. *ca* 200 m, 13 July 1986, *leg. H. Komorowska*, KRAM-F 28485; Ryongak-san Mt. (42), alt. *ca* 250 m, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 50409. – Mixed forests, on ground, at stumps.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, India, Kazakhstan, Korea, Russia (e.g. Siberia and Primorski Krai) and Sri Lanka.

NOTES. Species known from Europe, Asia, North America and Australasia, as well as from East Africa.

REFERENCES. Anonymous (1978: 88; 1983a: 119); Azbukina *et al*. (1984: 51); Breitenbach & Kränzlin (1995: 230, Pl. 272); Jahn (1979: 224, Pl. 200); Melik-Khachatrian (1980: 316); Orton & Watling (1979: 82, Figs 169, 178–179, 182); Pegler (1986: 367, Fig. 80N–R); Syarzhanina 1994: 278); Teng (1996: 480); Vasilyeva (1973: 187); Vasudeva (1962: 48).

Coprinus urticicola (Berk. & Broome) Buller

Trans. Brit. Mycol. Soc. **5**: 485. 1917.

Agaricus urticicola Berk. & Broome (as '*urticaecola*'), Ann. Mag. Nat. Hist., Ser. 3, **7**: 376. 1861. – *Psathyra urticicola* (Berk. & Broome) Sacc., Syll. Fung. **5**: 1073. 1887. – *Coprinus brassicae* Peck, Rep. N.Y. St. Mus. Nat. Hist. **43**: 64. 1890. For further synonyms see Orton & Watling (1979: 47) and Uljé & Noordeloos (1997: 294).

Pileus 4–6 mm broad, up to 6 mm high, ovoid, conico-campanulate, thin, fragile. Upper surface white to cream, to turn grey at margin, initially beset with a loose, floccose veil, glabrescent. Context thin, white. Smell and taste indistinct. Lamellae free, very crowded, white, then chocolate brown, deliquescent but not strongly so. Stipe 15–30 × 1–2 mm, equal, apically attenuate, fistulose, surface white, smooth, floccose at base arising from small strigose disc.

Pileipellis of broad, repent, thin-walled hyphae. Elements of veil hyaline, thin-walled, septate hyphae, 2.5–8.0 µm wide, with numerous irregular, short diverticulae. Clamps absent. Cheilocystidia 30–70 × 10–20 µm, pyriform to elliptic, hyaline, thin-walled. Pleurocystidia 60–90 × 15–20 µm, numerous, hyaline, thin-walled, cylindric, utriform, oblong or fusiform. Basidia 4-spored, 11.5–19.0 × 6.0–8.0 µm, pyriform to pedicellate. Basidiospores 6.0–7.5 × 4.5–6.0 × 4.5–5.0 µm, subglobose to ovoid, with truncate apex, translucent, pale reddish brown. Germ-pore small. Spore-print dark reddish brown.

SPECIMEN EXAMINED. Pagyon Ravine (65), alt. *ca* 300 m, mixed forest, on rotting plant debris, 26 July 1986, *leg. H. Komorowska*, KRAM-F 28407.

DISTRIBUTION. Reported e.g. from Europe (Great Britain and Switzerland), North America (Canada and United States), and East Africa.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 252, Pl. 306); Orton & Watling (1979: 47, Fig. 78); Pegler (1977: 397, fig. 88, 3 a-e); Uljé & Noordeloos (1997: 294, Fig. 11).

Lacrymaria lacrymabunda (Bull.: Fr.) Pat.

Hyménomyc. Eur. 123. 1887.

Agaricus lacrymabundus Bull., Herb. Fr. Pl. 525, Fig. 3. 1791. – *A. velutinus* Pers., Syn. Meth. Fung. 409. 1801. – *A. lacrymabundus* Bull.: Fr., Syst. Mycol. **1**: 287. 1821. – *Hypholoma velutinum* (Per.: Fr.) P. Kumm.,

Führ. Pilzk. 72. 1871. – *Psathyrella velutina* (Pers.: Fr.) Singer, Lilloa **22**: 446. ('1949') 1951. For further synonyms see Bas (1983: 103–106), Kreisel (1987: 135) and Watling & Gregory (1987: 73).

Pileus 30–70 mm, convex or umbonate, expanding to become broadly convex with obtuse broad umbo, yellowish to dull tawny, sometimes darker, covered in adpressed woolly fibrils, fibrillose-scaly and finally singly rugulose or smooth, at margin with appendiculate fibrils. Context in pileus yellowish, buff or tan, darker brown in stipe base, rather fragile. Smell earthy. Taste indistinct. Lamellae variable, adnate, adnexed, crowded, pale umber to fuliginous black, edge white, fimbriate. Stipe 40–100 × 4–10 mm, cylindric or slightly tapered upwards, soon hollow, clay colour or dull tawny, paler at apex and fibrillose ring-zone.

Pileipellis a cutis of erect, swollen-vesiculose cells arising from several levels to form a palisadoderm, intermixed and overlain by filamentous, tawny, smooth or ornamented hyphae 9–12 μm broad. Clamps present. Cheilocystidia 53.0–64.0 × 4.3–5.2 μm, cylindric, subcapitate to distinctly capitate, hyaline, abundant, with head 8.5–10.5 μm broad. Pleurocystidia 28–41 × 10–12(–13) μm, hyaline, rare, Stipitipellis made up of parallel, cylindric, hyaline or tawny hyphae. Apex of stipe covered with caulocystidia 50–70 × 12–20 μm, in groups of irregular vesiculose to flexuous capitate or swollen fusiform cells. Basidia (20.5–)22.0–30.0 × 6.5–9.0 μm, cylindric, hyaline. Basidiospores 8.5–10.5 × 6.0–7.0 μm, ovate or elliptic, slightly amygdaliform, verrucose, umber or vandyke brown, thick-walled. Germ-pore large, apical, central. Spore-print fuliginous black (Fig. 23).

SPECIMEN EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), on Hyangsan-gang River, alt. *ca* 100 m, deciduous forest, on ground, 14 July 1986, *leg. W. Wojewoda*, KRAM-F 31089.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan and Russia (e.g. Primorski Krai and Siberia).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 51); Breitenbach & Kränzlin (1995: 254, Pl. 308); Dähncke & Dähncke (1980: 335); Dennis (1986: 54, as *Lacrymaria velutina*); Imazeki & Hongo (1975, **1**: 55, Pl. 25: 136); J. E. Lange (1937: 71, Pl. 144B, B[1]); Ricken (1915: 245, Pl.64: 3); Syarzhanina (1994: 285); Teng (1996: 482); Vasilyeva (1973: 194); Watling & Gregory (1987: 73, Figs 55–57 & 59–62).

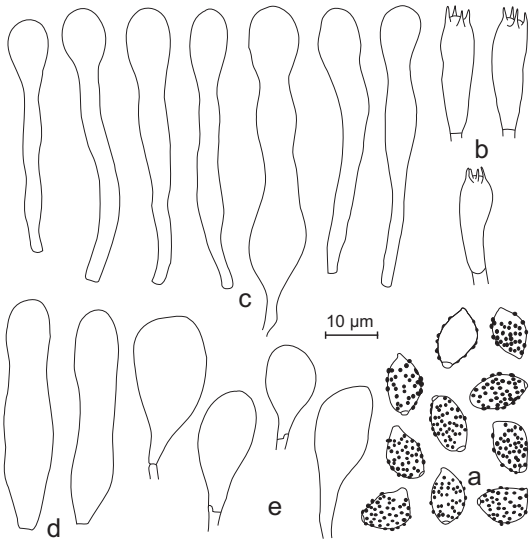


Fig. 23. *Lacrymaria lacrymabunda* (Bull.: Fr.) Pat.: a – basidiospores, b – basidia, c – cheilocystidia, d – pleurocystidia, e – swollen-vesiculose cells from hymeniderm (KRAM-F 31089).

Psathyrella candolleana (Fr.: Fr.) Maire

in Maire & Werner, Mem. Soc. Sci. Nat. Maroc **45**: 112. 1937.

Agaricus candolleanus Fr., Observ. Mycol. **2**: 182. 1818. – *Agaricus candolleanus* ('*candollianus*') Fr.: Fr., Syst. Mycol. **1**: 296. 1821. – *Psathyra candolleana* (Fr.: Fr.) Bertrand, Bull. Soc. Mycol. Fr. **17**: 278. 1901. For further synonyms see Kits van Waveren (1985: 149) and Kreisel (1987: 194).

Pileus 20–60 mm, bell-shaped becoming flattened, pale ochraceous brown when moist drying almost white or flushed with brown, margin often appearing toothed with remnants of veil. Context thin, fragile, white. Smell and taste not distinctive. Lamellae close, greyish lilac to chocolate brown. Stipe 40–80 × 4–8 mm, cylindric or slightly attenuated towards apex, hollow, fragile.

Cheilocystidia 23–35 × 8–12 µm, thin-walled, hyaline, utriform to cylindric. Pleurocystidia absent. Pileipellis an epithelium of elliptic to inflated clavate elements, 18–40 × 10–22 µm, hyaline, thin-walled. Clamps present. Basidia 14–17 × 7–8 µm, clavate, with 4 sterigmata. Basidiospores 6.5–8.5 × 3.5–4.7 µm, elliptic to ovoid, slightly truncated by small germ-pore, with slightly thickened wall, reddish brown to yellowish brown in water and alkali. Spore-print purple-brown.

SPECIMEN EXAMINED. Kumgang-san Mts: Onjong-ri village (60), park, near stump of tree, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 50410.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China (e.g. Tibet), Georgia, Israel, Japan, Kazakhstan, Korea, Russia (e.g. Siberia, Kamchatka, Primorski Krai and Sakhalin) and Sri Lanka.

REFERENCES. Anonymous (1978: 91; 1983: 119); Azbukina *et al*. (1984: 51); Breitenbach & Kränzlin (1995: 264, Fig. 322); Cetto (1980a: 185, Pl. 48); Dähncke & Dähncke (1980: 334); Dennis (1986: 71); Gorbunova (1997: 17); Imazeki & Hongo (1975, **1**: 55, Pl. 25, Fig. 137); Kits van Waveren (1985: 149, Figs 184–187); Konrad & Maublanc (1926: Pl. 43); J. E. Lange (1939: 77, Pls. 146B, 147D, as *Hypholoma egenulum*); Melik-Khachatrian (1980: 323); Michael *et al*. (1983a: 196, Pl. 41); Pegler (1977: 435, Fig. 98.3 a, b, c; 1986: 386, Fig. 85G–J); Syarzhanina (1994: 284); Vasilyeva (1973: 191); Ying *et al*. (1983: 159).

Psathyrella spintrigera (Fr.) Konr. & Maubl.

Encycl. Mycol. **14** (Agaricales **1**): 128. 1948.

Agaricus spintriger Fr., Epicr. Syst. Mycol. 217. 1838. – *Stropharia spintrigera* (Fr.) Sacc., Syll. Fung. **5**: 1025. 1887. – *Hypholoma spintrigerum* (Fr.) Konr. & Maubl., Ic. Sel. Fung. **6**: 88. 1927. – *Drosophila spintrigera* (Fr.) Kühner & Romagn., Fl. Anal. Champ. Sup. 368. 1953 (not validly published, basionym not mentioned). For further synonyms see Kits van Waveren (1985: 147).

Pileus 50–90 mm, at first ovoid, later semiglobate and sometimes irregularly lobed, finally expanded, subumbonate, rust-coloured, hygrophanous. Context of pileus very thin, fragile, date brown. Smell and taste strong and pleasant. Lamellae 5–6 mm broad, crowded, very unequal, very thin, not ventricose, broadly and rounded adnate without tooth, at first reddish tinge, then whitish-ochraceous and grey-brownish lilac, finally brown-violet, edge paler and fimbriate. Stipe 60–70 × 6–13 mm, slender, at base attenuated and strigose, hollow. Cortex of stipe whitish straw-coloured, darker around cavity, reddish hue at base.

Pileipellis composed of subglobose, elliptic or subclavate cells, 40–55(–75) × 15–40 µm. Clamps absent. Cheilocystidia 25–37 × 10–15 µm, abundant, and densely packed, utriform, but also clavate or subcylindric, with obtuse apex, thin-walled, colourless. Pleurocystidia absent. Basidia 22–25 × 8–9 µm, clavate, with 4 sterigmata. Basidiospores 7.0–8.0 × 4.5(–5.0) µm, elliptic, adaxially flattened, orange-brown in water, brown in alkali, not opaque. Germ-pore distinct. Spore-print violet-brown (Figs 24 & 25).

SPECIMENS EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, 16 July 1986, *leg. H. Komorowska*, KRAM-F 28323; Kumgang-san Mts: near Kuryong Falls in Okryu-dong Valley (59), alt. *ca* 700 m, 20 July 1986, *leg. H. Komorowska*, KRAM-F 28233. – Mixed forests, on ground.

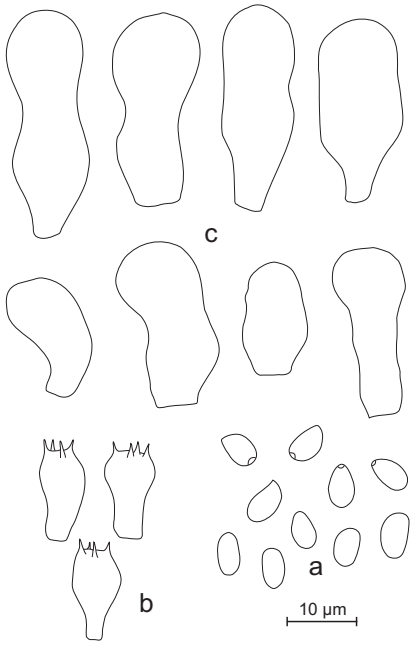


Fig. 24. *Psathyrella spintrigera* (Fr.) Konr. & Maubl.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28233).

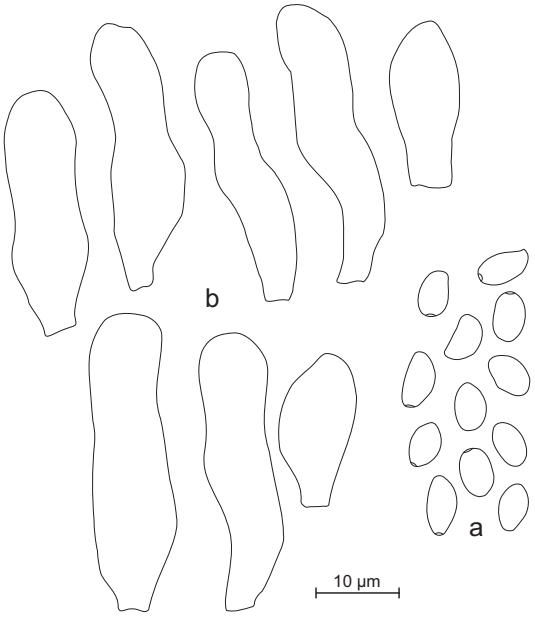


Fig. 25. *Psathyrella spintrigera* (Fr.) Konr. & Maubl.: a – basidiospores, b – cheilocystidia (KRAM-F 28323).

DISTRIBUTION IN ASIA. Russia (Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Cetto (1984: 65, Pl. 1299); Kits van Waveren (1985: 147, Figs 182–183); J. E. Lange (1939: 70, Pl. 143A–B); Vasilyeva (1973: 194, Fig. 47B).

Cortinariaceae R. Heim ex Pouzar 1983

Crepidotus applanatus (Pers.) P. Kumm.

Führ. Pilzk. 74. 1871.

Agaricus applanatus Pers., Obs. Mycol. **1**: 8. 1796. For further synonyms see Senn-Irlet (1995: 38).

Pileus 8–30 mm, flabelliform, semi-orbicular, smooth, slightly tomentose towards base, hygrophanous, white to ivory, then slightly pale cinnamon, with slightly striate and inrolled margin. Context thin, whitish. Smell and taste indistinct. Lamellae crowded, adnexed, whitish at first, then brownish. Stipe rudimentary, excentric.

Pileipellis composed of repent interwoven hyphae 3–9 µm broad, among them occasional clavate, cystidioid end-cells 6–11 µm broad. Clamps present. Cheilocystidia 30–50 × 8–10 µm, numerous, clavate to capitate. Pleurocystidia absent. Basidia 20–26 × 6–8 µm, clavate, with 4 sterigmata. Basidiospores 4.5–6.4 × 4.3–6.0 µm, globose to subglobose, pale cinnamon, echinulate. Spore-print olive brown.

SPECIMEN EXAMINED. Pagyon Ravine (65), alt. *ca* 300 m, 26 July 1986, mixed forest, on stump of deciduous tree, *leg. H. Komorowska*, KRAM-F 28289.

DISTRIBUTION IN ASIA. Armenia, Georgia, India, Japan, East Pakistan, Kirghizia and Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 56); Breitenbach & Kränzlin (2000: 296, Pl. 384); Dennis (1986: 40); Melik-Khachatrian (1980: 408); Norstein (1990: 88, Fig. 7.6); Pilát (1948: 31, Fig. 6, Pls. 2–11); Senn-Irlet (1995: 38, Fig. 44. Pl. 3a); Syarzhanina (1994: 433); Vasilyeva (1973: 254); Watling & Gregory (1989: 86, Fig. 134).

Crepidotus autochthonus J. E. Lange

Fl. Agar. Dan. 5: III. 1940.

Crepidotus fragilis Joss., Bull. Soc. Mycol. Fr. **53**(2): 18. 1937 (*nom.. nud*.). – *Crepidotus mollis* var. *pseudoapplanatus* Pilát, Stud. Bot. Čech. **10**: 151.

Pileus 20–45 mm, flabelliform, convex to funnel-shaped, with incurved, sometimes lobed margin, indistinctly hygrophanous, white, then cream-buff to olive-buff. Context thin, whitish. Taste mild. Lamellae crowded, 2 mm broad, whitish, then pale snuff brown. Stipe absent.

Pileipellis a cutis of parallel, slightly interwoven, hyaline hyphae, 4–8 µm broad. Clamps present. Cheilocystidia 20–55 × 5–10 µm, cylindric, slightly subcapitate, hyaline, thin- walled. Basidia 22–28 × 6–9 µm, clavate, with 4 sterigmata and basal clamps. Basidiospores 7.0–8.5(–9.0) × 5.0–5.6 µm, broadly ovoid, smooth, honey-coloured in water and alkali, apex almost mucronate. Spore-print clay-buff (Fig. 26).

SPECIMEN EXAMINED. Kumgang-san Mts: Okryu-dong Valley (59), mixed forest, on soil with litter and wood debris, 20 July 1986, *leg. Z. Heinrich*, KRAM-F 32551.

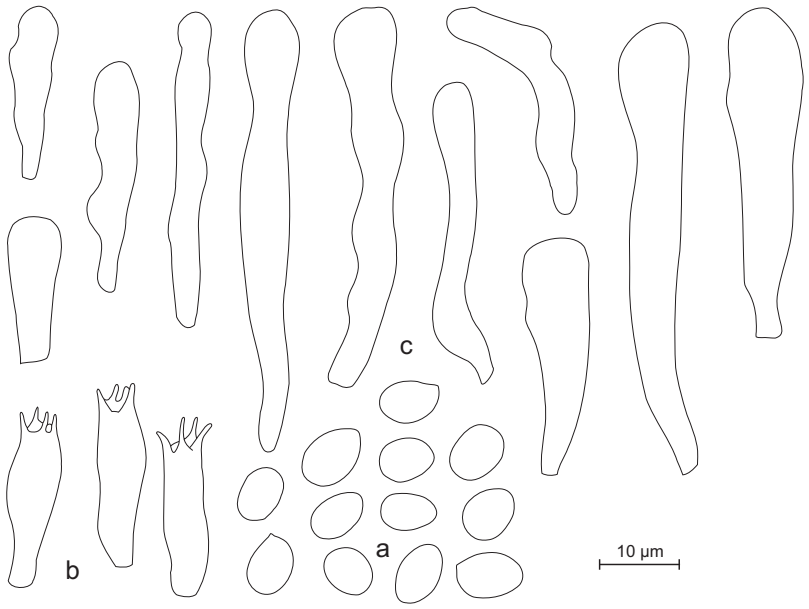


Fig. 26. *Crepidotus autochthonus* J. E. Lange: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 32551).

DISTRIBUTION IN ASIA. Russia (Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Josserand (1937: 216–219, as *C. fragilis*); J. E. Lange (1939: 45, pl. 132E); Moser (1983: 308); Senn- Irlet (1995: 66, Fig. 58); Stangl *et al*. (1991: 120–122, Fig. 1, 2); Syarzhanina (1994: 435); Vasilyeva (1973: 254, fig. 58A); Watling & Gregory (1989: 87, fig. 136).

Crepidotus calolepis (Fr.) P. Karst.

Bidr. Känn. Finl. Nat. Folk **32**: 414. 1879.

Agaricus calolepis Fr., Öfvers. K. Vetensk.-Akad. Förh. **30**(5): 5. 1873. – *Crepidotus mollis* var. *calolepis* (Fr.) Pilát, Acta Mus. Nat. Prag. **2B**: 74. 1940. – *Crepidotus mollis* subsp. *calolepis* (Fr.) Norstein, Syn. Fung. **2**: 67.1990.

Pileus 10–50 mm, reniform, flabelliform rounded, convex to plano-convex, tomentose at first, later appressed fibrillose-scaly, tomentum and scales clay-coloured, dark rust-coloured. Context thick, cream to olive-buff, gelatinous. Smell absent. Taste mild. Lamellae crowded, narrow, subventricose, pallid buff, ochraceous buff to cinnamon, edge minutely fimbriate, whitish at first, later even. Stipe absent.

Pileipellis a cutis of twisted hyphae 4–5 µm broad. Clamps absent. Cheilocystidia 30.0–65.0 × 5.0–8.5 µm, cylindric, narrowly utriform, rarely clavate and septate, hyaline. Pleurocystidia absent. Basidia 20–28 × 6–9 µm, clavate, hyaline, with 4 sterigmata, rarely with 2. Basidiospores 7.0–10.0 × 5.0–6.5 µm, broadly elliptic or ovoid, smooth, rust brown, slightly thick-walled. Sporeprint snuff brown. (Figs 27 & 28).

SPECIMEN EXAMINED. Suian-san Mts (48), *ca* 15 km N of Haeju, alt. *ca* 350 m, mixed forest, 6 July 1986, *leg. H. Komorowska*, KRAM-F 28246; *leg. Z. Heinrich*, KRAM-F 28137.

DISTRIBUTION IN ASIA. Reported e.g. from Armenia, China, Kazakhstan.

NOTES. New to North Korea.

REFERENCES. Melik-Khachatrian (1980: 409); Ryman & Holmåsen (1984: 468); Senn-Irlet (1995: 34, Fig. 43); Syarzhanina (1994: 436); Teng (1996: 432); Watling & Gregory (1989: 85).

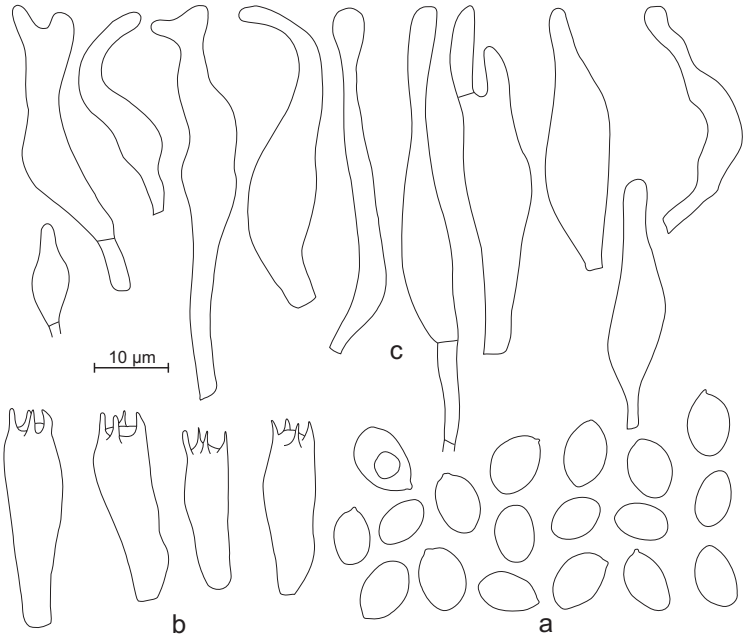


Fig. 27. *Crepidotus calolepis* (Fr.) P. Karst.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28137).

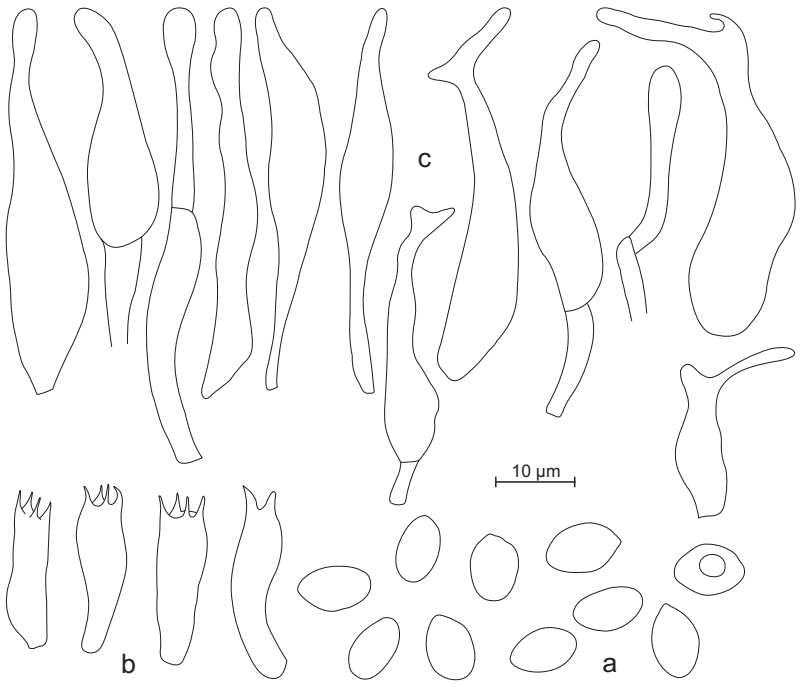


Fig. 28. *Crepidotus calolepis* (Fr.) P. Karst.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28246).

Crepidotus cesatii (Rabenh.) Sacc.

Syll. Fung. **5**: 879. 1887.

Agaricus cesatii Rabenh., Fl. Ratisb. 564. 1851.

Pileus 6–15 mm, reniform to ungulate, later dimidiate to flabelliform, slightly hygrophanous, appressed fibrillose to subtomentose, white, pale yellow, greyish yellow to orange grey. Context thin, white. Smell and taste mild. Lamellae thin, rather distant, whitish, later ochraceous brown, edges white, smooth to fimbriate. Stipe present in rudimentary, only very young basidiocarp, later absent.

Pileipellis composed of repent hyphae 2.5–6.0 µm broad, smooth, hyaline. Clamps present. Cheilocystidia 20–55 × 6–11 µm, numerous, variable, subcapitate to hair-shaped, mostly branched or with outgrowth. Pleurocystidia absent. Basidia 18–25 × 6–8 µm, clavate, hyaline, with 4 sterigmata. Basidiospores (6.0–)6.4–9.0 × (4.3–)4.7–6.8(–7.3) µm, subglobose to broadly elliptic, verruculose, pale honey colour to almost hyaline. Spore-print ochraceous brown (Fig. 29).

SPECIMEN EXAMINED. Paekdu-san Mts: Chongbong Mt. (9), near Rimyongsu, alt. *ca* 1300 m, rich taiga with *Larix* and *Betula*, on fallen twigs of deciduous trees, 1 July 1986, *leg. Z. Heinrich*, KRAM-F 28101.

DISTRIBUTION. Reported e.g. from Europe.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 298, Pl.386); Moser (1983: 309); Norstein (1990: 92, Fig. 7.7); Pilát (1948: 60, Fig. 18, Pls. 20b-23); Senn-Irlet (1995: 50, Fig. 51, Pl. 1c, d).

Crepidotus mollis (Schaeff.: Fr.) Staude

Schwämme Mitteldeutschl. **25**: 71. 1857.

Agaricus mollis Schaeff., Fung. Bavar. **4**: 49. 1774. – *Agaricus mollis* Schaeff.: Fr. Syst. mycol. **1**: 274. 1821. For further synonyms see Senn-Irlet (1995: 31).

Pileus 10–65 mm, reniform to conchiform, later convex to plano-convex, glabrous or with scattered brown scales, white, yellowish white, light yellow, light brown to brownish grey, sometimes with reddish brown spots, hygrophanous,

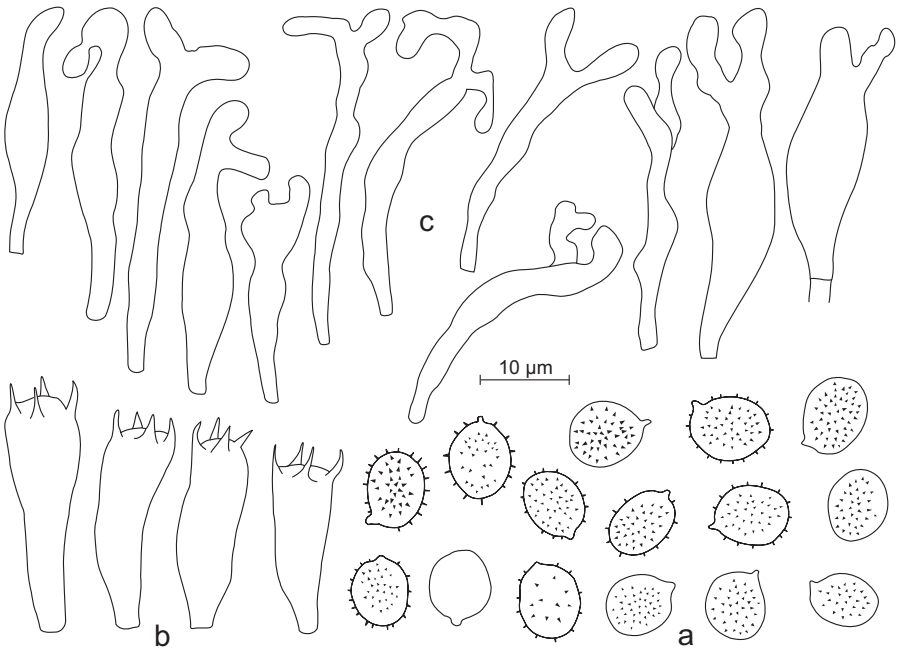


Fig. 29. *Crepidotus cesatii* (Rabenh.) Sacc.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28101).

gelatinous. Context thin, in part gelatinized, white when dry, light brown when moist. Smell faint, not distinctive. Taste mild. Lamellae broad, crowded, pale yellow, yellowish grey, greyish orange to greyish brown or light brown, edges white, smooth to fimbriate, gelatinized when mature. Stipe lacking or rudimentary.

Pileipellis gelatinous, composed of narrow, smooth, hyaline, repent hyphae. Clamps absent. Cheilocystidia 25–65 × 5–9 μm, variable, cylindric or lageniform, also branched, clavate, angulate, smooth, hyaline. Pleurocystidia absent. Basidia 24–26 × 6–8 μm, clavate, with 4 sterigmata. Basidiospores 7.0–10.7 × 5.0–6.4 μm, elliptic to ovoid, smooth, light grey-yellow. Spore-print umber brown (Figs 30 & 31).

SPECIMENS EXAMINED. Suian-san Mts (48), alt. *ca* 200 m, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 50400; alt. *ca* 350 m, 6 July 1986, *leg. H. Komorowska*, KRAM-F 28245, 28246, 28248; *leg. Z. Heinrich*, KRAM-F 28137; Kumgang-san Mts: Okryu-dong Valley below Kuryong Falls (59), alt. *ca* 700 m, 20 July 1986, *leg. H. Komorowska*, KRAM-F 28235. – Mixed forests, on wood of deciduous trees.

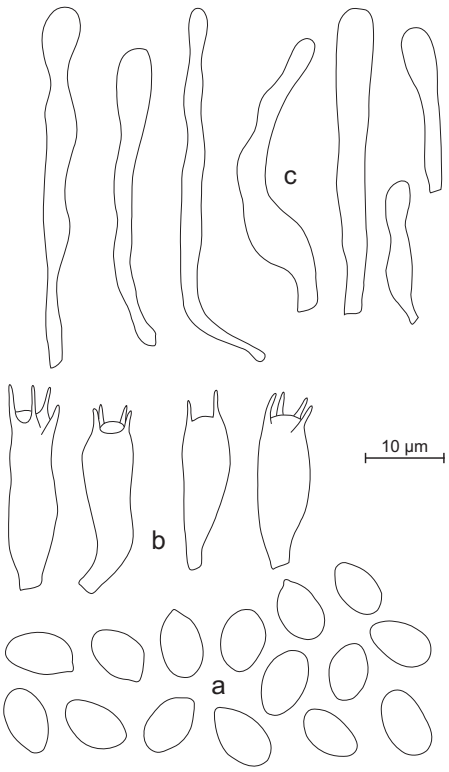


Fig. 30. *Crepidotus mollis* (Schaeff.: Fr.) Staude: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28235).

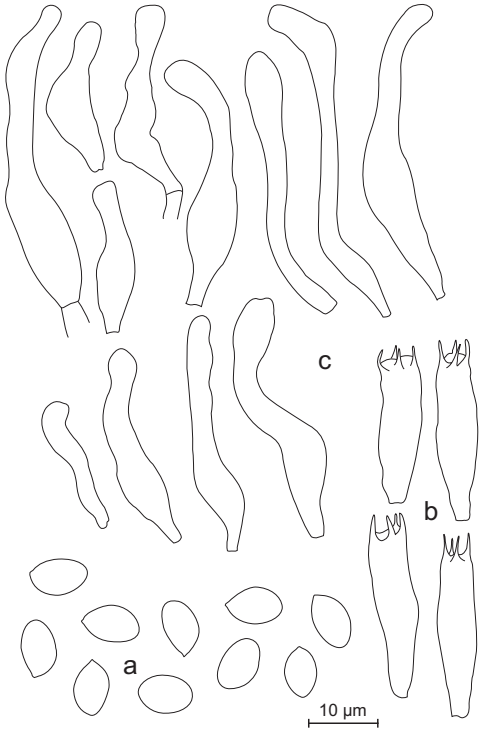


Fig. 31. *Crepidotus mollis* (Schaeff.: Fr.) Staude: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28248).

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China (e.g. Tibet), Georgia, Israel, Japan, Kazakhstan, Korea, Mongolia, Nepal and Russia (e.g. Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 121); Azbukina *et al*. (1984: 56); Breitenbach & Kränzlin (2000: 300, Pl. 390); Cetto (1984: 461, Pl. 1552); Dennis (1986: 40); Konrad & Maublanc (1937: Pl. 303: I); J. E. Lange (1939: 45, Pl. 132B); Melik-Khachatrian 1980: 410); Michael *et al*. (1985: 208, Pl. 22); Mukhin (1993: Tab. 1); Norstein (1990: 64, Fig. 7.1); Pilát (1940: 82; 1948: 24, Fig. 4, Pl. 1); Senn-Irlet (1995: 31, Fig. 42, Pl. 1a, b); Syarzhanina (1994: 437); Uranchimehg *et al*. (1983: 377); Vasilyeva (1973: 254); Wen & Sun (1999: 364); Ying *et al*. (1983: 123).

Crepidotus subverrucisporus Pilát

Studia Bot Čech. **10**: 151. 1949.

Crepidotus velenovskyi Pilát, Studia Bot. Čech. **10**: 152. 1949. For further synonyms see Senn-Irlet (1995: 63)

Pileus 5–14 mm, ungulate, semiorbicular to flabelliform, white, cream-yellow, light orange to greyish orange, velutinous to tomentose, later glabrescent. Context thin, white, later watery grey. Smell absent. Taste mild. Lamellae broad, distant, white, later light ochre, adnexed, edges white, ciliate. Stipe lacking.

Pileipellis not gelatinous, composed of loosely, irregularly interwoven hyaline hyphae 3–6 μm broad. Clamps present. Cheilocystidia 35.0–60.0 × 5.0–7.7 μm, cylindric, lageniform, somewhat fusiform, hyaline, thin-walled. Pleurocystidia absent. Basidia 20.0–30.0 × 6.4–8.0 μm, clavate, with 4 sterigmata. Basidiospores 7–10 × 5–6 μm, elliptic, ovate to amygdaliform, moderately verrucose, grey-yellow. Spore-print brownish, light brown, brown to reddish brown (Fig. 32).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 30395; Kumgang-san Mts: Onjong-ri village, near hotel (60), pine forest, 21 July 1986, *leg. W. Wojewoda*, KRAM-F 50394. – On dead, fallen twigs of deciduous trees.

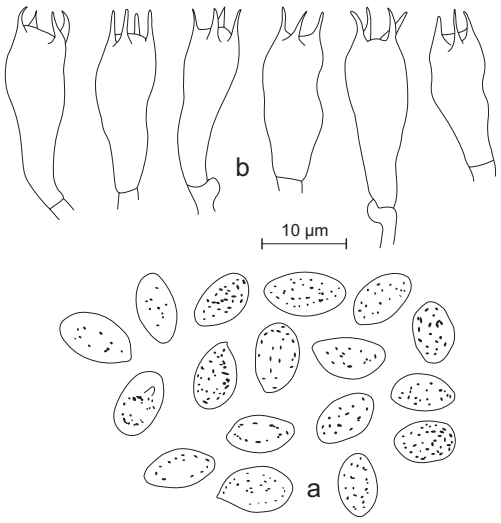


Fig. 32. *Crepidotus subverrucisporus* Pilát: a – basidiospores, b – basidia (KRAM-F 50394).

DISTRIBUTION IN ASIA. West Pakistan.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 302, Pl. 391); Moser (1983: 309); Pilát (1948: 51, Fig. 14); Senn-Irlet (1995: 64, Figs 11, 57); Stangl *et al*. (1991: 143, as *Crepidotus velenovskyi*).

Descolea flavoannulata (L. N. Vasilyeva) Horak

Persoonia **6**(2): 246. 1971.

Rozites flavoannulatus L. N. Vasilyeva, Bot. Mat. Inst. Spor. Rast. **6**: 199. 1950.

Pileus 50–60 mm, at first subglobose, becoming convex, then expanded and obtusely umbonate, radially wrinkled, melleous ochre to dark brown, with concentrically arranged, small, floccose, yellow fragments of velar patches. Smell and taste unknown. Lamellae adnate, subdistant, broad; yellowish, then dark rusty cinnamon; edge yellow and minutely fimbriate. Stipe 60–80 × 7–10 mm, equal, with subbulbous base, ochraceous yellow, paler at apex, somewhat brownish from base upwards; ring yellow, membranous, striate.

Pileipellis a cutis of clavate cells, 10–25 × 6–15 μm, forming distinct epithelium, hyphae strongly encrusted with rust-brown pigment, not gelatinized. Clamps present. Cheilocystidia 30–45 × 7–14 μm, clavate, forming sterile zone at gill edge. Hyphae of remnants of veil cylindric, heavily encrusted with pigment. Basidia 35–45 × 10–12 μm, clavate, with 4 sterigmata. Basidiospores 12.5–15.5 × 8.5–9.5 μm, lemon-shaped, coarsely verrucose, with prominent smooth mucro. Perispore distinct, rust brown (Fig. 33).

SPECIMEN EXAMINED. Myohyang-san Mts: Kuchung Falls (26), alt. *ca* 850 m, mixed forest with *Pinus* and *Quercus*, on ground, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 31090.

DISTRIBUTION IN ASIA. Japan, and Russia (Primorski Krai).

NOTES. New to North Korea. Species of *Descolea* Singer (1951: 257) genus were found to be rich in ectomycorrhizal root tips with different

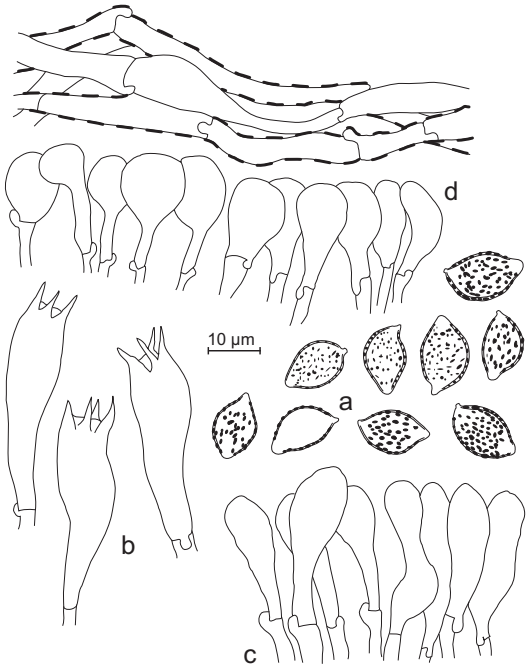


Fig. 33. *Descolea flavoannulata* (L. N. Vasilyeva) Horak: a – basidiospores, b – basidia, c – cheilocystidia, d – pileipellis (KRAM-F 31090).

host trees (*Castanopsis*, *Eucalyptus*, *Larix*, *Leptospermum*, *Melaleuca*, *Nothofagus*, *Pinus* and *Quercus*). At present the genus *Descolea* contains ten taxa. Eight taxa occuring in the subantarctic region (s.l.), *D. flavoannulata* occurs to Eastern Siberia, Korea and Japan. Data seem to indicate that the genus *Descolea* migrated from its en-edemic habitat in the southern *Nothofagus* forests to the Northern Hemisphere (Horak 1983).

REFERENCES. Horak (1971: 246, Fig. 10); Vasilyeva (1973: 228, Fig. 54B); Wojewoda *et al*. (1993: 125, 128).

Galerina calyptrata Orton

Trans. Brit. Mycol. Soc. **43**: 237. 1960.

Pileus 3–10 mm in diam., obtusely conic, becoming broadly conic to campanulate, dull to bright ochraceous orange to orange-tawny and fading to pale dingy ochraceous, striate when moist, margin at times crenate and sometimes with faint fibrillose remains of thin white veil. Context watery, ochraceous tawny, fading to buff. Smell and taste slightly farinaceous. Veil present in young fruitbody. Lamellae adnate, sometimes with a tooth, broad, distant to subdistant, pale buff or ochraceous, finally ochraceous tawny; edge typically faintly crenulate. Stipe 15.0–40.0 × 0.5–2.0 mm, equal or with a small basal bulb, concolorous at lamellae, apex pruinose, downwards slightly fibrillose.

Pileipellis of parallel, repent, short, yellow-brown, asperulate hyphae. Clamps present. Cheilocystidia 30.0–55.0 × 2.5–4.0 × 5.0–9.0 µm, ventricose, often with subcapitate, clavate to capitate apex. Pleurocystidia absent. Basidia 25–30 × 9–10 µm, cylindric to clavate, with 4 sterigmata. Basidiospores 9.0–12.0(–14.0) × 5.0–7.0(–7.5) µm, oval to amygdaliform, calyptrate and most of surface smooth to slightly roughened, rusty brown. Apical callus absent or faint. Spore-print ochre-brown (Fig. 34).

SPECIMEN EXAMINED. Paekdu-san Mts: S of Samjiyon town (8), alt. *ca* 1400 m, taiga with *Larix olgensis*

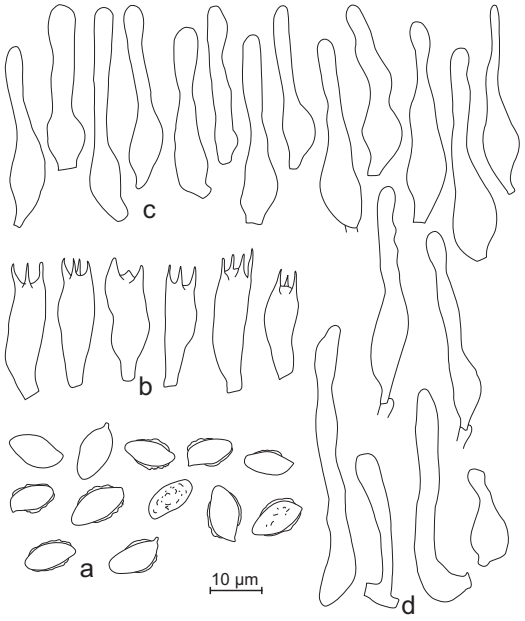


Fig. 34. *Galerina calyptrata* Orton: a – basidiospores, b – basidia, c – cheilocystidia, d – caulocystidia (KRAM-F 27775).

and *Ledum palustre*, in mosses, 26 June 1985, *leg. B. Zarzycka*, KRAM-F 27775.

DISTRIBUTION. Europe.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 314, Pl. 411); Gulden (1987: 195, Fig. 8, Pl. V: 15–16); Orton (1960: 237, Figs 26–28, 274, 410); Smith & Singer (1964: 65, Fig. 26); Watling *et al*. (1993: 27, Fig. 41); Wojewoda *et al*. (1993: 127).

Galerina clavata (Velen.) Kühner

Genre *Galera*. 171. 1935.

Galerula heterocystis Atk., Proc. Am. Philos. Soc. **57**: 362. 1918. – *Galera fragilis* Velen. var. *clavata* Velen., České Houby. 549. 1921. – *Galera clavata* (Velen.) J. E. Lange, Dansk Bot. Ark. **9**(6): 43. 1938. – *Galerina heterocystis* (Atk.) A. H. Sm.. & Singer, Sydowia **11**: 447. 1957. For further synonyms see Gulden (1987: 181), Gulden & Jenssen (1988: 51), Smith & Singer (1964: 34), Watling *et al*. (1993: 22).

Pileus 4–20 mm, obtusely conic to semiglobate, sometimes with darker small umbo or papilla, glabrous, pale yellow to pale fulvous, translucent-striate, hygrophanous and fading to pale buff. Context thin, fragile. Smell and taste indistinct. Lamellae close to distant, ascending adnate, somewhat adnexed, narrow, pale yellow becoming pale fulvous, edges even. Stipe 12.0–80.0 × 0.5–3.0 mm, equal, pallid to pale yellow.

Pileipellis a cutis of radially repent, cylindric to inflated hyphae, pileocystidia absent. Clamps absent. Cheilocystidia 28.0–48.0 × 7.3–15.5 × 2.5–6.0 × 5.0–12.0 µm, tibiiform, hyaline. Pleurocystidia absent. Stipitipellis of cylindric, short, 4–7 µm broad hyphae, caulocystidia ampullaceous or tibiiform (similar to cheilocystidia), numerous at stipe apex. Basidia 24–35 × 8–10 µm, cylindric-clavate, hyaline, with (2–)4 sterigmata. Basidiospores 10.0–15.5(–17.5) × 6.5–8.0(–9.5) µm, amygdaliform, elliptic, verrucose, yellow-brown to rusty brown. Plage and pore absent. Spore-print ochraceous rust-colour (Fig. 35).

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 25 km N of Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix* and *Picea*, in mosses, 25, 30 June 1986, *leg. Z. Heinrich*, KRAM-F 28081, 28083, 28085.

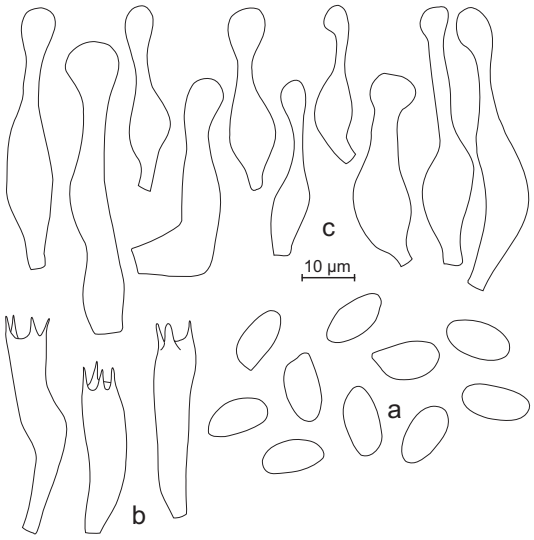


Fig. 35. *Galerina clavata* (Velen.) Kühner: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28081).

DISTRIBUTION IN ASIA. Japan, Korea and Russia (e.g. North and East Siberia).

NOTES. Reported also from Shetland, Faeroes, Europe, North America, Argentina, and Grenland.

REFERENCES. Breitenbach & Kränzlin (2000: 316, Fig. 414); Dennis (1986: 44); Gulden (1980: 227, Fig. 1; 1987: 181, Fig 2, Pl. 1: 1–2); Gulden & Jenssen (1988: 51); Hansen & Knudsen (1992: 311); Imazeki & Hongo (1975, **1**: 75, Pl. 33: 189); Kühner (1935: 171, Fig. 56); J. E. Lange (1939: 40, Pl. 130B); Pegler & Brand (1995: 156); Watling *et al*. (1993: 22, Figs 108–110); Wojewoda *et al*. (1993: 127).

Galerina fallax A. H. Sm. & Singer

Mycologia **47**: 561. 1955.

Pileus 5–10 mm, obtusely conic, broadly conic to nearly convex, surface glabrous, hygrophanous, slightly translucent-striate, tawny to ochraceous tawny. Lamellae broad, ± approximate, close to nearly subdistant, edges even. Stipe 15–30 mm, filiform or nearly so, equal, fragile, glabrous, pale ochraceous at apex, tawny or darker below.

Cheilocystidia 20–35 × 6–9 × 3–4 µm, subventricose or subcylindric, hyaline, smooth, thin-

walled,. Pleurocystidia absent. Clamps present. Basidia 16–20 × 6–7 μm, hyaline, with 4 sterigmata. Basidiospores 7–9 × 5–6 μm, inequilateral in profile, ovate in face view, tawny or darker, smooth and with exosporium loosening and separable from episporium. Apical callus present (Fig. 36).

SPECIMENS EXAMINED. Kumgang-san Mts: Onjongri village on Narugang (60), forest with *Pinus densiflora*, on mossy, coniferous logs, gregarious, 21 July 1986, *leg. Z. Heinrich*, KRAM-F 28045.

DISTRIBUTION. Reported from Europe and North America.

NOTES. New to North Korea.

REFERENCES. Moser *et al* (1986: Pl. 3: 1); Pegler & Brand (1995: 156); Smith & Singer (1964: 84, Pl. 2B, Pl. 3B, Fig. 38).

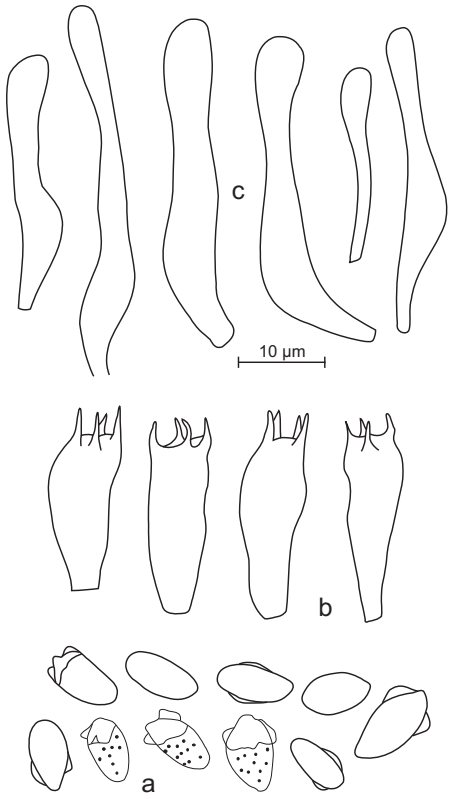


Fig. 36. *Galerina fallax* A. H. Sm. & Singer: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28045).

Galerina marginata (Batsch) Kühner

Genre *Galera*: 225. 1935.

Agaricus marginatus Batsch, Elench. Fung. **2**: 65. 1789. – *Pholiota marginata* (Batsch) Quél., Champ. Jura Vosges. 127. 1872. – *Galera marginata* (Batsch) Kühner & Romagn., Fl. Anal. Champ. Sup. 321. 1953. For further synonyms see Kreisel (1987: 96), Smith & Singer (1964: 259) and Watling *et al*. (1993: 51).

Pileus 15–35 mm, obtuse to convex then planoconvex, margin incurved for some time, moist but not viscid, hygrophanous, pale to dark ochraceous tawny over disc, yellow on margin at least when young, fading to dull tan, usually translucent-striate when moist. Context pale brownish, ochraceous to nearly white, thin, pliant. Smell farinaceous. Taste varying from very slightly to strongly farinaceous. Lamellae narrow and crowded, adnate, slightly decurrent, pale brown to yellow brown, edges white, flocculose. Stipe (20–)30–60 × 3–5(–7) mm, equal to slightly enlarged downward, with submembranous to fibrillose annulus, brown, reddish brown to bistre, pruinose at apex, white fibrillose below annulus.

Pileipellis composed of filamentous, pale ochraceous encrusted hyphae. Clamps present. Cheilocystidia 30–60 × (8–)9–10(–14) × 3–6 μm, hyaline, fusoid ventricose with obtuse or subacute apex. Pleurocystidia scattered similarly to cheilocystidia but often longer. Basidia 20–30 × 5–7 μm, subcylindric, hyaline, with 4 sterigmata. Basidiospores 8.0–10.5 × 5.0–6.0 μm, ovoid, slightly flattened, warty rugulose, with smooth plage and apical callus but lacking a loosening perispore, dark tawny in water, more rust-brown in alkali. Spore-print rust-colour (Fig. 37).

SPECIMENS EXAMINED. Myohyang-san Mts: near Habiro Temple (27), alt. *ca* 200 m, mixed forest, on coniferous wood, 16 Aug. 1984, *leg. W. Wojewoda*, KRAM-F 29494; 9 June 1985, *leg. B. Zarzycka*, KRAM-F 50399.

DISTRIBUTION IN ASIA. Armenia, Japan, Kazakhstan and Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 54); Breiten-

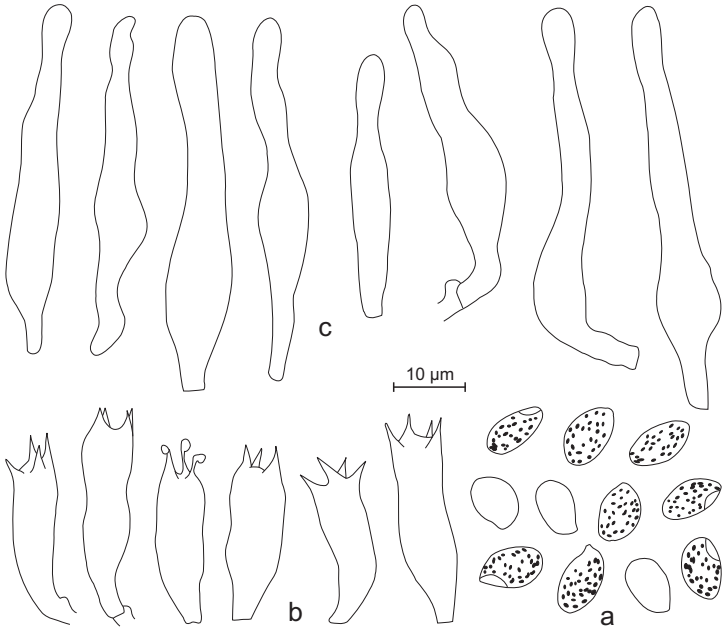


Fig. 37. *Galerina marginata* (Batsch) Kühner: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 29494).

bach & Kränzlin (2000: 318, Pl. 417); Bresadola (1930: Pl. 704); Gorbunova (1997: 18); Imazeki & Hongo (1975, **1**: 75, Pl. 33: 191); J. E. Lange (1938: 59, Pl. 109B); Melik-Khachatrian (1980: 401); Michael *et al*. (1985: 384, Pl. 212); Smith & Singer (1964: 259, Pl. 17B, Fig. 173); Syarzhanina (1994: 429); Vasilyeva (1973: 252); Watling *et al*. (1993: 51, Figs 91 & 92).

Galerina sphagnorum (Pers.: Fr.) Kühner

Genre *Galera*. 179. 1935.

Agaricus sphagnorus Pers., Syn. Meth. Fung. 386. 1801. – *Agaricus hypnorus* ['var.'] *sphagnorus* Pers.: Fr., Syst. Mycol. **1**: 267. 1821. – *Galera sphagnorum* (Pers.: Fr.) P. Karst., Bidr. Känn. Finl. Nat. Folk **32**: 441. 1879. For further synonyms see Smith & Singer (1964: 147).

Pileus 10–20 mm, broadly conic to convex, umbonate with or without papilla, yellow-brown to red-brown with paler margin, hygrophanous, smooth, striate. Context thin, concolorous with cap. Smell and taste indistinct to slightly mealy. Lamellae broad, adnate, subdistant, paler than pileus, ochre to pale yellow-brown, edges slightly fimbrate. Stipe 30–80 × 1–2 mm, equal, sometimes enlarged at base, paler than pileus, yellow-brown throughout. Velar remnants absent.

Pileipellis composed of repent, parallel, pale yellow-brown to hyaline, asperulate, medium-celled hyphae. Clamps present. Cheilocystidia 27.0–60.0 × 7.5–12.5 µm, hyaline, ventricose-subcapitate to lageniform. Pleurocystidia absent. Basidia 28–32 × 7–10 µm, cylindric to clavate, with 4 sterigmata. Basidiospores (9.0–)10.0–13.0(–14.0) × 5.5–8.0(–9.0) µm, amygdaliform to broadly amygdaliform, minutely marbled with a faint line at plage. Pore and callus absent. Spore-print tawny (Fig. 38).

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 20 km SE of Paekdu-san Mt. peak (1), taiga, in *Sphagnum*, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29127.

DISTRIBUTION IN ASIA. Japan, Korea and Russia (e.g. Siberia and Far East).

REFERENCES. Breitenbach & Kränzlin (2000: 324, Pl. 425); Dennis (1986: 44); Imazeki & Hongo (1975, **1**: 74, Pl. 33: 187); Kühner (1935: 179, Fig. 59); Michael *et al*. (1985: 382, Pl. 210); Poelt & Jahn (1963**:** 136); Smith & Singer (1964: 147, Pls 3D & 11, Fig. 93); Sy-

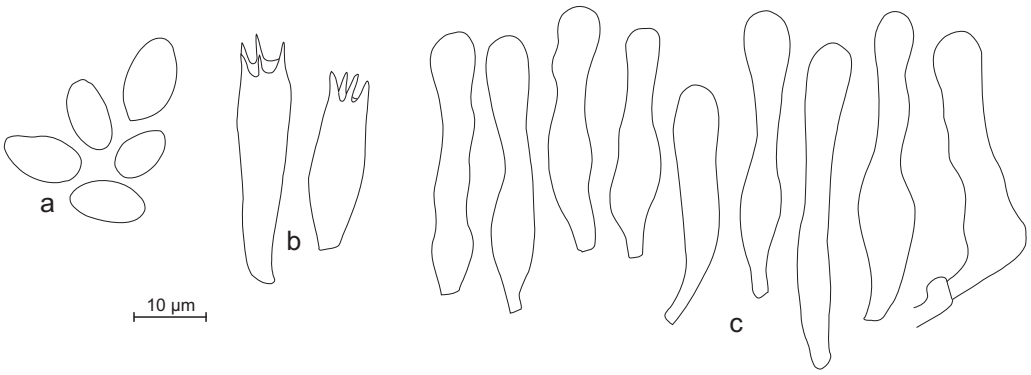


Fig. 38. *Galerina sphagnorum* (Pers.: Fr.) Kühner: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 29127).

arzhanina (1994: 426); Watling *et al*. (1993: 37, Figs 47–49); Wojewoda *et al*. (1993: 127).

Galerina stylifera (Atk.) A. H. Sm. & Singer

Sydowia **11**: 449. 1957.

Galerula stylifera Atk., Proc. Am. Philos. Soc. **57**: 365. 1918. – *Galerina sideroides* (Fr.) Kühner ss. Kühner, Genre *Galera*. 215. 1935. For further synonyms see Kreisel (1987: 97), Smith & Singer (1964: 132) and Watling *et al*. (1993: 49).

Pileus 15–30 mm, broadly convex to plano-convex with inrolled margin, and with or without slight umbo, viscid, smooth, ochraceous tawny, then cinnamon brown, paler with age especially at margin, hygrophanous. Context concolorous with pileus, although brown in stipe cortex. Smell and taste indistinct. Lamellae crowded, broad, adnate and seceding, yellowish brown when young, becoming ochraceous tawny. Stipe 40–60 × 3–6 mm, thick, equal, hollow, concolorous with cap

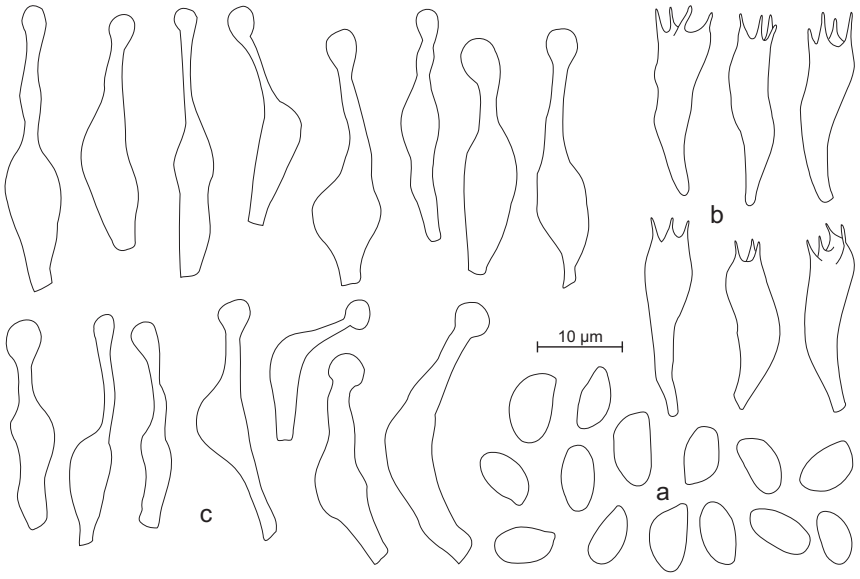


Fig. 39. *Galerina stylifera* (Atk.) A. H. Sm. & Singer: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 29128).

at apex, bistre or dark red-brown at base, pruinose at apex and with apical annular zone of veil fibrils, glabrescent with age.

Pileipellis of narrow, filamentous repent, pale tawny, yellow encrusted, gelatinized hyphae. Clamps present. Cheilocystidia 23.0–28.0 × 3.5–8.0 µm, abundant, ventricose-capitate, often rather narrow. Pleurocystidia absent. Stipitipellis of parallel, repent hyphae. Caulocystidia at apex of stipe similar to cheilocystidia. Basidia 19.0–23.0 × 4.0–7.5 µm, cylindric-clavate, hyaline, with 4 sterigmata. Basidiospores 6.3–8.7 × 4.0–5.0 µm, elliptic, ochraceous tawny in water, darker in alkali, smooth. Plage very indistinct, callus absent. Spore-print ochre-brown (Fig. 39).

SPECIMEN EXAMINED. Myohyang-san Mts: Wonman Mt. (31), alt. *ca* 1000 m, mixed forest, on dead coniferous wood, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29128.

DISTRIBUTION IN ASIA. Armenia.

NOTES. New to North Korea. Known from Asia, Europe and North America.

REFERENCES. Breitenbach & Kränzlin (2000: 324, Pl. 426); Kühner (1935: 215, Fig. 71, as *Galerina sideroides*); Melik-Khachatrian (1980: 402); Smith & Singer (1964: 131, Pls 6A, 7C, 9A, B, E, Fig. 79); Watling *et al*. (1993: 49, Figs 76–78).

Galerina tibiicystis (Atk.) Kühner

Genre *Galera*. 176. 1935.

Galerula tibiicystis Atk., Proc. Am. Philos. Soc. **57**: 365. 1918. – *Galera tibiicystis* (Atk.) Pearson, Trans. Brit. Mycol. Soc. **35**: 113. 1952. For further synonyms see Smith & Singer (1964: 91).

Pileus 10–30 mm, conic, campanulate then convex, umbonate, glabrous, strongly hygrophanous, tawny to ochraceous tawny and translucent-striate when moist, fading to various shades of ochraceous buff, margin striate. Context thin, watery, pale ochraceous tawny. Smell none; taste slightly fungous, indistinct. Lamellae moderately broad, subdistant, ± concolorous with pileus, edges even. Stipe 50–100(–150) × 2–3 mm, very fragile, equal, hollow, concolorous with pileus but paler with age.

Pileipellis composed of hyphae 5–8 µm broad, hyaline, somewhat interwoven, pileocystidia seen on some pilei, these similar to cheilocystidia or with more thickened walls, hyaline. Clamps present. Cheilocystidia 35–55 × 8–12 × 3–4 µm, abundant, ventricose with narrow neck and capitate apex (tibiiform), hyaline to ochraceous in KOH. Pleurocystidia absent. Stipitipellis composed of filamentous parallel hyphae, caulocystidia numerous near apex of stipe and mixed with hyphal fibrils, similar to cheilocystidia. Basidia 25–31 × 8–10 µm, narrowly clavate, hyaline in KOH, with 4 (rarely 1, 2, 3) sterigmata. Basidiospores 8.5–12.0 × 5.0–6.0 µm, amygdaliform, ovate, with strongly rugulose-warty exosporium. Plage nearly smooth or with indefinite boundaries in some, dark tawny to russet in KOH. Spore-print rust-coloured (Fig. 40).

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 25 km N of Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix* and *Picea*, 30 June 1986, *leg. Z. Heinrich*, KRAM-F 28077, 28078; *leg. W. Wojewoda*, KRAM-F 29129; Myohyang-san Mts: near Sangwon-am Monastery (19), mixed forest, 13 July 1986, *leg. Z. Heinrich*, KRAM-F 27935. – In *Sphagnum*.

DISTRIBUTION IN ASIA. Japan and Russia (e.g. East Siberia and Primorski Krai).

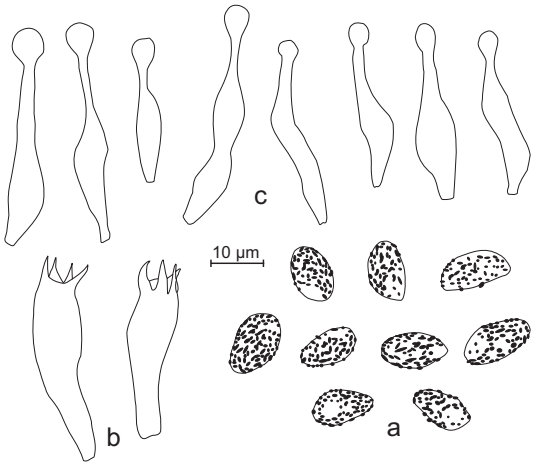


Fig. 40. *Galerina tibiicystis* (Atk.) Kühner: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 29129).

NOTES. New to North Korea.

REFERENCES. Dennis (1986: 44); Imazeki & Hongo (1975, **1**: 74, Pl. 33: 186); Kühner (1935: 177, Fig 57); Smith & Singer (1964: 91, Pl. 4A, Figs 44–45); Syarzhanina (1994: 427); Vasilyeva (1973: 252); Watling *et al*. (1993: 41, Figs 62–64).

Galerina tundrae A. H. Sm. & Singer

Mycologia **47**: 584. 1955.

Pileus 10–20 mm in diam., obtusely campanulate, dull tawny fading to ochraceous tawny, paler over margin, hygrophanous, moist, striate at margin. Context thin, fragile, soft, concolorous with pileus and stipe. Smell and taste not distinctive. Lamellae broad, distant to subdistant, ventricose, ascending-adnate and soon seceding, ochraceous tawny. Stipe 10–20 × 2 mm, equal, hollow, fragile, concolorous at apex with lamellae, darker to tawny below with faint fibrils from veil remnants.

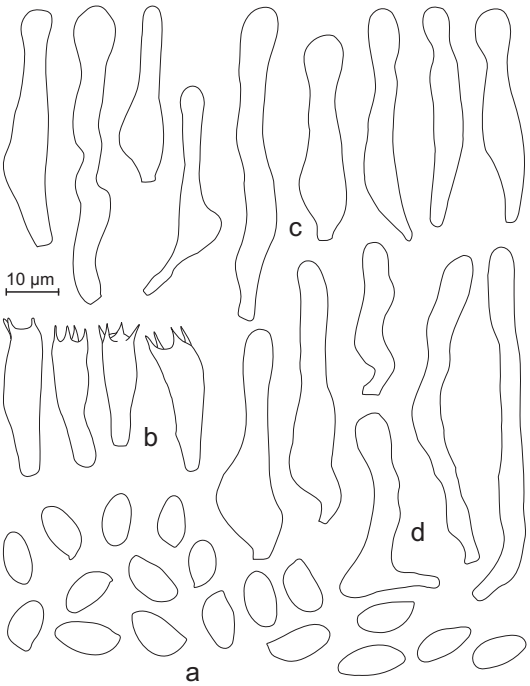


Fig. 41. *Galerina tundrae* A. H. Sm. & Singer: a – basidiospores, b- basidia, c – cheilocystidia, d – caulocystidia (KRAM-F 29495).

Pileipellis composed of narrow filamentous hyphae encrusted with cinnamon pigment. Clamps present. Cheilocystidia 42–60 × 6–9 µm, abundant, ventricose-fusiform with elongated neck, with obtuse apex (8–10 µm) and strongly elongate, clavate or ovate cells with thin pedicel and oval heads, 8–12 µm broad. Pleurocystidia absent. Stipitipellis of cylindric hyphae covered with a few hyaline or light-coloured filaments. Basidia 30.0–36.0 × 9.6–11.0 µm with 4 sterigmata. Basidiospores 10–13 × 5–6 µm, tawny in KOH, narrowly ovate, nearly smooth with faint plage. Callus lacking. Spore-print ochraceous tawny (Fig. 41).

SPECIMEN EXAMINED. Paekdu-san Mts: near Mupo (4), alt. *ca* 1400 m, taiga, on ground, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29495.

DISTRIBUTION. St. Kilda (Hebrides) and North America.

NOTES. New to North Korea.

REFERENCES. Dennis (1986: 44); Gulden (1980: 246, Fig. 20); Smith & Singer (1964: 184, Pl. 13B, Fig. 115); Watling *et al*. (1993: 35); Wojewoda *et al*. (1993: 127).

Galerina vittiformis (Fr.) Singer

Trudy Bot. Inst. Akad. Nauk S.S.S.R. **6**: 472. 1950.

– var. ***albescens*** A. H. Sm. & Singer for. ***bispora*** A. H. Sm. & Singer

Monogr. Genus *Galerina* Earle. 334. 1964.

Pileus 5–17 mm, conic to campanulate, becoming broadly conic, with straight margin, glabrous, moist hygrophanous, rather pale ochraceous to pale pinkish buff. Context thin, concolorous with pileus and stipe. Lamellae adnate, rather distant, first pale ochraceous to bright ochraceous tawny, narrow, edges even. Stipe 25–40 × 1–2 mm, equal, ochraceous tawny, evenly pruinose to base, concolorous with lamellae, veil not seen.

Cheilocystidia 45–70 × 7–14 µm, apex 1.4–5.6 µm, fusoid-ventricose. Pleurocystidia similar to cheilocystidia, 35–65 × 9–18 µm with subacute apex 2.5–6.5 µm. Pilocystidia absent. Caulocystidia numerous. Clamps present. Basidia 20.0–30.0

× 6.0–8.6 µm, with 2 sterigmata. Basidiospores 10.6–14.5 × 6.0–8.0 µm, ovate, with slightly wrinkled-verruculose exosporial ornamentation, and marked plage, pale tawny in KOH. Spore-print pale tawny (Fig. 42).

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, among mosses, 13 July 1986, *leg. Z. Heinrich*, KRAM-F 29130.

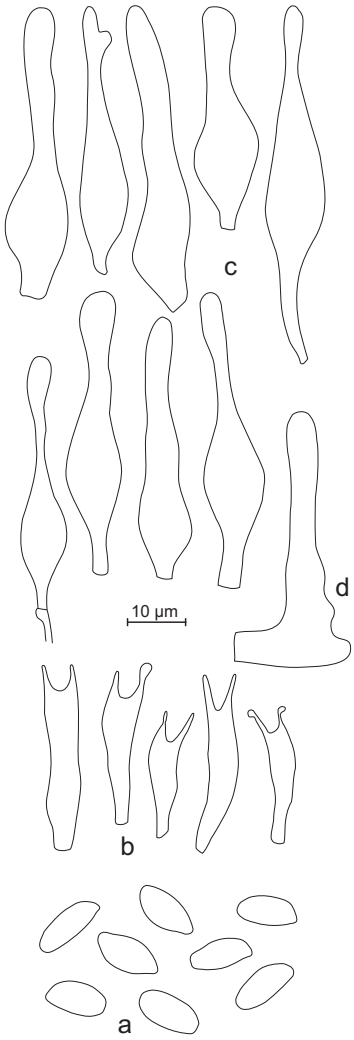


Fig. 42. *Galerina vittiformis* (Fr.) Singer var. *albescens* A. H. Sm. & Singer for. *bispora* A. H. Sm. & Singer: a – basidiospores, b – basidia, c – cheilocystidia, d – caulocystidium (KRAM-F 29130).

DISTRIBUTION IN ASIA. China, Korea and Russia (e.g. Primorski Krai).

NOTES. Varietas and forma new to North Korea.

REFERENCES. Anonymous (1983a: 121, *Galerina vittiformis* var. *vittiformis* was published as *Galerina rubiginosa*); Breitenbach & Kränzlin (2000: 330, Pl. 433); Gulden (1980: 239, Fig. 12); Smith & Singer (1964: 334, Figs 224, 225); Vasilyeva (1973: 253); Watling *et al*. (1993: 25, Figs 2, 26, 37–38), Wen & Sun (1999: 364); Wojewoda *et al*. (1993: 127).

Gymnopilus hybridus (Fr.: Fr.) Maire

Treb. Mus. Ciènc. Nat. Barcelona **15**(2): 96. 1933.

Agaricus hybridus Fr., Obs. Mycol. **2**: 30. 1818. – *A. sapineus* Fr. β *A. hybridus* (Fr.) Fr., Syst. Mycol. **1**: 239. 1821. – *Flammula hybrida* (Fr.: Fr.) Gillet, Hyménomycètes. 532. 1874.

Pileus 25–60 mm, conico-convex, then expanded, sometimes indistinctly umbonate, at first cinnamon-fulvous, then tinged orange to ferruginous, margin rust with whitish cortinal veil remnants. Context white-yellow to slightly reddish yellow. Smell faint. Taste bitter. Lamellae adnate, with tooth or slightly emarginate, yellowish ochre, not spotted, crowded, edge paler and minutely flocculose. Stipe 35–70 × 3–8 mm, equal or slightly thickened at base, pale ochre-yellow then slightly ferruginous from the base up, white silky-striate, base white tomentose.

Pileipellis composed of filamentous, hyaline or encrusted yellow-brown hyphae 1.5–7.0 µm broad. Clamps present. Cheilocystidia 23–50 × 4–9 µm, lageniform, mostly capitate, hyaline or yellowish. Pleurocystidia rare, similar to cheilocystidia. Caulocystidia 30–55 × 5–15 µm, lageniform or more variably shaped cells at stipe apex. Basidia 20.0–28.0 × 5.0–7.5 µm, with 4 sterigmata. Basidiospores 7.0–9.0 × 4.0–5.0(–5.5) µm, elliptic or slightly amygdaliform, moderately verrucose, ferruginous in KOH. Spore-print yellow-ochre.

SPECIMEN EXAMINED. Ryongak-san Mt. (42), alt. *ca* 230 m, mixed forest, on rotten wood, 16 July 1986, *leg. H. Komorowska*, KRAM-F 28301.

DISTRIBUTION IN ASIA. Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Gorbunova (1997: 18); Hesler (1969: 57); Konrad & Maublanc (1928: Pl. 63, as *Flammula sapinea*); J. E. Lange (1939: 9, Pl. 121A); Syarzhanina (1994: 372); Vasilyeva (1973: 249); Watling, *et al*. (1993: 63).

Inocybe albomarginata Velen.

České Houby. 379. 1920.

I. ovalispora C. H. Kauffm., North Amer. Fl. **10**(4): 248. 1924. For further synonyms see Kuyper (1986: 186).

Pileus 20–30 mm, plano-convex to applanate, with low, broad umbo, with margin slightly inflexed, then straight, dark reddish brown, especially around disc, tomentose around centre, outwards radially fibrillose, with diverging fibrils, soon radially rimose. Context whitish in pileus and stipe, pure white in bulb. Smell absent. Taste indistinct. Lamellae moderately crowded, 2.0–6.5 mm broad, ventricose or not, emarginate, narrowly adnate to almost free, yellowish brownish; edge almost even to indistinctly fimbriate, whitish or concolorous. Stipe 30–43 × 4–4 mm, at base with rather conspicuous submarginate bulb (to 7 mm), pale brown to brownish orange.

Clamps present. Cheilocystidia 40–68 × 11–19 µm, fusiform to somewhat utriform, thick-walled, with up to 1.0–1.3 µm thick, colourless wall, somewhat crystalliferous at apex, frequent. Pleurocystidia similar to cheilocystidia, rather frequent. Basidiospores 6.0–8.5 × 4.0–5.0 µm, elliptic to amygdaliform, smooth, with obtuse apex. Spore-print umber-brown (Fig. 43).

SPECIMEN EXAMINED. Haeju town (46), park, pine forest, on ground, 5 July 1986, *leg. Z. Heinrich*, KRAM-F 28131.

DISTRIBUTION. Reported from Europe and North America.

NOTES. New to North Korea.

REFERENCES. Kuyper (1986: 186, Figs 158–159); J. E. Lange (1940: 101, Pl. 200E, as *Inocybe reducta*).

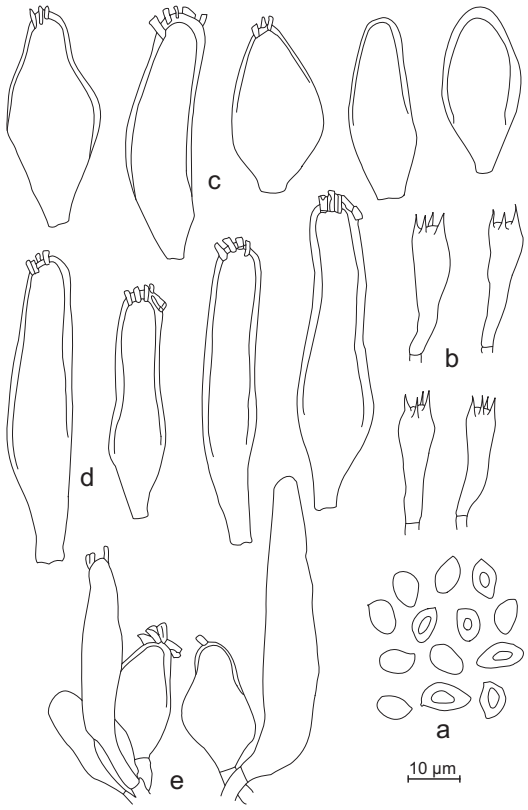


Fig. 43. *Inocybe albomarginata* Velen.: a – basidiospores, b – basidia, c – cheilocystidia, d – pleurocystidia, e – caulocystidia (KRAM-F 28131).

Inocybe assimilata (Britz.) Sacc.

Syll. Fung. 5: 789. 1887.

Agaricus (*Clypeus*) *assimilatus* Britz., Ber. Naturhist. Ver. Ausburg **26**: 137. Pl. 166., Fig. 12. 1881. – *Inocybe umbrina* Bres., Fungi Trid. **1**: 50, Pl. 35. 1884. For further synonyms see Kreisel (1987: 126) and Michael *et al*. (1985: 468).

Pileus 15–35 mm, conic when young, campanulate, convex, plano-convex to applanate, with distinct umbo, surface radially fibrillose, red- to umber-brown. Context whitish to light brownish, thin. Smell faint, not distinctive. Taste mild. Lamellae 5 mm broad, cream-beige when young, later grey- to red-brown, narrowly attached, edges white-ciliate. Stipe 20–50 × 3–5 mm, cylindric, with distinct, non-marginate, whitish bulb, surface

reddish-brown, smooth, apex paler, white fibrillose.

Pileipellis composed of periclinal hyphae 6–11 μm broad, yellow-brown and encrusted, hyaline hyphae 4–6 μm broad present above them. Clamps abundant. Cheilocystidia 35–60 × 10–20 μm, fusiform to lageniform, thick-walled (1 μm), encrusted at apex, clavate to pyriform, thin-walled cells, abundant. Pleurocystidia similar to cheilocystidia. Basidia 25–32 × 7–11 μm, clavate, with 4 sterigmata. Basidiospores 6.4–9.4 × 4.5–6.2 μm, yellow, elongate, with 7–9 indistinct, rounded warts. Spore-print grey-brown (Fig. 44).

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, taiga, on ground, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 32042.

DISTRIBUTION IN ASIA. Russia (Siberia and Kamchatka).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 86, Pl. 68); Bresadola (1930: Pl. 758, as *I. umbrina*); Heim (1931: 357, Fig. 204, Pl. 32, Fig. 3, as *I. umbrina*); J. E. Lange (1938: 86, Pl. 118G, as *I. umbrina*); Michael *et al*. (1985: 258, 468, Pl. 80); Moser *et al*. (1986**:** Pl. 20: 2, as *I. umbrina*); Peintner & Horak (2002: 223, Fig. 8); Stangl (1989: 246, Fig. 94, Pl. 27: 2).

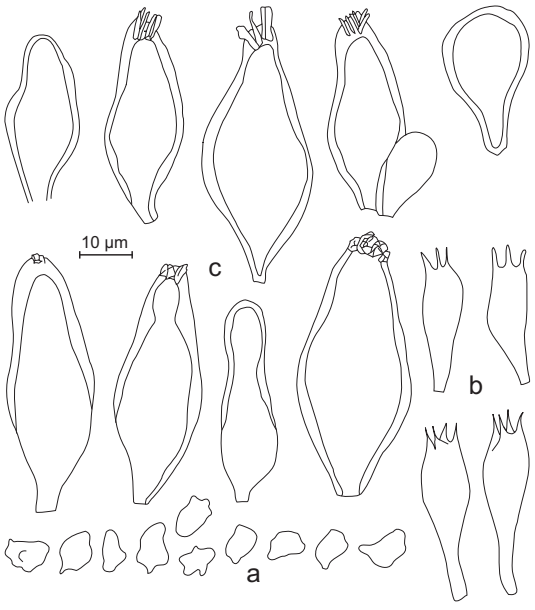


Fig. 44. *Inocybe assimilata* (Britz.) Sacc.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 32042).

Inocybe asterospora Quél.

Bull. Soc. Myc. Fr. **26**: 50. 1879.

Pileus 30–50 mm broad, conic when young, later campanulate to plane with distinct, obtuse umbo. Upper surface radially fibrillose to striate from separated fibrils, red-brown, umber or chestnut brown. Context whitish. Smell spermatic. Taste mild, not distinctive. Lamellae 4–6 mm broad, grey beige, grey-brown, red-brown, ascending, narrowly attached; edges white-flocculose. Stipe 60–70 × 3–8 mm, cylindric, pruinose, base with whitish marginate bulb, surface light brown to yellow-brown, reddish brown toward base.

Pileipellis of periclinal hyphae 4–8 μm broad, yellow-brown and lightly encrusted. Clamps abundant in all tissues. Cheilocystidia 35–70 × 14–23 μm, fusiform to ventricose, thick-walled, apically encrusted, a few pyriform cells present among them. Pleurocystidia similar to cheilocystidia. Stipitipellis a cutis of narrow, cylindric 4.7–7.7 μm wide hyphae. Caulocystidia similar to cheilocystidia. Basidia 30–35 × 10–14 μm, clavate, with 4 sterigmata. Basidiospores 9.0–12.0 × 7.3–11.2 μm, subglobose, with 9–11 prominent tubercules, yellow-brown. Spore-print reddish brown.

SPECIMEN EXAMINED. Shore of Soham-ho Lake (32), forest with *Pinus densiflora*, on ground, 17 July 1986, *leg. Z. Heinrich*, KRAM-F 27981.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Japan, Kazakhstan and Russia (e.g. Primorski Krai and Siberia).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 86, Pl. 69); Bresadola (1930: Pl. 766: 2); Heim (1931: 372, Fig. 212, Pl. 34: 1); Imazeki & Hongo (1975, **1**: 67, Pl. 29: 165); Konrad & Maublanc (1926: Pl. 105); J. E. Lange (1938: 84, Pl. 117G); Melik-Khachatrian (1980: 369); Michael *et al*. (1985: 256, Pl. 75); Stangl (1989:248, Fig. 95, Pl. 37: 2); Syarzhanina (1994: 356); Teng (1996: 474); Vasilyeva (1973: 219; 1978: 162, Pl. 149).

Inocybe calida Velen.

České Houby. 366. 1920.

Inocybe brunneorufa Stangl & Veselský, Česká Mykol. **25**: 5, Pl. 79: 3. 1971.

Pileus 15–30 mm broad, conic, later campanualate to plane with papilliform umbo, light umber-brown to dark red-brown, umbo sometimes whitish pruinose. Context whitish, thin. Smell faint. Taste mild. Lamellae 3 mm broad, whitish, later grey-brown, adnate-emarginate, edges white-ciliate. Stipe 20–35 × 2–4 mm, cylindric, base with small marginate bulb, whitish to pale warm ochre, white pruinose over the entire length.

Pileipellis composed of periclinal hyphae 10–17 μm broad, encrusted. Clamps present. Cheilocystidia 49–70 × 15–23(–25) μm, thick-walled (3.5–4.5 μm) with apical crystals. Pleurocystidia similar to cheilocystidia, rather frequent. Stipitipellis of narrow, cylindric, 3–7 μm wide hyphae. Basidia 26.0–35.0 × 9.0–10.2 μm, clavate, with 4 sterigmata. Basidiospores 8.4–10.7 × 6.5–8.2 μm, elongate, with 8–12 tubercules, yellow-brown. Spore-print umber-brown (Fig. 45).

SPECIMEN EXAMINED. Myohyang-san Mts: near Pohyon Temple (16), on ground, among grass, 11 July 1986, *leg. H. Komorowska*, KRAM-F 28468.

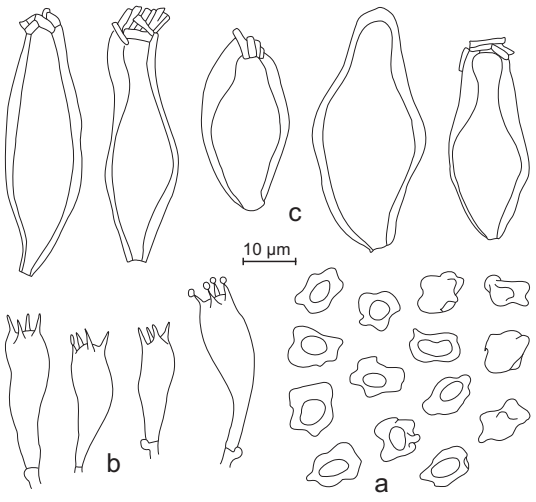


Fig. 45. *Inocybe calida* Velen.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28468).

DISTRIBUTION IN ASIA. Russia (e.g. Kamchatka).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 88, Pl. 71); Kuyper (1985: 379, Fig. 8); Nespiak (1990: 134, Fig. 58, Pl. VG); Peintner & Horak (2002: 230, Fig. 13); Stangl (1989: 254, Fig. 98, Pl. 36: 4).

Inocybe calospora Quél.

in Bres., Fungi Trid. **1**: 19. 1881. For further synonyms see Stangl (1989: 257) and Vauras (1989: 79).

Pileus 15–25 mm broad, conic to acutely umbonate, surface fibrillose, minutely scaly from the centre outward, light umber to reddish brown, margin incurved. Context thin, whitish. Smell spermatic. Taste mild. Lamellae broad, narrowly adnate, whitish, later light brown, edges white-ciliate. Stipe 30.0–40.0 × 1.5–3.0 mm, cylindric, surface grey to reddish brown, whitish, fibrillose.

Pileipellis composed of periclinal hyphae 5–11 μm broad, yellow and encrusted. Clamps present. Cheilocystidia 38–55 × 10–15 μm, cylindric, fusiform to lageniform, thick-walled (wall to 2.5 μm thick), with apical crystals. Pleurocystidia similar to cheilocystidia. Basidia 27–41 × 10–12 μm, cylindric to ventricose, with 4(-2) sterigmata. Basidiospores 7.0–11.5 × 6.0–9.2 μm (excluding spines), subglobose, with obtuse spines (up to 30), yellow-brown. Spore-print red-brown (Fig. 46).

SPECIMEN EXAMINED. Wonsan town (50), Botanical Garden, on ground, 22 July 1986, *leg. W. Wojewoda*, KRAM-F 32041.

DISTRIBUTION IN ASIA. China, India (Himalayas), Japan, Korea and Russia (e.g. Siberia, Kamchatka and Primorski Krai).

NOTES. New to North Korea. This species is known from the Northern Hemisphere: Europe, Asia and North America (Canada, United States and Greenland).

REFERENCES. Azbukina *et al*. (1984: 55); Breitenbach & Kränzlin (2000: 88, Pl. 72); Imazeki & Hongo (1975, **1**; 68, Pl. 29: 170); Jülich (1982: 456, Pl. 8a); Nespiak (1990: 121–130, Fig. 51A); Park *et al*. (1987: 73, Pl. 1: 3, Pl. 3: 1); Peintner & Horak (2002: 232, Fig. 14); Stangl (1989: 257, Fig. 99, Pl. 31: 1); Syarzhanina

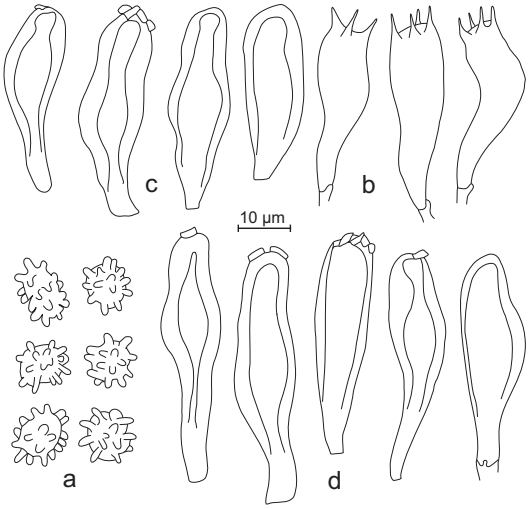


Fig. 46. *Inocybe calospora* Quél.: a – basidipospores, b – basidia, c – cheilocystidia, d – pleurocystidia (KRAM-F 32041).

(1994: 356); Teng (1996: 474); Vasilyeva (1973: 220, Fig. 51A); Vauras (1989: 79, Figs 1–5); Ying *et al*. (1983: 151, 154, Pl. 25: 3–4).

Inocybe flavella P. Karst.

Meddn. Soc. Fauna Fl. Fenn. **16:** 100. 1890.

I. fulvoumbrina Bres., *in* Sacc., Fl. Ital. Crypt. **1**: 728. 1916. – *I. xanthocephala* P. D. Orton, Trans. Brit. Mycol. Soc. **43**: 277. 1960.

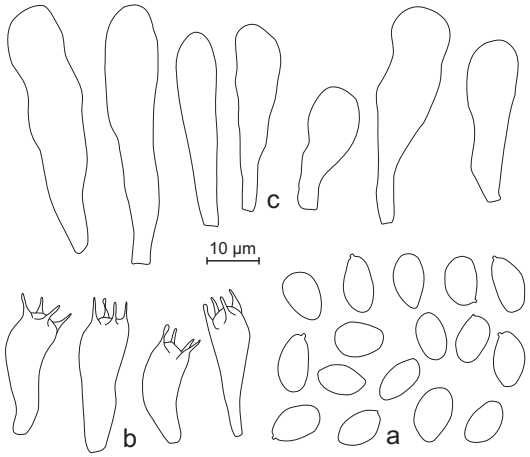


Fig. 47. *Inocybe flavella* P. Karst.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 27906).

Pileus 25–60 mm, conic to plano-convex with indistinct to prominent umbo, pale ochraceous to ochraceous yellow, sericeous-smooth around disc, outwards indistinctly fibrillose. Context whitish. Smell and taste indistinct. Lamellae narrowly adnate to emarginate, greyish yellow, edges paler to whitish. Stipe 40–90 × 4–5 mm, equal to clavate, whitish to pale yellowish.

Pileipellis a rather undifferentiated cutis, composed of periclinal hyphae 10–14 µm broad, lightly encrusted. Clamps present. Cheilocystidia 27–65 × 8–13 µm, cylindric, thin-walled, colourless. Pleurocystidia absent. Basidia 27–40 × 9–12 µm, with 4 sterigmata. Basidospores 8.5–12.0 × 4.5–6.0 µm, smooth, elliptic to subphaseoliform. Spore-print ochre-brown (Figs 47 & 48).

SPECIMENS EXAMINED. Ryongak-san Mt. (42), mixed forest, on ground, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27906, 32044.

DISTRIBUTION. Europe (Finland, France, Italy).

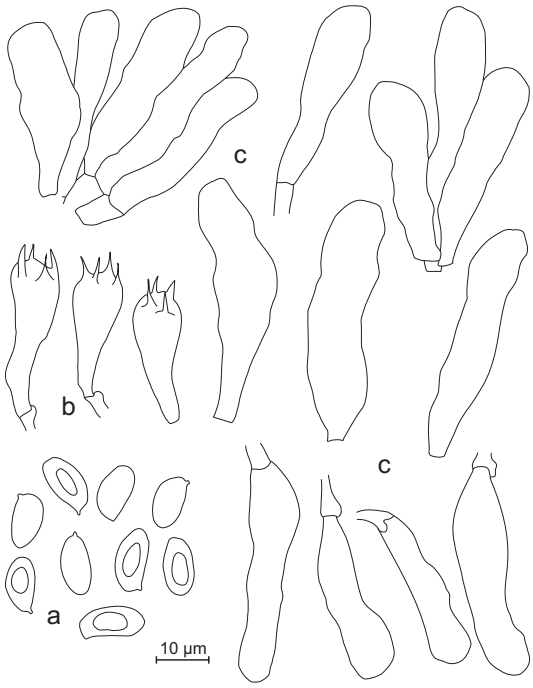


Fig. 48. *Inocybe flavella* P. Karst.: a – basidiospores, b – basidia, c - cheilocystidia (KRAM-F 32044).

NOTES. New to North Korea.

REFERENCES. Kuyper (1986: 53, Figs 19–20, 23); Stangl (1989: 68, Fig. 17, Pl. 7: 3).

Inocybe fuscomarginata Kühner

Bull. Soc. Mycol. Fr. **71**(3): 169. 1955.

I. fuscomarginata Kühner, Fl. Anal. Champ. Sup. 217. 1953 (*nom. nud.*). – *I. relicina* (Fr.) ss. Heim, Genre *Inocybe*. 154, Pl. 4. 1931.

Pileus 10–25 mm, hemispherical, later convex to plane, hygrophanous, dark red-brown when moist, yellow ochre with brown squamules when dry, margin incurved, slightly dentate and with remnants of velum. Context thin, cream to watery grey-brown. Smell and taste indistinct. Lamellae broad, narrowly attached, grey-brown, later dark olivaceous brown, edges denticulate, concolorous. Stipe 15–25 × 2–3 mm, cylindric, with faint annular zone, whitish above annular zone, brownish below, later entirely olive- to ochre-brown, longitudinally fibrillose to fibrillose-scaly.

Pileipellis composed of periclinal hyphae 9–15 μm broad, yellow-brown and slightly encrusted. Clamps present. Cheilocystidia 20–40 × 17–35 μm, vesicular to pyriform. Pleurocystidia absent. Basidia 26–35 × 8–10 μm, clavate, with 4(2) sterigmata. Basidiospores 9.5–12.6 × 5.2–7.2 μm, oval to broadly elliptic, smooth, yellow-brown, thick-walled. Spore-print red-brown (Fig. 49).

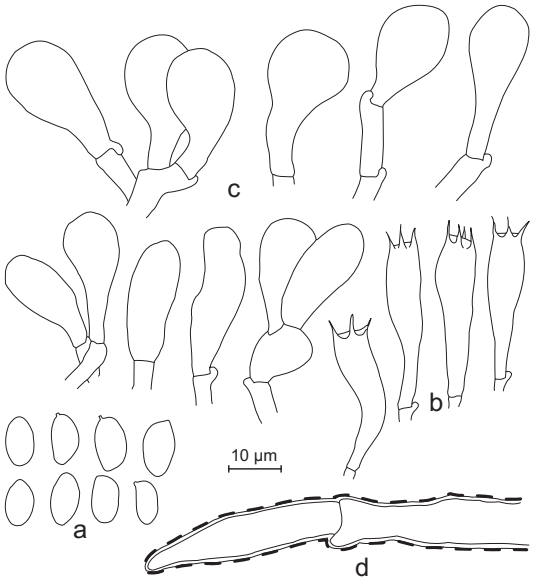


Fig. 49. *Inocybe fuscomarginata* Kühner: a – basidiospores, b – basidia, c – cheilocystidia, d – incrusted hyphae of pileipellis (KRAM-F 28133).

SPECIMEN EXAMINED. Suian-san Mts (48), mixed forest with *Pinus densiflora* and *Quercus* sp., on ground, 5 July 1986, *leg. Z. Heinrich*, KRAM-F 28133.

DISTRIBUTION. Europe (e.g. France, Germany and Switzerland).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (2000: 54, Pl. 20); Heim (1931: 154, Figs 115–117, Pl. 4, as *I. relicina*); Kühner & Romagnesi (1953: 217, Fig. 325); Michael *et al*. (1985: 224, Pl. 38); Stangl (1989: 38, Fig. 2, Pl. 2: 4).

Inocybe lacera (Fr.: Fr.) P. Kumm.

Führ. Pilzk. 79. 1871.

Agaricus lacerus Fr., Observ. Mycol. **2**: 41. 1818. – *A. lacerus* Fr.: Fr., Syst. Mycol. **1**: 257. 1821. For further synonyms see Kuyper (1986: 98).

Pileus 10–40 mm, campanulate-convex, conico-convex to plano-convex with obtuse umbo, dark brown around centre, paler (ochraceous brown) toward margin, surface radially fibrillose to tomentose with appressed fibrillose squamules. Context whitish in pileus, reddish brown to dark brown in stipe. Smell indistinct to faintly spermatic. Taste indistinct. Lamellae 2–7 mm broad, broadly to narrowly adnate, light brown, ochraceous brown to dark olivaceous brown, edges paler or concolorous, slightly ciliate. Stipe 20–70 × 2–5 mm, equal with slightly thickened base, light ochre-brown, later dark brown to blackish brown at base, white-fibrillose.

Pileipellis composed of short hyphae 9–15 μm broad, brown and encrusted. Clamps present. Cheilocystidia 45–70 × 12–21 μm, fusiform to subutriform, thick-walled, colourless, apically indistinctly encrusted. Pleurocystidia similar to cheilocystidia. Basidia 24–33 × 9–11 μm, clavate, with 4 sterigmata. Basidiospores 10.3–15.9 × 4.7–

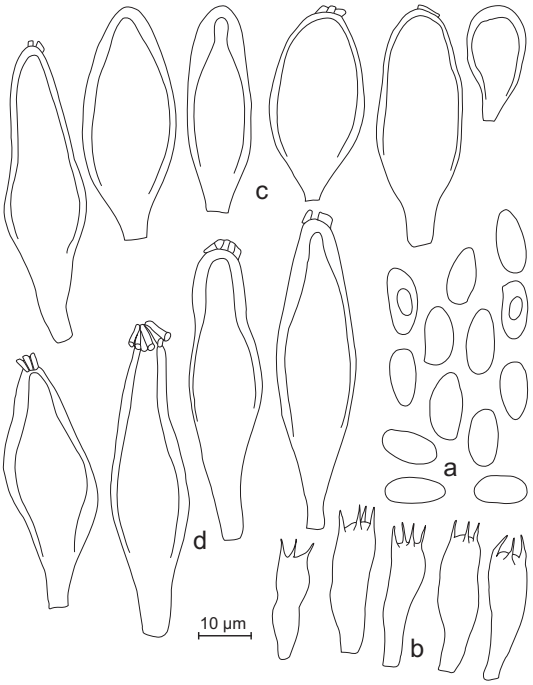


Fig. 50. *Inocybe lacera* (Fr.: Fr.) P. Kumm.: a – basidiospores, b – basidia, c – cheilocystidia, d – pleurocystidia (KRAM-F 32036).

7.0 µm, cylindric to elliptic, smooth, yellow-brown, thick-walled. Spore-print umber-brown (Fig. 50).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, taiga with *Larix olgensis*, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 32043; Kumgang-san Mts: near Samil-po Lake (62), mixed forest, alt. *ca* 50 m, 19 July 1986, *leg. W. Wojewoda*, KRAM-F 32036. – On ground.

DISTRIBUTION IN ASIA. Armenia, Georgia, Japan and Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 55); Breitenbach & Kränzlin (2000: 62, Pl. 33); Bresadola (1930: Pl. 731); Imazeki & Hongo (1975, **1**: 66, Pl. 29: 162); Kuyper (1986: 98, Figs 62–65); J. E. Lange (1938: 78, Pl. 110D, D1); Melik-Khachatrian (1980: 377); Michael *et al*. (1985: 248, Pl. 65); Moser *et al*. (1986: Pl. 18: 2); Nespiak (1990: 56, Fig. 22); Stangl (1989: 158, Fig. 57, Pl. 12: 1); Syarzhanina (1994: 348); Vasilyeva (1973: 217).

Rozites caperatus (Pers.: Fr.) P. Karst.

Ryssl., Finl. Skand. Halföns Hattsvamp. **1**: 290. 1879.

Agaricus caperatus Pers., Observ. Mycol. 1: 48. 1796. – *A. caperatus* Pers.: Fr., Syst. Mycol. **1**: 241. 1821. – *Pholiota caperata* (Pers.: Fr.) Gillet, Champ. Fr. 435, Pl. 290. 1876.

Pileus 50–120 mm, hemispherical, later convex to conico-convex, then expanded with broad obtuse umbo, light ochre to ochre, sienna or cinnamon in centre, margin upturned or wavy-lobed. Context whitish, deep cream under pileus cuticle. Smell faintly pleasant. Taste mild, not distinctive. Lamellae crowded, broad, whitish to cream, later fulvous buff, adnate-emarginate, often with tooth, edges somewhat paler, minutely crenate, then even and concolorous. Stipe 70–100 × 10–20 mm, cylindric, whitish, then pale cream or buff when old, surface fibrillose-scaly to silky-fibrillose, ring membranaceous, pendulous, white then tinged creamy buff or buff.

Pileipellis composed of filamentous hyphae 3–9 µm broad, hyaline to light yellow with smooth walls. Subcutis composed of yellow, subglobose, encrusted hyphae. Clamps present. Cheilo- and pleurocystidia absent, or the former replaced by undifferentiated cylindric to clavate cells 25–45 × 6–10 µm. Basidia 30–45 × 10–12 µm, clavate, with 4 sterigmata. Basidiospores 10.3–13.8 × 7.3–8.6 µm, elliptic to sublimoniform, moderately verrucose, light ochre-yellow. Spore-print deep fulvous.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 10 km S of Samji-yon town (8), taiga, on ground, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 50396.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Japan, Kazakhstan, Korea and Russia (e.g. Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 121); Azbukina *et al*. (1984: 56); Breitenbach & Kränzlin (2000: 296, Pl. 383); Dähncke & Dähncke (1980: 471); Horak (1968: 550, Fig. p. 551; 1981: 98, Fig. 1: 1); Imazeki & Hongo (1975, **1**: 69, Pl. 30: 172); Konrad & Maublanc (1928: Pl. 65); J. E. Lange (1938: 54, Pl. 104F); Melik-Khachatrian (1980: 391); Michael *et al*. (1983a: 202, Pl. 47); Syarzhanina (1994: 424); Teng (1996: 466); Vasilyeva (1973: 228, Fig. 54; 1978: Pl. 135).

Entolomataceae Kotl. & Pouzar 1972

Clitopilus rhodophyllus (Bres.) Singer

Ann. Mycol. **41**: 1–189. 1943.

Pleurotus rhodophyllus Bres., Ann. Mycol. **3**: 159. 1905.

Basidiocarp pileate, subsessile. Pileus up to 30 mm broad. Upper surface floccose-fibrillose, becoming glabrous, saffron-pink to orange-pink. Margin involute. Flesh white, soft. Smell absent. Hymenophore lamellate. Lamellae 2.0–2.5 mm broad, pink. Stipe absent or very short.

Hyphae up to 7.7 μm wide, smooth, thin-walled, without clamps. Cystidia absent. Basidia 15.0–20.0 × 5.0–6.6 μm, cylindric-clavate, without basal clamp. Basidiospores (5.8–)6.7–9.7(–10.6) × 3.8–4.8(–5.8) μm, elliptic, longitudinally striate, distinctly angled in end view.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, in mixed forest, on rotten stump, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 53228.

DISTRIBUTION IN ASIA. China.

NOTES. New to North Korea.

REFERENCES. Bresadola (1928: Pl. 295: 1); Kühner & Romagnesi (1953: 174); Moser (1983: 191); Pilát (1935: 47, Figs 72–73); Teng (1996: 431).

Entoloma byssisedum (Pers.: Fr.) Donk

Bull. Bot. Gard. Buitenzorg, Ser. III, **18**: 158. 1949.

Agaricus byssisedus Pers., Ic. Descr. Fung. **2**: 56. 1800. – *Agaricus byssisedus* Pers.: Fr., Syst. Mycol. **1**: 276. 1821. – *Claudopus byssisedus* (Pers.: Fr.) Gillet, Hyménomycètes. 427. 1876. – *Rhodophyllus byssisedus* (Pers.: Fr.) Quél., Enchir. Fung. 65. 1886.

Pileus 5–10 mm, plano-convex to applanate, sometimes concave to infundibuliform, cylindric to reniform, with undulating, slightly involute margin, not hygrophanous, pale grey or brown, radially fibrillose, sometimes zonate. Context thin, pale grey-brown. Smell farinaceous. Taste farinaceous rancid. Lamellae thin, distant, adnate to decurrent, pale grey to pinkish brown, edge concolorous, entire or eroded. Stipe 2–5 × 1–2 mm, excentric, lateral, pale grey brown, pruinose to silky striate.

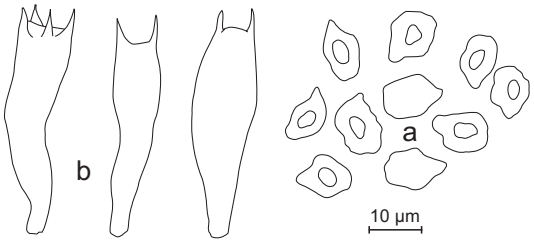


Fig. 51. *Entoloma byssisedum* (Pers.: Fr.) Donk: a – basidiospores, b – basidia (KRAM-F 50401).

Pileipellis a cutis of radially arranged hyphae. Clamps present. Cheilocystidia absent. Basidia 20–32 × 8–10 μm, with 4 sterigmata. Basidiospores 9.5–12.0 × 6.0–7.5 μm, irregularly nodulose-angular. Spore-print pink-brown (Fig. 51).

SPECIMEN EXAMINED. Kumgang-san Mts: near Onjong-ri village (60), mixed forest, on ground and on rotten wood, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 50401.

DISTRIBUTION IN ASIA. Russia (e.g. West Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 58, Pl. 13); J. E. Lange (1936: 105, Pl. 80C); Mukhin (1993: Tab. 1); Noordeloos (1988: 172, Fig. 19; 1992: 605, Fig. 274, Pl. 71b); Ryman & Holmåsen (1984: 386); Vasilyeva (1973: 264).

Entoloma hebes (Romagn.) Timbach

Doc. mycol. **11**(44): 6. 1981.

Rhodophyllus hebes Romagn., Rev. Mycol. **19**: 4. 1954. – *R. mammosus* var. *absoletus* Romagn., Rev. Mycol. **19**: 7. 1954. – *Nolanea tenuipes* P. D. Orton, Trans. Br. Mycol. Soc. **43**: 334. 1960. – *Entoloma leptopus* Noordel., Persoonia **10**: 442. 1980.

Pileus 8–30 mm, conic-campanulate then convex-campanulate to plane, usually with papilla. Upper surface smoth, yellow-brown to reddish brown. Margin paler, faintly translucent-striate. Context thin, membranaceous, whitish, brown under cuticle. Smell rancid-farinaceous or absent. Taste rancid, rarely indistinct. Lamellae broad, al-

most free or adnate-emarginate, whitish, then pink to brownish pink, edge concolorous. Stipe 30–60 × 1–2 mm, cylindric, smooth, apex pale brown, dark brown toward base.

Pileipellis a cutis composed of cylindric, 2.5–8.0 µm wide hyphae. Clamps abundant in hymenium, rare or lacking in other tissues. Cheilocystidia 18–40 × 4–9 µm, cylindric and capitate to clavate. Pleurocystidia absent. Basidia 25.0–36.0 × 8.0–12.5 µm, cylindric, with 4 sterigmata. Basidiospores 8.0–12.0 × 6.0–7.5 µm, 6–8-angled. Spore-print brown-pink.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake, near Samji-yon Hotel (7), taiga with *Larix olgensis*, on ground, 28 June 1986, *leg. Z. Heinrich*, KRAM-F 27890.

DISTRIBUTION IN ASIA. China, Japan and Russia (e.g. Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 74, fig. 37); Dähncke & Dähncke (1980: 261); Imazeki & Hongo (1975, **1**: 78, pl. 34, fig. 198); Noordeloos (1980: 442, Figs 3a–f; 1988: 119, Fig. 91); Syarzhanina (1994: 216).

Entoloma hirtipes (Schum.: Fr.) M. Moser

in Gams, Röhrlinge-Blätterpilze, 4 Aufl., **2**(b/2): 206. 1978.

Agaricus hirtipes Schum., Enum. Plant. **2**: 272. 1803. – *A. hirtipes* Schum.: Fr., Syst. Mycol. **1**: 206. 1821. – *Nolanea hirtipes* (Schum.: Fr.) P. Kumm., Führ. Pilzk. 95. 1871. – *Rhodophyllus hirtipes* (Schum.: Fr.) Quél., Enchir. Fung. 64. 1886.

Pileus 40–55 mm, conic, conico-convex to campanulate, hygrophanous, reddish brown, margin slightly translucently striate, pale. Context thin, grey brown. Smell farinaceous. Taste farinaceous rancid. Lamellae moderately distant, broadly ventricose (6 mm broad), pale, then dark brown-pink, edges concolorous, eroded. Stipe 70–120 × 3–6 mm, cylindric, enlarged towards base, grey-brown to sepia, whitish-fibrillose, apex paler, pruinose, base white, tomentose.

Pileipellis a cutis of cylindric, encrusted hyphae and with intercellular pigment. Clamps present in hymenium. Cheilocystidia 30–60 × 6–14 µm, cylindric with rounded to subcapitate apex. Pleurocystidia absent. Basidia 25–45 × 9–12 µm, with 4 sterigmata. Basidiospores 10.3–13.3 × 8.1–9.4 µm, angled. Spore-print yellowish brown.

SPECIMEN EXAMINED. Paekdu-san Mts: Mubong (3), alt. *ca* 1900 m, taiga with *Larix olgensis*, on ground, 30 June 1986, *leg. Z. Heinrich*, KRAM-F 28088.

DISTRIBUTION IN ASIA. Japan and Russia (Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 74, Pl. 39); Imazeki & Hongo (1975, **1**: 78, Pl. 34: 199); Konrad & Maublanc (1930: 177); J. E. Lange (1936: 101, Pl. 78G); Noordeloos (1988: 118, Fig. 89; 1992: 220, Fig. 97, Pl. 25); Vasilyeva (1973: 260).

Hydnangiaceae Gäum. & C. W. Dodge 1928

Laccaria laccata (Scop.: Fr.) Cooke

Grevillea **12**: 70. 1888

Agaricus laccatus Scop., Fl. Carniol. **2**: 444. 1772. – *A. laccatus* Scop.: Fr., Syst. Mycol. **1**: 106. 1821.

– var. ***pallidifolia*** (Peck) Peck

Ann. Rep. N. Y. St. Bot. **157**: 92. 1912.

Clitocybe laccata var. *pallidifolia* Peck, Ann. Rep. N. Y. St. Bot. **43**: 274. 1890. – *Laccaria laccata* var. *anglica* Singer, Bull. Soc. Mycol. Fr. **83**: 110. 1967. – *Laccaria affinis* var. *anglica* (Singer) M. Bon, Doc. Mycol. **13**(51): 50. 1983. For further synonyms see Mueller (1992: 35).

Basidiocarps gregarious or caespitose. Pileus 15–45 mm across, convex or plane with central depression; orange-brown or very pale buff, glabrous or fibrillose-scaly to squamulose at centre, hygrophanous, margin usually striate, undulate, sometimes eroded. Flesh thin, concolorous with pileus. Lamellae variously broad, adnate or arcuate, pinkish flesh color. Stipe 35–50(–95) × 2–4(–5) mm, equal, occasionally widened at base; dry fibrillose, longitudinally striate or not. Basal mycelium ± copious, always white.

Hyphae of cortical layer of pileus interwoven with scattered perpendicular fascicles (composed of 4–12, or more hyphae); fascicular hyphae

60–100 × 3–10 μm; walls light yellowish brown. Hyphae of cortical layer of stipe cylindric 6–8 μm broad with intracellular and slightly encrusting pigment. Cheilocystidia 25.0–55.0 × 2.0–6.8 μm, filamentous to subclavate, thin-walled. Basidia 28.0–50.0 × 7.2–12.8 μm, clavate, with 4 sterigmata. Basidiospores up to 10 μm in diam., (excluding ornamentation), globose to subglobose, hyaline, echinulate. Echinulae 1–2 μm long.

SPECIMENS EXAMINED. Peakdu-san Mts: between Mubong (3) and Taehong-dan (6), taiga, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52709; near Taehong-dan (6), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28641; *ca* 28 km NE of Samji-yon town (8), taiga with *Larix* and *Picea*, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28604; Wonsan town (50), Botanical Garden, under *Quercus*, 20 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52697; Kumgang-san Mts: near Onjong-ri village (60), mixed forest, 18 July 1986, *leg. H. Komorowska*, KRAM-F 28341; near tomb of King Kongmin (64), 26 July 1986, *leg. W. Wojewoda*, KRAM-F 52710. – On ground.

DISTRIBUTION IN ASIA. Japan.

NOTES. Variety new to North Korea. Known also from Europe and North America: Canada and United States.

REFERENCES. Breitenbach & Kränzlin (1991: 204, Pl. 232); Mueller (1992: 35, 146, Figs 12–14, 54d–f, 68c); Vellinga (1995a: 97, Fig. 91).

Laccaria ohiensis (Mont.) Singer

Mycologia **38**: 688. 1946.

Agaricus ohiensis Mont., Syll. Crypt. 100. 1856. – *Clitocybe ohiensis* (Mont.) Sacc., Syll. Fung. **5**: 181. 1887. – *C. tortilis* var. *gracilis* Peck, Annual Rep. New York State Bot. **67**: 36. 1903. – *Laccaria tetraspora* Singer, Mycologia **38**: 689. 1946. For further synonyms see Mueller (1992: 48).

Basidiocarps scattered to gregarious. Pileus 7–22 mm across, convex to plane, with central depression, plicate-striate to translucent-striate, reddish brown to orange-brown; glabrous to finely fibrillose, hygrophanous. Margin decurved to plane, entire to undulate. Flesh thin, concolorous with pileus. Lamellae adnaxed to adnate, up to 3 mm broad; pinkish flesh color. Stipe 15–35 × 1–3 mm, equal, or slightly bulbous; concolorous with pileus, dry, glabrous to finely fibrillose. Base with white mycelium.

Hyphae of cortical layer of pileus interwoven with perpendicular scattered fascicles, composed of more than ten hyphae, walls light yellowish brown. Cheilocystidia 20.0–55.0 × 3.0–5.5 μm, filamentous to subcapitate, hyaline, thin-walled. Basidia 30–50 × 8–12 μm, with 4 sterigmata. Basidiospores 8.1 × 9.4 μm (excluding ornamentation), globose, hyaline-echinulate. Echinulae 1.5–2.8 μm long.

SPECIMENS EXAMINED. Myohyang-san Mts: Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52705; 13 July 1986, *leg. H. Komorowska*, KRAM-F 28507; Manpok Valley, near Kuchung Falls (26), alt. *ca* 850 m, mixed forest, 14 July 1986, *leg. H. Komorowska*, KRAM-F 52701; between Isonnam Falls (29) and Habiro Temple (27), alt. *ca* 200 m, 13 July 1986, *leg. H. Komorowska*, KRAM-F 28489; *leg. W. Wojewoda*, KRAM-F 52704; shore of Taesong-ho Lake (43), deciduous forest with *Alnus japonica* and *Populus davidiana*, 23 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52698; Sokdamgukok village (47), mixed forest, 7 July 1986, *leg. H. Komorowska*, KRAM-F 52700; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, 25 Aug.1983, *leg. W. Wojewoda*, KRAM-F 52708; mixed thicket with *Corylus heterophylla*, *Pinus densiflora* and *Quercus* sp., 5 July 1986, *leg. H. Komorowska*, KRAM-F 52699, 52707; *leg. W. Wojewoda*, KRAM-F 52703; Wonsan town (50), Botanical Garden, 22 July 1986, *leg. H. Komorowska*, KRAM-F 28570; Kumgang-san Mts: Okryu-dong Valley below Kuryong Falls (59), alt. *ca* 300 m, 5 July 1985, *leg. B. Zarzycka*, KRAM-F 27810; Kuryong Falls (59), 20 July 1986, *leg. H. Komorowska*, KRAM-F 28371, 28372; near Onjong-ri village (60), alt. *ca* 100 m, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 52702; near Onjong-ri Hotel, pine forest, 21 July 1986, *leg. H. Komorowska*, KRAM-F 28388, 28391; *leg. Z. Heinrich*, KRAM-F 28044; shore of Samil-po Lake (62), mixed forest, 19 July 1986, *leg. H. Komorowska*, KRAM-F 28354, 28358; *leg. Z. Heinrich*, KRAM-F 28013; Kaesong town (63): near Kaesong Hotel, park with *Pinus densiflora*, 21 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52706. – On ground.

DISTRIBUTION. Known from Europe (e.g. France, Scotland), South America (Argentina, Chile), and North America (United States).

NOTES. New to North Korea.

REFERENCES. Mueller (1992: 48, 151, Figs 25, 26, 55a, 68b).

Laccaria trichodermofora G. M. Muell.

Mycotaxon **20**: 112–114. 1984.

Misapplied name: *Laccaria farinacea* ss. Singer, non Hudson, Sydowia Beih. **7**: 8. 1973.

Basidiocarps scattered to gregarious. Pileus 12–25 mm across, plano-convex with slight central depression; reddish brown, fading light brown to buff colour, fibrillose to scaly, hygrophanous. Margin nonstriate, incurved. Flesh thin, pinkish. Stipe 15–40 × 2–5 mm, equal, dry, fibrillose, longitudinally striate, concolorous with pileus. Lamellae broad, adnate, flesh color. Basal mycelium violet, fading to white.

Hyphae of cortical layer of pileus ± perpendicular, composed of very numerous, large fascicles often forming a trichodermium; walls up to 0.5 µm thick, light yellowish brown. Cheilocystidia 18.0–60.0 × 3.0–6.8 µm, filamentous, occasionally subclavate. Basidia 24–50 × 7–12 µm, clavate, hyaline, with 4 sterigmata. Basidiospores 6.8–7.8 × 6.0–8.0 (excluding ornamentation) subglobose, hyaline, echinulate. Echinulae up to 2 µm.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samij-yon Lake (7), taiga with *Larix olgensis*, 28 June 1986, *leg. H. Komorowska*, KRAM-F 28678; Myohyang-san Mts: Manpok Valley, near Kuchung Falls (26), alt. *ca* 850 m, mixed forest, 14 July 1986, *leg. H. Komorowska*, KRAM-F 28534, 28537. – On ground.

DISTRIBUTION. Known from Europe (Italy) and North America (Canada, United States).

NOTES. New to North Korea.

REFERENCES. Cacialli *et al*. (1996: 38); Mueller (1992: 55, 130, Figs 30–32, 56c,72c).

Lycoperdaceae Chevall. 1826

Bovista aestivalis (Bonord.) Demoulin

Beih. zur Sydowia, Ann. Mycol, Ser. II, **8**: 143. 1979.

B. polymorpha (Vittad.) Kreisel., Feddes Repert. **69**: 201. 1964. – *Lycoperdon aestivale* Bonord., Handb. Allg. Mykol. 251. 1851. – *L. polymorphum* Vittad., Monogr. Lycoperdin. **39**: 183, Pl. 2, Fig. 8. 1842.

Basidiocarp 1–3 cm in diam., globose to pyriform. Exoperidium furfuraceous. Endoperidium yellowish to greyish brown, at base sometimes with orange-red flush. Sterile subgleba rather conspicuous, compact, of minute cells. Young gleba clay-color, snuff brown with age.

Hyphae of exoperidium 2.5–7.8 µm in diam., cylindric, without clamps. Outer layer of exoperidium without vesicular cells. Threads of capillitium 2.5–4.5 µm wide, olive to umber, branched, with minute pits and with septa. Basidiospores 3.6–4.8 µm, globose, smooth, punctate to finely verrucose, with very short (0.6–2.0 µm long) pedicels, olivaceous brown, some with oil-drops (Fig. 52).

SPECIMENS EXAMINED. Paekdu-san Mts: upper forest line below Paekdu-san Mt. peak (1), alt. *ca* 2000 m, at road, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29237; near Mupo (3), *ca* 15 km NE of Samji-yon, alt. *ca* 1500 m, taiga with *Larix olgensis*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27853; near upper forest line, *ca* 20 km NW of Samji-yon town (8), alt. *ca* 1900 m, taiga with *Larix olgensis* (loose forest), 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27855; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, at forest road, 25 Aug.

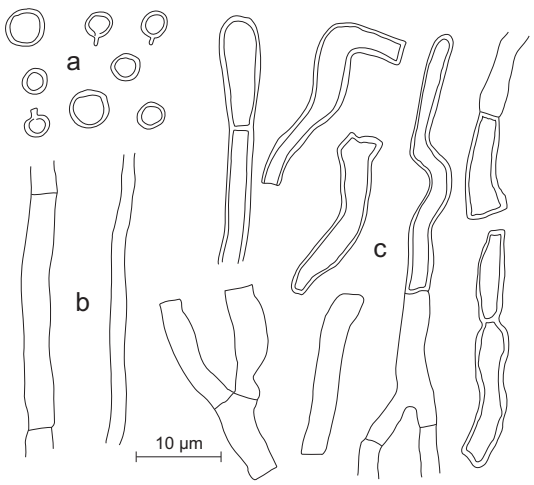


Fig. 52. *Bovista aestivalis* (Bonord.) Demoulin: a – basidiospores, b – hyphae of endoperidium, c – hyphae of exoperidium (KRAM-F 27853).

1983, *leg. W. Wojewoda*, KRAM-F 27852; Pagyon Ravine (65), on rocks, 26 July 1986, *leg. H. Komorowska*, KRAM-F 28261. – On ground.

DISTRIBUTION IN ASIA. China, Pakistan and Russia (Far East).

NOTES. New to North Korea.

REFERENCES. Eckblad & Ellingsen (1984: 32, Figs 1D, 2E); Hansen & Knudsen (1997: 333, Fig. 747); Kreisel (1967: 108, Figs 2a, 5, 18c–d, 27b); Teng (1996: 502).

Bovista dermoxantha (Vittad.) De Toni

in Sacc., Syll. Fung. **7**: 100. 1888.

B. pusilla (Batsch): Pers., Syn. Meth. Fung. 138. 1801. – *Lycoperdon dermoxanthum* Vittad., Monogr. Lycoperd. 178. 1832. – *L. pusillum* Batsch, Elench. Fung., Cont. **2**: 124., Pl. 41, Fig. 228. 1789.

Basidiocarp 10–20 mm in diam., subglobose to globose, without sterile base, attached to substrate by cord-like rhizomorphs. Young basidiocarp white, then clay-color to tawny olive, Exoperidium granulose to furfuraceous, consisting of minute adpressed-fugacious granules. Endoperidium thin, smooth, with a small apical pore at maturity. Gleba honey-yellow to tawny olive.

Hyphae of exoperidium 12.0–48.0 × 8.4–36.0 μm, cylindric and vesicular. Threads of capillitium 2–5 μm wide, branched, fragile, with septa. Basidiospores 2.5–4.8 μm in diam., globose, at first nearly smooth then finely verruculose, with very short pedicels (to 2 μm) or without pedicels (Fig. 53).

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 10 km N of Samji-yon town (8), taiga with *Larix* and *Picea*, at forest road, 29 June 1986, *leg. Z. Heinrich*, KRAM-F 28068; shore of Soham-ho Lake (32), mixed young forest, 17 July 1986, *leg. Z. Heinrich* and *W. Wojewoda*, KRAM-F 27979; Suian-san Mts, (48), alt. *ca* 200 m, mixed forest, at forest road, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27851; 6 July 1986, *leg. W. Wojewoda*, KRAM-F 30623. – On ground.

DISTRIBUTION IN ASIA. Caucasus, China, India, Kazakhstan, Kirghizia, Russia (e.g. Siberia and Far East), Sri Lanka and Uzbekistan.

NOTES. New to North Korea.

REFERENCES. Bottomley (1948: 558); Eckblad & Ellingsen (1984: 32, Fig. 1E); Hansen & Knudsen (1997: 333, Fig. 752); Kreisel (1967: 63, Fig. 5, 12d, 26i, 45); Sosin (1973: 82); Shvartsman & Filimonova (1970: 114); Teng (1996: 502); Wen & Sun (1999: 369).

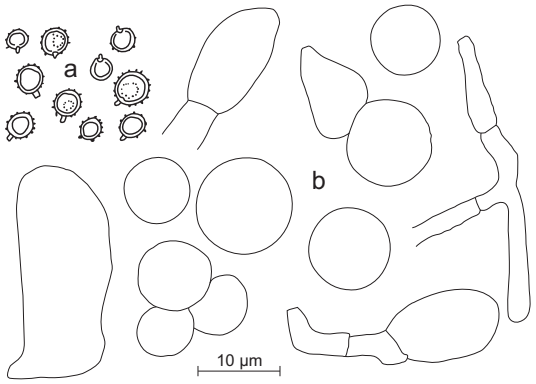


Fig. 53. *Bovista dermoxantha* (Vittat.) De Toni.: a – basidiospores, b – hyphae of exoperidium (KRAM-F 27979).

Bovista nigrescens Pers.: Pers.

Syn. Meth. Fung. 136. 1801.

B. nigrescens Pers., *in* Roemer, Neues Mag. Bot. **1**: 86. 1794.

Basidiocarp up to 50 mm in diam. Exoperidium of young specimens white, smooth, next dark red-brown to almost black. Subgleba absent. Gleba of young basidiocarp white, then olive- or dark brown to reddish brown.

Capillitium threads up to 30 μm wide, brown, thick-walled, dichotomously branched, without pores and septa. Basidiospores 3.6–5.4(–6.0) × 4.2–6.0 μm, globose or subglobose, punctulate or very finely verruculose; pedicels of basidiospores straight, 3.6–15.6 × 0.6–1.2 μm. Spore-print dark lilac-brown.

SPECIMENS EXAMINED. Paekdu-san Mts: E slope of Paekdu-san Mt. peak (1), slightly below upper forest line, *ca* 30 km N of Samji-yon, alt. *ca* 1900 m, in taiga (scattered forest with *Larix olgensis*), 30 June 1986, *leg. Z. Heinrich*, KRAM-F 28090, 28094; *leg. W. Wojewoda*, KRAM-F 30582.

DISTRIBUTION IN ASIA. Armenia, Israel, Kazakhstan, Russia (Siberia and Far East).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 386, Pl. 507); Hansen & Knudsen (1997: 334, Fig. 750); Kreisel (1967: 151, Figs 24a, 27q); Pilát (1958a: 362, Figs 112: 4; 112: 5); Shvartsman & Filimonova (1970: 118, Fig. 37); Sosin (1973: 92, Fig. 45).

Bovista plumbea Pers.: Pers.

Syn. Meth. Fung. 137. 1801.

B. plumbea Pers., Obs. Mycol. **1**: 5. 1796.

Basidiocarp 15–30 mm in diam., globose. Exoperidium smooth, white, splits up into eggshell-like pieces. Young endoperidium lead-white to grey-white, black-brown to grey when old, smooth. Gleba at first white, then olivaceous brown. Subgleba absent.

Threads of capillitium up to 20 µm wide, thick-walled, strongly dichotomously branched, without pores and septa. Basidiospores 3.5–6.0 × 3.0–5.0 µm, subglobose to ovoid, smooth, brown, with pedicels up to 13 µm and with oil-drops. Spore-print olive-reddish brown.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 15 km E of Paekdu-san Mt. peak (1), *ca* 15 km N of Samji-yon, E slope of Paekdu-san Mt., alt. *ca* 1900 m, in scattered forest with *Larix olgensis*, below upper forest line, 30 June1986, *leg. W. Wojewoda*, KRAM-F 27927; Hyesan town (15), park, among grass, 7 Sept.1983, *leg. W. Wojewoda*, KRAM-F 27854. – On ground.

DISTRIBUTION IN ASIA. Afghanistan, Armenia, China, Georgia, India, Iran, Iraq, Kazakhstan, Kirghizia, Pakistan, Russia (e.g. North Altai, Siberia and Far East), Turkey and Uzbekistan.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 388, Pl. 508); Eckblad (1970: 130; 1976: 68); Eckblad & Ellingsen (1984: 35); Gorbunova (1997: 19); Hansen & Knudsen (1997: 334, Fig. 751); Kreisel (1967: 160, Figs 24a–b, 27s, t, 68–70); Pilát (1958a: 365, Figs 112: 1–2; 115–116); Shvartsman & Filimonova (1970: 120, Fig. 38); Sosin (1973: 91, Fig. 44); Teng (1996: 505, Fig. 342); Vasilyeva (1978: 177, Pl. 197).

Calvatia excipuliformis (Scop.: Pers.) Perdeck

Blumea **6**: 490, Figs 3–4. 1950.

Lycoperdon excipuliformis Scop. – *L. excipuliformis* Scop.: Pers., Syn. Meth. Fung. 143. 1801. – *L. saccatum* Vahl, Flora Danica. Pl. 1139. 1799. – *Calvatia saccata* (Vahl.) Morgan, Jour. Cin. Soc. Nat. Hist. **12**: 171. 1890.

Basidiocarp 70–100 × 50–80 mm, consisting of head and stipe, pestle-shaped to pyriform, covered with fine spines and granules, at first whitish, then ochraceous to light brown. Stipe cylindric to tapered. Gleba and subgleba at first white, then olive brown.

Threads of capillitium 2.9–4.8 µm wide, smooth, brownish, thick-walled, branched, with pores. Basidiospores 2.9–4.8 µm in diam., verrucose, brown, with remnants of sterigmata up to 2.5 µm long (Fig. 54).

SPECIMEN EXAMINED. Pyongyang town: Central Botanical Garden (36), under trees, on ground, 12 Sept.1984, *leg. W. Wojewoda*, KRAM-F 27865.

DISTRIBUTION IN ASIA. China, Georgia, India, Kazakhstan, Korea, Russia (e.g. Siberia and Far East) and Turkmenia.

REFERENCES. Anonymous (1983a: 127); Breitenbach & Kränzlin (1986: 388, Pl. 510); Pilát (1958a: 288, Figs 66, 89–91); Shvartsman & Filimonova (1970: 72, Fig. 23); Sosin (1973: 71, Figs 30–31); Teng (1996: 503); Vasilyeva (1978: 175, Pl. 193).

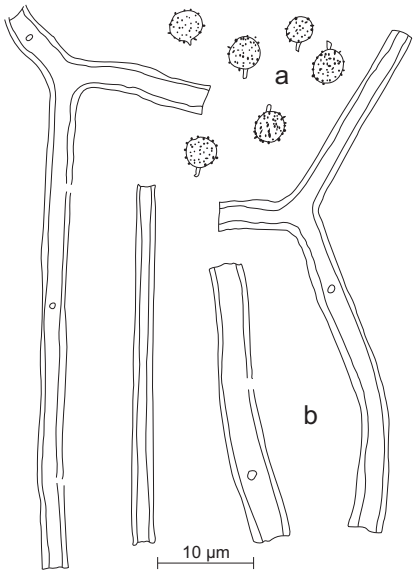


Fig. 54. *Calvatia excipuliformis* (Scop.: Pers.) Perdeck: a – basidiospores, b – threads of capillitium (KRAM-F 27865).

Lycoperdon caudatum J. Schröt.

in Cohn, Krypt. Schles. **3**(1): 698. 1889.

L. pedicellatum Peck, New York State Mus. Rep. **26**: 73. 1874.

Basidiocarp 15–30 × 15–30 mm, subpyriform to subglobose, consisting of head and short stipe. Exoperidium with conic spines up to 1.5 mm long. Gleba olivaceous to olivaceous brown. Mature subgleba *ca* 5–10 mm long, grey-brown. Columella indistinct.

Threads of capillitium 2.0–5.8(–11.5) μm wide, subelastic, thick-walled, smooth, olive brown, sparsely branched, without septa, with few pores. Basidiospores 3.8–5.8 × 3.8–4.8 μm, globose, subglobose, broadly elliptic to ovoid, finely punctate, yellowish, thick-walled, with attached pedicels (2.0–)11.5–34.0(–38.0) × 0.9–1.5 μm (Fig. 55).

SPECIMENS EXAMINED. Paekdu-san Mts: near Naegok (13), alt. *ca* 1000 m, meadow in coniferous forest, 27 June 1986, *leg. W. Wojewoda*, KRAM-F 52948; Myohyang-san Mts: below Wonman Mt. peak (31), alt. *ca* 1000 m, coniferous forest zone with *Picea*, *Pinus and Thuja*, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52949; Kumgang-san Mts: Onjong-ri (60), alt. *ca* 50 m, park, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27825; Chanto Forest (61), near Onjong-ri, alt. *ca* 50 m, forest with *Pinus densiflora*, 9 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27819. – On ground, among mosses.

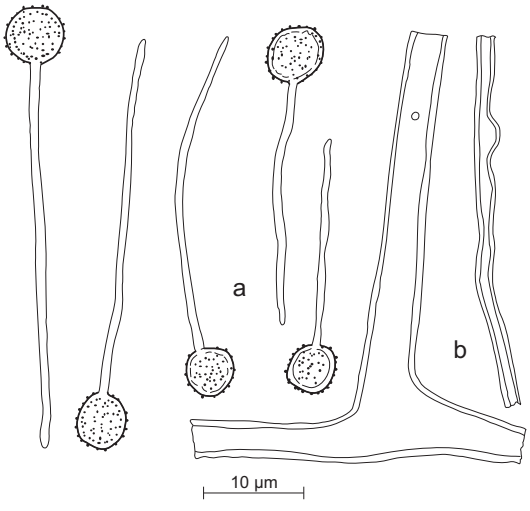


Fig. 55. *Lycoperdon caudatum* J. Schröt.: a – basidiospores, b – threads of coprllitium (KRAM-F 52948).

DISTRIBUTION IN ASIA. Caucasus, China and Russia (Far East).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 394, Pl. 517); Hansen & Knudsen (1997: 337, Fig. 759); Jülich (1984: 501); Kreisel (1962: 149); Pilát (1958a: 315, Fig. 62: 4); Sosin (1973: 83); Teng (1996: 501).

Lycoperdon foetidum Bonord.

Bot. Zeit. **15**: 629. 1857.

L. nigrescens Lloyd, Myc. Notes **2**: 2212. 1905. – *L. perlatum* Pers. var. *nigrescens* Pers., Syn. Meth. Fung. 146. 1801. For further synonyms see Kreisel (1962: 147).

Basidiocarp 20–30 × 15–30 mm, pyriform, consisting of head and stipe. Exoperidium with conic brown to blackish spines up to 1.5 mm long. Areolae network polygonal with small, persistent warts almost linearly arranged. Young endoperidium at first cream-coloured, then brownish. Gleba olive brown. Young subgleba white, mature grey-brown to olive brown. Columella indistinct.

Threads of capillitium 2.5–6.0 μm wide, elastic, thick-walled, smooth, brown, branched, without septa, with few pores. Basidia not seen. Basidiospores 3.5–5.0 × 3.5–4.8 μm, globose, smooth to almost finely punctate, yellowish to brownish, thin- to thick-walled, without pedicels.

SPECIMENS EXAMINED. Paekdu-san Mts: near Mubong (3), alt. *ca* 1500 m, taiga with *Larix olgensis*, 4 Sept.1983, *leg. W. Wojewoda*, KRAM-F 27834; near Samji-yon Hotel, shore of Samji-yon Lake (7), 3 Sept.1983, *leg. W. Wojewoda*, KRAM-F 27833; *ca* 10 km S of Samji-yon town (8), mixed forest, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27836; Taesong-san Mts: near Somun Mt. peak (34), mixed forest with *Pinus densiflora* and *Quercus mongolica*, 29 Aug.1983, *leg. W. Wojewoda*, KRAM-F 27826; Ryongak-san Mt. (42), mixed forest with *Pinus densiflora* and *Quercus*, 16 July 1986, *leg. W. Wojewoda*, KRAM-F 30615; Kumgang-san Mts: bank of Onjong-gang River, near Onjong-ri (60), mixed thicket, under *Pinus densiflora*, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27835. – On ground.

DISTRIBUTION IN ASIA. Russia (e.g. North Altai).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 390, Pl. 513); Cetto (1983: 523, Pl. 1191); Gorbunova (1997: 19); Hansen & Knudsen (1997: 339); Kreisel (1962: 147); Pilát (1958a: 330, Fig. 104).

Lycoperdon molle Pers.: Pers.

Syn. Meth. Fung. 150. 1801.

L. molle Pers., Obs. Mycol. **2**: 70. 1799.

Basidiocarp 20–50 mm in diam., subglobose to pyriform. Exoperidium with short (up to 2 mm long), simple, soft, grey-brown spines, surface between them granular-furfuraceous, brown. Endoperidium cream-coloured to yellow-brown. Subgleba white. Gleba olive brown.

Threads of capillitium 1.5–5.0 µm, sinuous, smooth, brown, thick-walled, with pores and few septa. Basidiospores 4–5 µm in diam., globose, verrucose, light brown. Between basidiospores many detached remnants of sterigmata, 10–20 µm long. Spore-print red-brown.

SPECIMENS EXAMINED. Paekdu-san Mts: near Mubong (3), taiga with *Larix olgensis*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27839; between Potae-gu (11) and Poso-ri (12), mixed taiga, under *Larix* and *Betula*, 28 Sept.1984, *leg. W. Wojewoda*, KRAM-F 28578; Myohyang-san Mts: near Habiro Temple (27), mixed forest, 6 Aug.1983, *leg. W. Wojewoda*, KRAM-F 27823; Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest with *Pinus densiflora* and *Quercus*, 3 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 28092. – On ground.

DISTRIBUTION IN ASIA. China, Georgia, Iran, Kazakhstan, and Russia (e.g. North Altai, Far East and Siberia).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 60); Breitenbach & Kränzlin (1986: 392, Pl. 516); Eckblad (1976: 69); Eckblad & Ellingsen (1984: 31, Fig. 1B); Gorbunova (1997: 19); Pilát (1958a: 347, Figs 86, 110); Rudnicka-Jezierska (1991: 33, Fig. 4: 4; Pls. III: 1; IV: 5); Sosin (1973: 85, Fig. 40); Shvartsman & Filimonova (1970: 110, Fig. 36).

Lycoperdon perlatum Pers.: Pers.

Syn. Meth. Fung. 145. 1801.

L. perlatum Pers., Obs. Myc. **1**: 4. 1796. – *L. gemmatum* Batsch, Elench. Fung. 147. 1783.

Basidiocarp 30–70 × 30–35 mm, pyriform, obovoid to turbinate, consisting of head and stipe. Exoperidium with numerous obtuse warts intermingled with larger, well developed, acute or obtuse spines which leave an areolate network after the spines have fallen away; white when young, then greyish to yellowish brown. Subgleba present. Young gleba whitish, then olivaceous to brown.

Threads of capillitium 2.0–6.5 µm wide, elastic, smooth or with bumps, thick-walled, with scattered pits, without septa, sparingly branched, olivaceous to brown. Basidiospores 3.0–4.5 µm in diam., globose, finely verrucose, brown, thick-walled, without pedicels.

SPECIMENS EXAMINED. Paekdu-san Mts: Onsupyong near Naegok (13), *ca* 15 km NE of Pochonbo, alt. *ca* 800 m, mixed forest, 27 June 1986, *leg. Z. Heinrich*, KRAM-F 27873; Myohyang-san Mts: under Wonman Mt. peak (31), alt. *ca* 1000 m, coniferous forest zone with *Picea* and *Thuja*, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 27862; shore of Soham-ho Lake (32), mixed forest with *Pinus densiflora* and *Quercus mongolica*, 14 Sept.1984, *leg. W. Wojewoda*, KRAM-F 30622; between Soham-ho Lake (32) and Pyongsong town, *ca* 25 km N of Pyongyang city, alt. *ca* 250–500 m, in deciduous forest, 14 Sept.1984, *leg. W. Wojewoda*, KRAM-F 30621; Ryongak-san Mt. (42), alt. *ca* 250 m, in mixed forest with *Pinus densiflora* and *Quercus*, on ground, only one fruitbody on fallen cone of *Pinus densiflora*, 16 July 1986, *leg. H. Komorowska*, KRAM-F 28320; Wonsan town (50), Botanical Garden, under coniferous trees, 22 July 1986, *leg. W. Wojewoda*, KRAM-F 30618; Kumgang-san Mts: near Kuryong Falls (59), alt. *ca* 600 m, mixed forest, 5 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28089; near Pagyon Falls (65), mixed forest, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29238. – On ground, rarely on stumps.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Korea and Russia (e.g. North Altai, Siberia and Far East).

REFERENCES. Anonymous (1978: 174; 1983a: 127); Azbukina *et al*. (1984: 60); Bottomley (1948: 554);

Breitenbach & Kränzlin (1986: 394, Pl. 518); Cunningham (1944: 149, Pls. XIX: 5; XXI: 5, XXXVI: 6); Eckblad (1976: 69); Eckblad & Ellingsen (1984: 30); Gorbunova (1997: 19); Hansen & Knudsen (1997: 338, Fig. 764); Imazeki & Hongo (1975, **1**: 123, Pl. 58, Fig. 317); Pilát (1958a: 325, Fig. 101); Shvartsman & Filimonova (1970: 100, Fig. 32); Sosin (1973: 86); Teng (1996: 500, Fig. 338); Vasilyeva (1978: 176, Pl. 195); Ying *et al*. (1983: 166).

Lycoperdon pyriforme Schaeff.: Pers.

Syn. Meth. Fung. 148. 1801.

L. pyriforme Schaeff., Icon. Fung. Bav. **4**: 128. 1774. For further synonyms see Pilát (1958: 338).

Basidiocarp 20–30 mm in diam., pyriform to clavate, with spherical head and conic stipe. Exoperidium coarsely granular to finely verrucose. Endoperidium papery, firm, whitish when young, then light to chestnut brown. Stipe with conspicuous basal rhizomorph. Subgleba present, white. Gleba at first white, then olive brown.

Threads of capillitium 2.0–6.5 μm wide, elastic, smooth, brownish, thick-walled, branched, without pores and septa. Basidiospores 3–5 μm in diam., globose, smooth, brownish, thick-walled, with oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: Chongbong Mt. (9), near Rimyongsu, alt. *ca* 1460 m, mixed taiga, on fallen, dead, decayed deciduous trunk, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 30613; Myohyang-san Mts: near Unson Falls (23), alt. *ca* 600 m, mixed forest, on stump, 12 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 29240; Kumgang-san Mts: between Onjong-ryong Pass (54) and Onjong-ri village (60), alt. *ca* 220 m, mixed forest, on stump, 16 Sept. 1982, *K. Zarzycki*, KRAM-F 29239.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Kirghizia, Korea, Mongolia, Russia (e.g. North Altai, Siberia and Far East), and Uzbekistan.

REFERENCES. Anonymous (1978: 175; 1983a: 127); Azbukina *et al*. (1984: 60); Breitenbach & Kränzlin (1986: 394, Pl. 519); Cunningham (1944: 149, Pls. XX: 6; XXXVI: 4); Eckblad (1976: 69); Gorbunova (1997: 19); Imazeki & Hongo (1975, **1**: 123, Pl. 58, Fig. 318); Jahn (1979: 232, Pl. 207); Pilát (1958a: 338, Figs 80, 82–83, 107); Rudnicka-Jezierska (1991: 24, Fig. 3: 1, Pl. I: 2, Pl. III: 4); Shvartsman & Filimonova (1970: 105, Fig. 34); Sosin (1973: 84, Fig. 39); Teng (1996: 500); Vasilyeva (1978: 176, Pl. 196); Wen & Sun (1999: 369); Ying *et al*. (1983: 166).

Lycoperdon umbrinum Pers.: Pers.

Syn. Meth. Fung. 147. 1801.

L. umbrinum Pers., Tent. Disp. Fung. 53. 1797. For further synonyms see Bottomley (1948: 560).

Basidiocarp 30–50 mm in diam., globose or pyriform. Exoperidium covered with short, dark brown spines leaning together at tips to form pyramids, surface between them smooth to finely verrucose and brown. Endoperidium smooth, ochraceous yellow. Subgleba white. Gleba olivaceous yellow to olivaceous brown, usually with a distinct columella.

Threads of capillitium 2.0–7.2 μm in diam., smooth, brown, thick-walled, with numerous pores. Basidiospores 4.2–5.4(–6.0) μm, globose, finely verrucose, yellow, with short remnants of sterigmata or without pedicels. Spore-print yellow-brown.

SPECIMENS EXAMINED. Paekdu-san Mts: below Paekdu Mt. peak (1), alt. *ca* 1900 m, slightly below upper forest limit, in taiga with *Larix olgensis*, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30619; *ca* 20–30 km SE of Paekdu Mt. peak, in taiga with *Larix olgensis*, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27840; near Samjiyon Hotel, shore of Samji-yon Lake (8), taiga with *Larix olgensis*, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27818; *ca* 10 km S of Samji-yon town (8), in mixed taiga with *Larix olgensis*, *Abies* and *Picea*, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30614; *ca* 25 km N of Samji-yon town, alt. *ca* 1700 m, in taiga with *Larix* and *Picea*, on stump, 30 June 1986, *leg. Z. Heinrich*, KRAM-F 28073; *ca* 15 km NW of Samji-yon town, alt. *ca* 1850 m, in taiga with *Larix olgensis*, 29 June 1985, *leg. B. Zarzycka*, KRAM-F 27769; *ca* 60 km N of Hyesan (15), alt. *ca* 1900–2000 m, taiga with *Larix olgensis*, below upper forest line, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27837; Myohyang-san Mts: in Hyangsan-gang River Valley, near Myohyang-san Hotel (20), alt. *ca* 100 m, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27822; Ryongak-san Mt. (42), alt. *ca* 200 m, mixed forest with *Castanea*, *Pinus densiflora* and *Quercus*, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27845. – Most often on ground, sometimes (rarely) on stumps.

DISTRIBUTION IN ASIA. China, India, Kazakhstan, Korea, Russia (e.g. Siberia and Far East) and Uzbekistan.

REFERENCES. Anonymous (1983a: 127); Bottomley (1948: 560); Breitenbach & Kränzlin (1986: 396, Pl. 520); Jülich (1982: 464, Pl. 16a); Pilát (1958a: 333, Fig. 106); Shvartsman & Filimonova (1970: 102); Sosin (1973: 77, Fig. 33); Teng (1996: 499); Ying *et al*. (1983: 166).

Vascellum pratense (Pers.: Pers.) Kreisel

Feddes Repert. **64**: 159, Pl. VI: 14. 1962.

Lycoperdon pratense Pers., Disp. Meth. Fung. 7. 1787. – *L. pratense* Pers.: Pers., Syn. Meth. Fung. 142. 1801. – *L. depressum* Bonord., Bot. Ztg. 611. 1837. – *Vascellum depressum* (Bonord.) F. Šmarda, in Pilát, Gasteromycetes Houby – Břichatky, in Novak, Flora ČSR, B, **1**: 305. 1958. For further synonyms see Pilát (1958: 305).

Basidiocarp 20–45 mm broad, turbinate, bowl-shaped, depressed above. Exoperidium covered with granules or short spines, in maturity tawny olive to brown. Endoperidium pale greyish brown, membranous, dehiscing with a broad irregular apical pore. Gleba light brownish olive. Subgleba composed of large cells, separated from gleba by a distinct diaphragm.

Threads of capillitium 2.5–4.8 µm wide, hyaline, subhyaline to brown, thin- to thick-walled, septate, sparingly branched. Basidiospores (2.9–)3.8–4.8 µm in diam., globose to ovoid, finely verrucose, brown, thick-walled (Fig. 56).

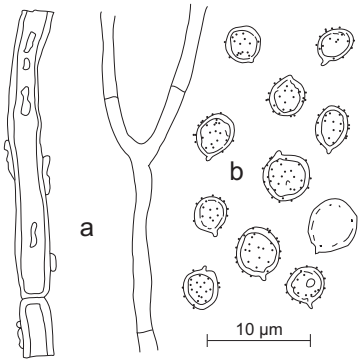


Fig. 56. *Vascellum pratense* (Pers.: Pers.) Kreisel: a – threads of capillitium, b – basidiospores (KRAM-F 30583).

SPECIMENS EXAMINED. Pyongyang town: Central Botanical Garden (36), among grass, under *Paulownia tomentosa*, 3 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27848; Suian-san Mts (48): alt. *ca* 200 m, at road, scattered, mixed, young forest, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30583; Kumgang-san Mts: near Onjong-ri (60), forest with *Pinus densiflora*, 21 July 1986, *leg. W. Wojewoda*, KRAM-F 29252. – On ground.

DISTRIBUTION IN ASIA. China, Iran, Kazakhstan, Pakistan and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Widely distributed species, found throughout temperate Europe and the Pacific coast of North America, as well as Australasia and Africa.

REFERENCES. Breitenbach & Kränzlin (1986: 396, Pl. 521); Eckblad (1957: 38; 1976: 69); Eckblad & Ellingsen (1984: 36); Hansen & Knudsen (1997: 340, Figs 767, 769); Morris (1990: 325); Pilát (1958a: 305, Figs 68, 87, 96); Shvartsman & Filimonova (1970: 87, Fig. 28); Sosin (1973: 73, Fig. 32); Teng (1996: 500).

Marasmiaceae Roze *ex* Kühner 1980

Flammulina velutipes (M. A. Curtis: Fr.) Singer

Lilloa **22**: 307. 1951 ('1949').

Agaricus velutipes M. A. Curtis, Fl. Londin. **4**: 212, Pl. 70. 1777. – *A. velutipes* M. A. Curtis: Fr., Syst. Mycol. **1**: 119. 1821. – *Collybia velutipes* (M. A. Curtis: Fr.) P. Kumm., Führ. Pilzk. 116. 1871.

Basidiocarps caespitose. Pileus 10–30 mm across, convex, pale cream, subviscid, smooth. Margin incurved, translucent-striate. Flesh white, tough-fleshy. Smell and taste none. Lamellae up to 5 mm broad, adnaxo-adnate white to cream colour. Stipe 10–25 × 3–6 mm, cylindric, curved, cream, slightly brown at base, finely velutine.

Hyphae of cortical layer of pileus cylindric, erect, straight (ixotrichodermium), strongly gelatinized, with dendroid to coralloid elements 1.5–4.0 µm broad. Pileocystidia 35–105 × 6–10 µm, sublageniform. Cheilocystidia and pleurocystidia similar, 45–65 × 8–15 µm, utriform to lageniform, hyaline. Basidia 25.0–32.0 × 5.5–7.0 µm, with 4 sterigmata. Basidiospores 6.3–8.8(–10.2) × 3.8 µm, oblong-elliptic, hyaline, thin-walled.

SPECIMENS EXAMINED. Paekdu-san Mts: Chongbong Mt. (9), mixed taiga, on dead trunk, 1 July 1986, *leg. H. Komorowska*, KRAM-F 53273; on dead trunk of *Betula platyphylla*, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 53274.

DISTRIBUTION IN ASIA. Korea, Mongolia and Russia (e.g. Primorski Krai).

REFERENCES. Anonymous (1983a: 114); Bas (1983a: 59, Figs 8, 12; 1995: 172, Fig. 176); Breitenbach & Kränzlin (1991: 188, Pl. 210); Uranchimehg *et al*. (1983: 376).

Macrocystidia cucumis (Pers.: Fr.) Joss.

Bull. Soc. Mycol. Fr. **49**: 373. 1934.

Agaricus cucumis Pers., Observ. Mycol. **1**: 45. 1796. – *A. cucumis* Pers.: Fr., Syst. Mycol. **1**: 231. 1821.

Basidiocarps in small groups or solitary. Pileus 15–35 mm across, convex or plano-convex, dark reddish brown, hygrophanous. Margin straight, not translucent, striate. Flesh thin, membranaceous. Smell very strong, like raw fish or rancid oil. Taste unpleasant. Lamellae 2–6 mm broad, free, ochraceous or brownish. Stipe 20–35 mm cylindric, equal, pale cream at apex, below yellowish brown to blackish brown at base, finely pruinose or distinctly velutinous all over, base tomentum.

Hyphae of cortical layer of pileus 2.5–5.0 μm broad, cylindric, with repent to ascending, coralloid terminal elements mixed with erect, thin-walled, fusiform to lageniform pileocystidia 40–110 × 15–20 μm. Hyphae of cortical layer of stipe 2–7 μm broad, with clusters of caulocystidia. Clamps present. Caulocystidia 40–100 × 10–15 μm, similar to cheilocystidia. Cheilocystidia 50.7–147.0 × 15.0–30.0 μm, broadly fusiform to lageniform, with acute apex, similar to pleurocystidia. Basidia 25.0–40.0 × 7.2–10.5 with 4 sterigmata. Basidiospores 7.6–9.6 × 3.8–4.8 μm. Sporeprint pinkish brown (Fig. 57).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), taiga, 28 June 1986, *leg. H. Komorowska*, KRAM-F 28687; near tomb of King Kongmin (64), thicket, 26 July 1986, *leg. H. Komorowska*, KRAM-F 28242. – On ground.

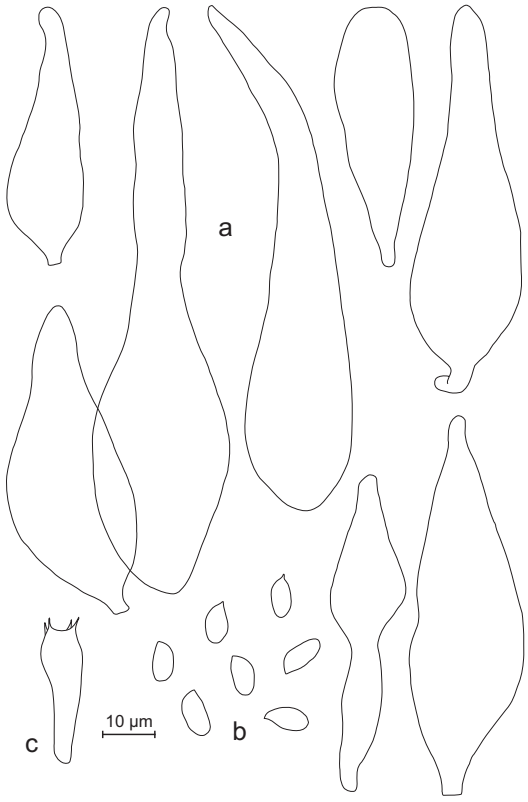


Fig. 57. *Macrocystidia cucumis* (Pers.: Fr.) Joss.: a – cheilo- and pleurocystidia, b – basidiospores, c – basidium (KRAM-F 28242).

DISTRIBUTION IN ASIA. Reported from China (e.g. Tibet), Japan and Russia (e.g. Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 45); Breitenbach & Kränzlin (1991: 230, Pl. 273); Capellano (1976: 221); Dähncke & Dähncke (1980: 230); Horak (1968: 361); Imazeki & Hongo (1975, **2**: 29, Pl. 9: 51); Konrad & Maublanc (1926: Pl. 176); J. E. Lange (1939: 25, Pl. 126B); Noordeloos (1983: 38); Vasilyeva (1973: 111, Fig. 22B); Ying *et al*. (1983: 132, Pl. 23: 18–19).

Marasmiellus candidus (Bolton) Singer

Pap. Mich. Acad. Sci. **32**: 129. 1946, ss. Antonín & Noordeloos (1993: 169).

Agaricus candidus Bolton, Hist. Fung. Halifax **1**: 39. 1788. – *Marasmius candidus* (Bolton) Fr., Epicr. Syst. Mycol. 381. 1838 [non E. J. Lange, Fl. Agar. Dan. **2**: 25.

1937 = *Marasmiellus vaillantii* (Pers.: Fr.) Singer, see: Hansen & Knudsen 1992: 142–143]. – *Agaricus albuscorticis* Secr., Mycogr. Suisse **2**: 229.1833. – *Marasmiellus albuscorticis* (Secr.) Singer, Lilloa **22**: 300. 1951 ('1949'). For further synonyms see Antonín & Noordeloos (1993: 169).

Basidiocarps gregarious. Pileus 5–22 mm across; purely white to sordid white, often with grey, brown or ochre tinges at centre, radially wrinkled. Flesh thin, whitish. Smell and taste none. Lamellae narrow, often anastomosing, white to sordid beige. Stipe 4–15 × 1 mm, cylindric, often bulbose at base, white to dark grey, entirely white-pruinose, with basal tomentum (often as basal disc with ciliate margin).

Hyphae of cortical layer of pileus 3–10 µm broad, cylindric, inflated, smooth; terminal elements scattered diverticulate, smooth or coralloid. Hyphae of cortical layer of stipe 4–6 µm broad, cylindric with scattered clusters of caulocystidia. Clamps present. Caulocystidia 40–75 × 5–9 µm, thin-walled, filiform to subleganiform. Cheilocystidia 72–84 × 5–7 µm, filamentous to subcylindric. Basidia 25.0–40.0 × 8.0–12.5 µm, with 4 sterigmata. Basidiospores 11.4–14.4 × 3.6–4.8 µm. Spore-print white (Fig. 58).

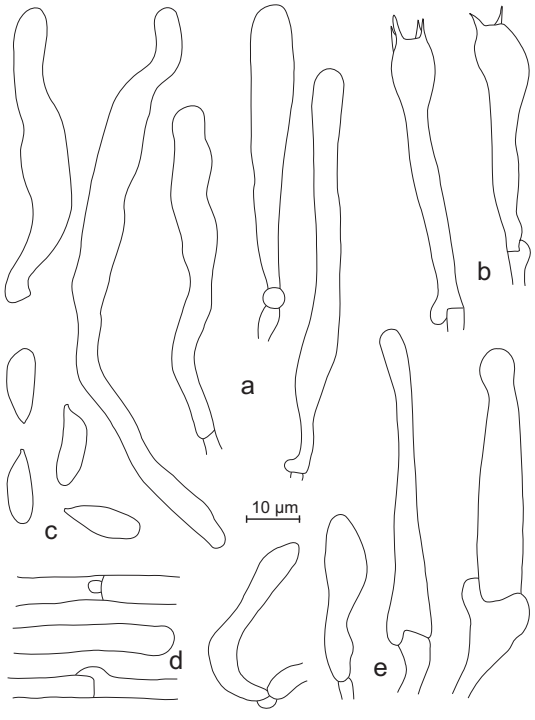


Fig. 58. *Marasmiellus candidus* (Bolton) Singer: a – cheilocystidia, b – basidia, c – basidopspores, d – hyphae of cortical layer of stipe, e – caulocystidia (KRAM-F 28198).

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100 m, mixed forest, on fallen deciduous branches, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53085; Sijung-ho Lake (52), forest with *Pinus densiflora*, on fallen branches, 20 Aug.1983, *leg. W. Wojewoda*, KRAM-F 53086; Pagyon Ravine (65), alt. *ca* 300 m, mixed forest, on fallen branches, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28198, 28630.

DISTRIBUTION IN ASIA. Japan.

NOTES. New to North Korea. Known also from Europe and North America.

REFERENCES. Antonín & Noordeloos (1993: 169, Fig. 56, Pl. 13); Malençon & Bertault (1975: 354, fig 74); Noordeloos (1983: 32; 1995b: 126, Fig. 126), Redhead (1989: 3049).

Marasmiellus ramealis (Bull.: Fr.) Singer

Pap. Mich. Acad. Sci. Arts Letters **32**: 130. 1948 ('1946').

Agaricus ramealis Bull., Herb. Fr. 336. 1786. – *A. ramealis* Bull.: Fr., Syst. Mycol. **1**: 135. 1821. – *A. amadelphus* Bull.: Fr. Syst. Mycol. **1**: 135. 1821. – *Marasmius ramealis* (Bull.: Fr.) Fr., Epicr. Syst. Mycol. 381. 1838. For further synonyms see Antonín & Noordeloos (1993: 149).

Basidiocarps gregarious. Pileus 5–15 mm across convex to applanate, weakly radially sulcate, sordid cream to yellow-brown, centre darker, entirely pruinose, mat. Flesh thin, smell and taste not recorded. Lamellae adnate or slightly decurrent, white to sordid cream. Stipe 5.0–15.0 × 0.5 mm central, cylindric, usually tapering towards base, white under pileus, reddish brown below.

Hyphae of cortical layer of pileus 6–10 µm broad, cylindric to inflated, smooth or covered with warty or cylindric, simple to somewhat branched excrescences. Hyphae of cortical layer of stipe 3–6 µm broad, cylindric. Caulocystidia

25–57 × 6–9 μm. Cheilocystidia 45.0–55.0 × 12.5–18.5 μm, clavate to subglobose, with finger-like or coralloid excrescences. Basidia 20.0–30.0 × 5.5–7.5 μm, cylindric, with 4 sterigmata. Basidiospores 9.6–10.8 × 4.8 μm (Fig. 59).

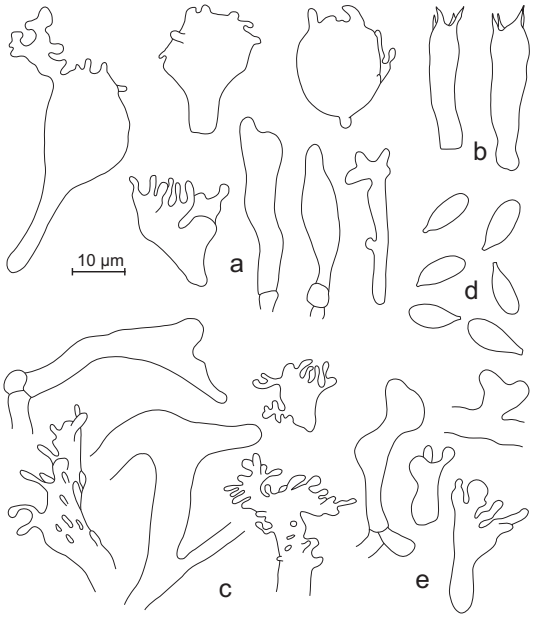


Fig. 59. *Marasmiellus ramealis* (Bull.: Fr.) Singer: a – cheilocystidia, b – basidia, c – hyphae of cortical layer of pileus, d – basidiospores, e – caulocystidia (KRAM-F 28377).

SPECIMENS EXAMINED. Myohyang-san Mts: Manpok Valley, near Unson Falls (23), alt. *ca* 500 m, mixed forest, on root of overthrown stump, 14 July 1986, *leg. H. Komorowska*, KRAM-F 28543; Kumgang-san Mts: Okryu-dong Valley, *ca* 1.5 km before Kuryong Falls (59), in litter, on fallen leaves, 20 July 1986, *leg. H. Komorowska*, KRAM-F 28377.

DISTRIBUTION IN ASIA. Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea. Known also from Africa (e.g. Morocco), America and Europe.

REFERENCES. Antonín & Noordeloos (1993: 149, Fig. 47); Azbukina *et al*. (1984: 45); Breitenbach & Kränzlin (1991: 232, Pl. 274); Horak (1968: 174, Fig. p. 175); Malençon & Bertault (1975: 377, as *Marasmius*); Mukhin (1993: Tab. 1); Noordeloos (1983: 37; 1995b: 124, Fig. 122); Singer (1973: 172); Syarzhanina (1994: 170); Vasilyeva (1973: 137).

Marasmius pallidocephalus Gilliam

Mycologia **67**(4): 818, Figs 1–3. 1975.

Basidiocarps gregarious or caespitose. Pileus 3–10 mm across, convex to plane, with slightly depressed centre, often umbonate, dry, dull, opaque, smooth or faintly rugulose-striate up to ⅔ pileus radius, pale orange-yellow-brown, light pinkish to yellowish brown. Flesh thin, yellowish-white. Smell and taste none. Lamellae up to 1 mm broad, adnexed to sinuate. Stipe 23.0–35.0 × 0.2–0.6 mm, terete equal, straight, on drying curling and twisting, light yellowish brown to dark brown on upper half, blackish brown below, insititious. Rhizomorphs blackish brown, thread-like, branched, scarce to abundant.

Hyphae of pileus 3–9 μm thick, with hyaline to moderate yellowish brown, often spirally thickened or encrusted wall, mixed with hyaline diverticulate cells. Hyphae of cortical layer of stipe 3–5 μm wide, with irregularly encrusted or spirally thickened greyish yellow to deep brown walls. Clamps absent. Cystidia lacking. Basidia 26.3–31.3 × 6.3–6.9 μm, clavate or subclavate, with 4 sterigmata. Basidiospores 7.2–8.4 × 2.5–3.0 μm, narrowly elliptic, obovate to pip-shaped. Spore-print white (Fig. 60).

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 25 km NW of Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix* and *Picea*, on needles under *Picea*, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28609; 28 June 1985, *leg. B. Zarzycka*, KRAM-F 51385.

DISTRIBUTION. Known from North America: Canada and United States.

NOTES. New to North Korea. *M. pallidocephalus* differs from *Setulipes androsaceus* (L.: Fr.) Antonín: paler colour of pilei; hyphae of stipe are irregularly encrusted or spirally thickened; lacks diverticulate cells on lamellar edges.

REFERENCES. Gilliam (1975: 818, Figs 1–3; 1976: 26, Fig. 10); Wojewoda *et al*. (1993: 125, 128).

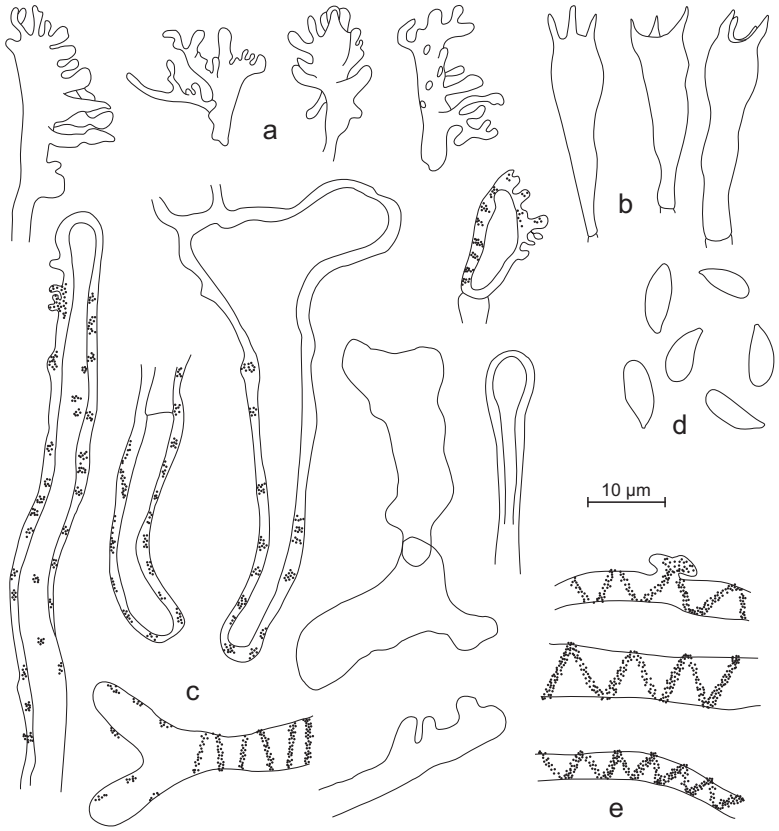


Fig. 60. *Marasmius pallidocephalus* Gilliam: a, c – hyphae of cortical layer of pileus, b – basidia, d – basidiospores, e – hyphae of cortical layer of stipe (KRAM-F 51385).

Marasmius pulcherripes Peck

Annal. Rep. New York State Mus. **24**: 77, Pl. 4, Figs 19–22. 1871.

Basidiocarps gregarious. Pileus 3–7 mm across, up to 6 mm high, campanulate, umbonate; dry, dull, minutely velutinous, greyish-reddish orange to orange brown. Margin plicate or striate. Flesh thin, fragile, white. Smell and taste none. Lamellae narrow, whitish, adnexed to free. Stipe 30.0–45.0 × 0.2–0.5 mm, filiform, dark pink to greyish red. Basal mycelium white.

Hyphae of cortical layer of pileus cylindric, clavate to elliptic, with moderate, orange to light yellowish rod-like projections, hyaline to pale pink walls up to 1 µm thick and with pale yellow to moderate orange-yellow walls up to 2 µm thick, with fewer projections, 3–18 × 3–11 µm, (broom cells Siccus-type). Hymenial broom cells 11.2–15.0 × 7.3–.2 µm. Cheilo- and pleurocystidia similar, rare, 25–45 × 3–11 µm, cylindric, clavate to fusiform, hyaline. Basidia 17.0–29.3 × 3.9–4.6 µm, with 4 sterigmata. Basidiospores 10.8–13.5 × 2.3–3.5 µm (Fig. 61).

SPECIMEN EXAMINED. Myohyang-san Mts: Manpok Valley near Kuchung Falls (26), alt. *ca* 850 m, mixed forest, on fallen leaves, 14 July 1986, *leg. H. Komorowska*, KRAM-F 28539.

DISTRIBUTION. Known from North America.

NOTES. New to North Korea.

REFERENCES. Gilliam (1976: 99, Fig. 40); Singer (1965: 330); Wojewoda *et al.* (1993: 125, 128).

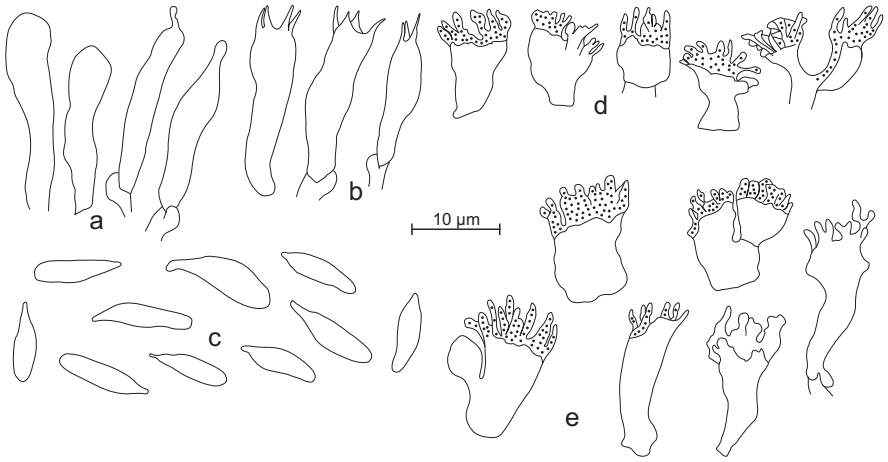


Fig. 61. *Marasmius pulcherripes* Peck: a – hymenial cystidia, b – basidia, c – basidiospores, d – broom cells from lamellar edge, e – broom cells from pileus cuticle (KRAM-F 28539).

Marasmius scorodonius (Fr.: Fr.) Fr.

Epicr. Syst. Mycol. 379. 1938.

Agaricus scorodonius Fr., Obs. Mycol. **1**: 29. 1815. – *A. scorodonius* Fr.: Fr., Syst. Mycol. **1**: 130. 1821.

Basidiocarps single or in groups. Pileus 5–20 mm across, convex to plane, sometimes with central depression, hygrophanous, non striate, pinkish brown, red-brown to ochraceous red, at centre darker, pallescent on drying. Margin elevated, straight or undulate with age. Flesh thin, whitish. Taste and smell like garlic. Lamellae 1–2 mm broad, adnate to free, white to pale yellowish cream (dry edge paler than over lamella). Stipe 20.0–60.0 × 0.5–2.0 mm, pale to pale brown at apex, lower portion of stipe red-brown, insititious or with scanty basal mycelium.

Hyphae of cortical layer of pileus clavate, pyriform or lobate; smooth or with apical projections (26–50 × 10–18 µm, not true broom cells); walls hyaline, thin or thick (up to 2 µm) yellow-brown, in hymeniderm form. Hyphae of cortical layer of stipe 3–8 µm broad, cylindric with yellow-brown to dark brown walls. Non dextrinoid. Clamps present. Cheilocystidia 22–40 × 7–14 µm, irregularly cylindric to clavate, with long projections and varying in number. Basidia 28.0–42.0 × 7.5–8.5 µm, with 4 sterigmata. Basidiospores 7.5–10.3 × 3.8–4.7 µm. Spore-print white (Fig. 62).

SPECIMENS EXAMINED. Paekdu-san Mts: Taehongdan (6), alt. *ca* 1500 m, taiga with *Larix olgensis*, on litter, 29 June 1986, *leg. Z. Heinrich*, KRAM-F 27914, 27916, 27920; *ca* 10 km NE of Samji-yon town (8), taiga with *Larix* and *Picea*, on litter, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28460; *ca* 28 km NE of Samji-yon town, 29 June 1986, *leg. H. Komorowska*,

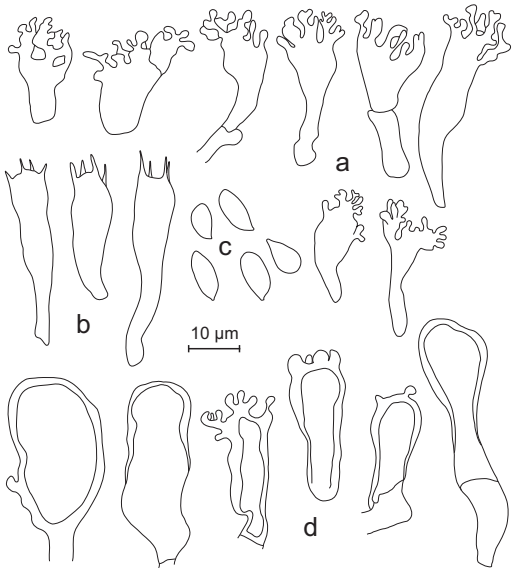


Fig. 62. *Marasmius scorodonius* (Fr.: Fr.) Fr.: a – cheilocystidia, b – basidia, c – basidiospores, d – hyphae of cortical layer of pileus (KRAM-F 28528).

KRAM-F 28599; near Samji-yon, at skirt of taiga, on fragment of wood covered with soil, 29 June 1986, *leg. W. Wojewoda*, KRAM-F 28487; Myohyang-san Mts: near Myohyang-san Hotel (20), lawn, 9 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51421; shore of Soham-ho Lake (32), coniferous forest, on fallen *Pinus densiflora* cones and fallen twigs, 17 July 1986, *leg. H. Komorowska*, KRAM-F 28574, 28586; *leg. W. Wojewoda*, KRAM-F 51424; Pyongyang town: Morangbong Park (38), on roots, 15 July 1986, *leg. H. Komorowska*, KRAM-F 28528; Ryongak-san Mt. (42), in forest, on root of *Pyrus* sp., 16 July 1986, *leg. H. Komorowska*, KRAM-F 28321; Suian-san Mts (48): near ruins of castle, on pieces of wood lying on ground, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51422; Kumgang-san Mts: shore of Samil-po Lake (62), mixed forest with *Pinus densiflora*, on fallen twigs, 3 July 1985, *leg. B. Zarzycka*, KRAM-F 51423; Kaesong town: near Buddhist temple and Buddhist school (63), lawn, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28124.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Mongolia and Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Antonín & Noordeloos (1993: 111, Fig. 34); Azbukina *et al*. (1984: 46); Breitenbach & Kränzlin (1991: 244, Pl. 292); Bresadola (1929: Pl. 499); Gorbunova (1997: 16); Melik-Khachatrian (1980: 233); Noordeloos (1995c: 151, Fig. 156); Syarzhanina (1994: 166); Uranchimehg *et al*. (1983: 376); Vasilyeva (1973: 137; 1978: 140, Pl. 86).

Marasmius siccus (Schwein.) Fr.

Epicr. Syst. Mycol. 382. 1838.

Agaricus siccus Schwein., Schriften Natur. Forst. Ges. Leipzig **1**: 84. 1822. – *Marasmius campanulatus* Peck, Annual Rep. New York State Mus. **23**: 126. 1873 ('1870').

Basidiocarps gregarious. Pileus 2.5–17.0 mm across, convex, conic-convex to applanate, with depressed or papillate centre, sulcate with dentate straight or reflexed margin, deep orange to brownish orange. Flesh thin, whitish cream. Smell indistinct. Taste mild. Lamellae 1.0–2.5 mm broad, distant, free or adnate, narrowly ventricose, white to cream. Stipe 30.0–70.0 × 0.2–1.0 mm, cylindric, straight, equal, pale yellow at apex, lower red-brown to black-brown; base whitish tomentose.

Hyphae of cortical layer of pileus clavate with branched apical projections, thick-walled, yellow-brown (broom cells Siccus-type), 8–23 × 4–11 μm, hymeniform. Hyphae of cortical layer of stipe 5–15 μm broad, thick-walled, brown-yellow, caulocystidia absent. Cheilocystidia 8.0–21.5 × 4.5–10.0 μm, clavate with yellow-brown thick-walled apices (Siccus-type) with variable projections. Pleurocystidia 25.0–80.0 × 5.0–21.5 μm, clavate, cylindric or fusiform, often in apex rostrate or ± strangulate (less often capitate). Basidia 20–40 × 5–9 μm clavate, with 4 sterigmata and basal clamp. Basidiospores 15.0–23.5 × 3.0–4.5 μm, narrowly clavate, non-amyloid. Spore-print white.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 200–300 m, deciduous forest with *Pinus*, on fallen leaves, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51391; Taesong-san Mts: near peak of Chujak Mt. (35), pine forest with *Quercus mongolica*, on dead, fallen needles and leaves, 29 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27067; Kumgang-san Mts: Okryu-dong Valley, *ca* 2.5 km before Kuryong Falls (59), on fallen leaves, 20 July 1986, *leg. H. Komorowska*, KRAM-F 28234; Pagyon Ravine (65), alt. *ca* 300 m, on litter, 26 July 1986, *leg. H. Komorowska*, KRAM-F 28280, 28411, 51390.

DISTRIBUTION IN ASIA. China, Japan, Korea, Mongolia and Russia (e.g. North Altai and Primorski Krai).

NOTES. Widespread in the subarctic, boreal and temperate zone of the Northern Hemisphere, with a circumpolar distribution (Europe, Asia and North America).

REFERENCES. Anonymous (1978: 59; 1983a: 114); Antonín & Noordeloos (1993: 81, Fig. 24); Azbukina *et al*. (1984: 46); Gilliam (1976: 85, Figs 7, 35, 36); Gorbunova (1997: 17); Imazeki & Hongo (1975, **1**: 38, Pl. 14: 79; **2**: 31, Pl. 10: 57); Noordeloos (1987: 244, Figs 14–22); Petrov & Belova (1999: 27); Teng (1996: 435); Vasilyeva (1973: 137); Ying *et al*. (1983: 135).

Setulipes androsaceus (L.: Fr.) Antonín

Česká Mykol. **41**: 86. 1987.

Agaricus androsaceus L., Spec. Plant. **2**: 1175. 1753. – *A. androsaceus* L.: Fr., Syst. Mycol. **1**: 137. 1821. – *Marasmius androsaceus* (L.: Fr.) Fr., Epicr. Syst. Mycol. 385. 1838.

Basidiocarps gregarious. Pileus 2–15 mm across, hemispherical to convex, sometimes with slightly depressed centre, dry, dull or sometimes shining when wet, smooth or rugulose-striate, dark brown, yellowish brown tinged pink when young and moist. Flesh thin, yellowish. Smell and taste lacking. Lamellae up to 1 mm broad, narrow, adnate, yellowish pink or pale pink. Stipe 20.0–60.0 × 0.2–1.0 mm filiform, glabrous, smooth, shining, whitish at apex, dark red-brown to blackish brown below, insititious.

Hyphae of cortical layer of pileus 8–25 μm wide, often spirally encrusted, sometimes diverticulate, mixed with hyaline, clavate to cylindric lobed or branched broom cells 18–24 × 4–6 μm. Cystidia 6–35 × 4–11 μm. Basidia with 4 or rarely 2 sterigmata. Basidiospores 7.2–9.0 × 3.0–5.2 μm (Fig. 63).

SPECIMENS EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1500 m, taiga, in litter, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28631, 28639; *ca* 5 km of Taehong-dan, taiga with *Larix*, on ground, 29 June 1986, *leg. W. Wojewoda*, KRAM-F 53229; shore of Samji-yon Lake (7), taiga, on needles, under *Larix*, 28 June 1986, *leg. H. Komorowska*, KRAM-F 28648; *ca* 30 km of Samji-yon town (8), forest with *Larix* and *Betula*, on fallen needles of *Larix*, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 51526; *ca* 25 km NW of Samji-yon, alt. *ca* 1700 m, taiga with *Larix* and *Picea*, on fallen needles under *Picea*, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28608; Ryongak-san Mt. (42), mixed forest, in litter, 16 July 1986, *leg. H. Komorowska*, KRAM-F 28312; Kumgang-san Mts: shore of Samil-po Lake (62), pine forest, on fallen needles under *Pinus densiflora*, 19 July 1986, *leg. H. Komorowska*, KRAM-F 28342.

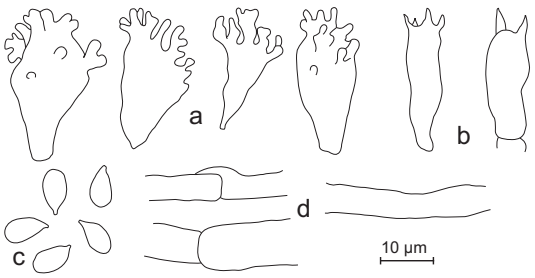


Fig. 63. *Setulipes androsaceus* (L.: Fr.) Antonín: a – cheilocystidia, b – basidia, c – basidiospores, d – hyphae of cortical layer of stipe (KRAM-F 28342).

DISTRUBUTION IN ASIA. China, Japan, Kazakhstan and Russia (e.g. Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 114); Antonín & Noordeloos (1993: 137; Fig. 44); Azbukina *et al*. (1984: 45); Breitenbach & Kränzlin (1991: 234, Pl. 277); Clemençon (1982a: 7); Gilliam (1976: 28, Figs 11–13); Imazeki & Hongo (1975, **2**: 31); Noordeloos (1995c: 146, Fig. 149); Syarzhanina (1994: 168); Vasilyeva (1973: 133, Fig. 29A).

Xerula radicata (Relh.: Fr.) Dörfelt

Mus. Gera Nat. **2–3**: 67. 1975.

Agaricus radicatus Relh., Fl. Cantabr. No. 1040. 1785. – *A. radicatus* Relh.: Fr., Syst. Mycol. **1**: 118. 1821. – *Collybia radicata* (Relh.: Fr.) Quél., Mém. Soc. Émul. Montbéliard, Sér. 2, **5**: 92.1871 (Champ. Jura Vosges 1). – *Oudemansiella radicata* (Relh.: Fr.) Singer, Lilloa **22**: 288. 1951 (‘1949’). For further synonyms see Boekhout (1999: 182).

Basidiocarp solitary. Pileus 50 mm in diam., plano-convex, fulvous buff, gelatinous, radially wrinkled or furrowed. Flesh thin, soft, elastic, white. Lamellae broad, rather thick, adnexed with tooth, white. Stipe 130 × 5 mm, cylindric, carilaginous, striato-sulcate, white at apex, lower part concolorous with pileus, elongate to fusiform root.

Hyphae of cortical layer of pileus inflated, clavate or vesicular, with brownish pigment, somewhat thick-walled, gelatinized. Hyphae of cortical layer of stipe cylindric, filamentous. Terminal elements at apex 35–110 × 14–32 μm, narrowly clavate. Clamps present. Cheilocystidia 50–130 × 13–25 μm, clavate and ventricose. Pleurocystidia 60–120 × 20–35 μm, broadly clavate. Basidia 52.0–56.4 × 9.6–14.4 μm, with 4 sterigmata. Basidiospores 12.2–16.8 × 7.2–9.6 μm, broadly elliptic to elongate-ovoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangown-am Monastery (19), alt. *ca* 400 m, forest with *Juglans*, on ground, 7 June 1985, *leg. B. Zarzycka*, KRAM-F 53345.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, Georgia, Japan and Russia (e.g. Primorski Krai).

REFERENCES. Anonymous (1978: 56; 1983a: 115); Boekhout (1999: 182); Breitenbach & Kränzlin (1991: 348, Pl. 450); Dörfelt (1979: 376; 1981: 645; 1983: 45); Imazeki & Hongo (1975, **1**: 34, Pl. 13: 69); Melik-Khachatrian (1980: 225); Vasilyeva (1973: 126).

Nidulariaceae Dumort. 1822

Cyathus stercoreus (Schwein.) De Toni

in Sacc. Syll. Fung. **7**: 40. 1888.

Nidularia stercorea Schwein., Trans. Amer. Phil. Soc. **4**: 253. 1824. For further synonyms see Bottomley (1948: 637).

Basidiocarp 5–15 mm high, *ca* 5 mm in diam., at apex, obconic, turbinate to campanulatae, covered with shaggy, woolly matted hairs, ochre-brown when young, then greyish. Inner surface smooth, even, not striate, dark greyish brown to nearly black. Peridioles *ca* 2 mm in diam., lenticular, blackish, smooth.

Hyphae without clamps. Hyphae of peridiole walls 2–4 μm wide. Generative hyphae 2.0–5.5 μm, thin-walled. Cystidia absent. Basidiospores 17–25 × 15–18 μm, globose, subglobose to broadly elliptic, smooth, hyaline, thick-walled, with granular contents.

SPECIMEN EXAMINED. Suian-san Mts (48), near little hospital in forest, alt. *ca* 200 m, hospital garden, plot with medicinal plants, on rich fertilized soil, probably on dung of herbivores, 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 27066.

DISTRIBUTION IN ASIA. China, India, Israel, Japan, Kazkhstan, and Russia (e.g. Far East).

NOTES. New to North Korea. Known also from Europe, North America, Africa, Australia and New Zealand.

REFERENCES. Bottomley (1948: 637, Pl. LXXVIII); Breitenbach & Kränzlin (1986: Pl. 495); Cunningham (1944: 206, Pls XXXII: 1–2; XXXVII: 9); Imazeki & Hongo (1975, **2**: 165, Pl. 55: 322); Pilát (1958a: 652, Figs 242–243); Shvartsman & Filimonova (1970: 271); Sosin (1973: 135, Fig. 85); Teng (1996: 514).

Cyathus striatus (Huds.) Willd.: Pers.

Syn. Meth. Fung. 237. 1801.

Peziza striata Huds., Fl. Angl. 634. 1762, ed. 2. 1778.

Basidiocarp 5–15 × 5–10 mm, cylindric to conic, turbinate, egg-shaped, conic to turbinate when young, specimens completely enclosed by the exoperidium, then with a whitish membranaceous operculum (epiphragm), attached to the substratum by mycelial strands. Upper surface hispid, tomentose, dark brown. Inner surface grey- to grey-brown, striate, with black peridioles 1.5–2.0 mm in diam.

Hyphae with clamps. Hyphae of peridioles 2.0–3.5 μm wide, smooth, hyaline, thin-walled, with clamps. Cystidia absent. Basidiospores 15.0–20.0 × 6.5–10.0 μm, elliptic, smooth, hyaline, thick-walled.

SPECIMEN EXAMINED. Suian-san Mts (48), alt. *ca* 200 m, mixed forest, on ground, among fallen leaves, 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 27846.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Iran, Japan, Kazakhstan, Korea, Russia (e.g. Siberia and Far East) and Turkey.

NOTES. Known also from Europe and North America.

REFERENCES. Anonymous (1978: 173; 1983a: 128); Azbukina *et al*. (1984: 60); Breitenbach & Kränzlin (1986: 380, Pl. 496); Eckblad (1976: 68); Imazeki & Hongo (1975, **2**: 166, Pl. 55; 323); Jahn (1979: 234, Pl. 210); Pilát (1958a: 656, Figs 243–246); Shvartsman & Filimonova (1970: 272, Fig. 107); Sosin (1973: 135, Fig. 84); Teng (1996: 514, Fig. 348); Ying *et al*. (1983: 170).

Pleurotaceae Kühner 1980

Hohenbuehelia angustata (Berk.) Singer

Lilloa **22**: 255. 1951 ('1949'), ss. Thorn & Barron 1986: 383.

Panus angustatus Berk., Lond. J. Bot. **6**: 318. 1847. – *Geopetalum angusastum* (Berk.) Murrill, North Americ. Fl. **9**(5): 300. 1916. – *Pleurotus petaloides* (Bull.: Fr.) Quél. var. *eupetaloides* Pilát for. *americana* Pilát, *Pleurotus*. Atl. Champ. Europe **2**: 90. 1935.

Basidiocarps solitary or in groups. Pileus 5–20 mm across, flabelliform or circular, sessile, laterally to dorsally attached, pruinose, near base with whitish strigose patch, white to buff or pale brown, darker with age. Flesh thin, up to 3 mm

thick. Lamellae narrow, buff to ashen-brown on drying. Stipe absent.

Hyphae of cortical layer of pileus 1.5–5.0 μm broad, gelatinous layer up to 250 μm thick. Metuloid pileocystidia 60.0–80.0 × 5.0–7.5 μm. Cheilocystidia 22–35 × 4–7 μm, numerous, fusoid to clavate or lageniform. Hymenial metuloids 39.5–55.8 × 6.0–8.5 μm. Basidia 22.0–28.0 × 4.5–6.5 μm, with 4 sterigmata. Basidiospores 4.7–6.3 × 3.2–4.7 μm (Figs 64 & 65).

SPECIMEN EXAMINED. Kumgang-san Mts: near Onjong-ryong Pass (54), alt. *ca* 800 m, forest, on deciduous wood, 16 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53256.

DISTRIBUTION. Known from Europe (Austria and Czech Republic) and North America (Canada, Mexico and United States).

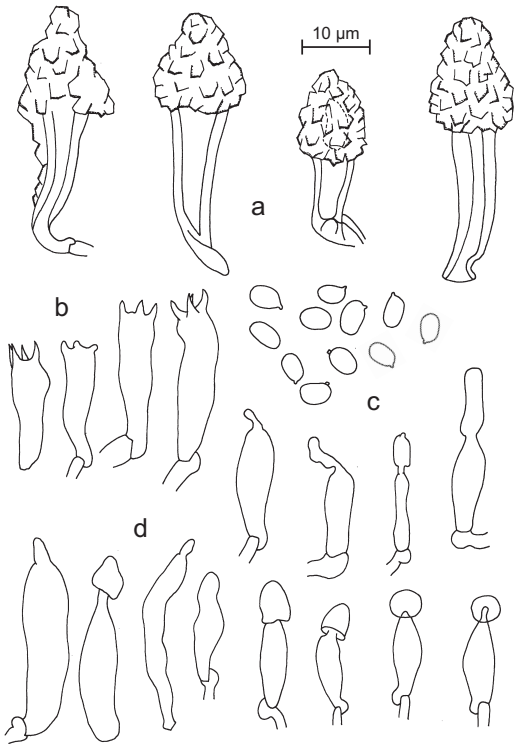


Fig. 64. *Hohenbuehelia angustata* (Berk.) Singer: a – hymenial metuloids, b – basidia, c – basidiospores, d – cheilocystidia (KRAM-F 53256).

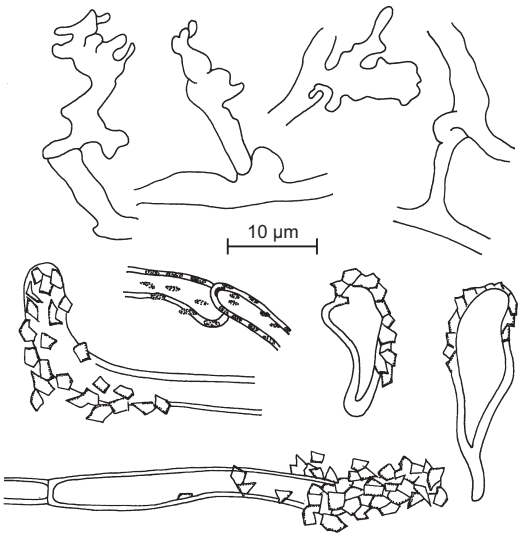


Fig. 65. *Hohenbuehelia angustata* (Berk.) Singer: hyphae of cortical layer of pileus and metuloid pileocystidia (KRAM-F 53256).

NOTES. New to North Korea.

REFERENCES. Antonín & Hausknecht (1993: 39, Fig. 1); Thorn & Barron (1986: 383); Vargas *et al*. (1993: 438, Figs 4–8).

Hohenbuehelia approximans (Peck) Singer

Lilloa **22**: 255. 1951 (‘1949’).

Pleurotus approximans Peck, Bull. N. Y. State Mus. **150**: 37. 1991. – *Resupinatus approximans* (Peck) Murrill, *in* Murrill *et al*., North Americ. Fl. **9**(4): 241. 1915.

Basidiocarps solitary or in small groups. Pileus up to 10 mm across, dimidiate to orbicular, sessile, attached dorsally or laterally, brown in centre, paling to buff on margin, base medium brown. Upper surface finely white-hispid. Flesh very thin. Lamellae radiationing from point of attachment, whitish to pale yellow. Stipe absent.

Hyphae of cortical layer of pileus 3–6 μm broad, cylindric, hyaline, repent or some of them ascending and forming small fascicles (3–4 hyphae), 25–65 × 4–6 μm, smooth or with pale amorphous-granular coating. Apex round. Hyphae of gelatinous zone 2.0–3.8 μm broad. Cheilocystidia 20.0–32.0 × 4.8–7.6 μm, fusoid-ventricose,

hyaline, apex with hour-glass cell or mucous ball. Hymenial metuloids (38.0–)58.0–77.0(–100.0) × 7.7–11.5 µm, broadly lanceolate, hyaline, with encrusted apices. Basidia 23.0–25.0 × 5.8–7.2 µm, slenderly clavate, with 4 sterigmata. Basidiospores 6.7–7.7(–9.7) × 2.9–3.8(–4.8) µm, elliptic-phaseoliform, smooth, hyaline, thin-walled, non-amyloid (Figs 66 & 67).

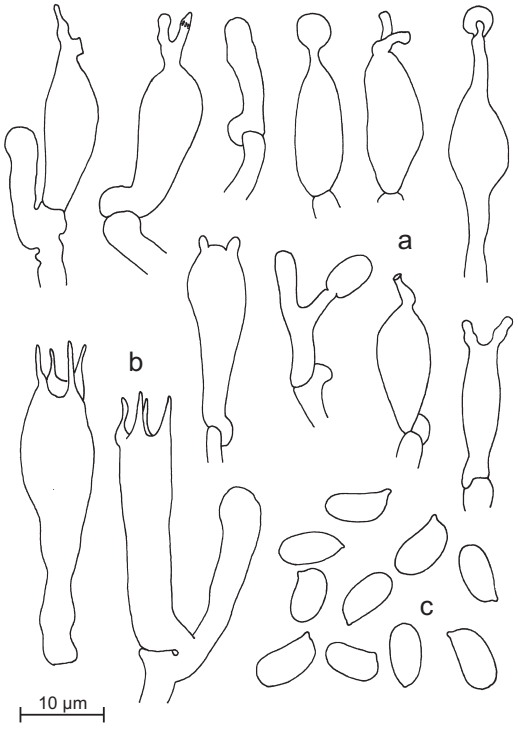


Fig. 66. *Hohenbuehelia approximans* (Peck) Singer: a – cheilocystidia, b – basidia, c – basidiospores (KRAM-F 53281).

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed taiga, on fallen dead trunk of ?deciduous tree, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 53281.

DISTRIBUTION. North America (Canada and United States).

NOTES. New to North Korea.

REFERENCES. Thorn & Barron (1986: 388, Fig. 17A–F).

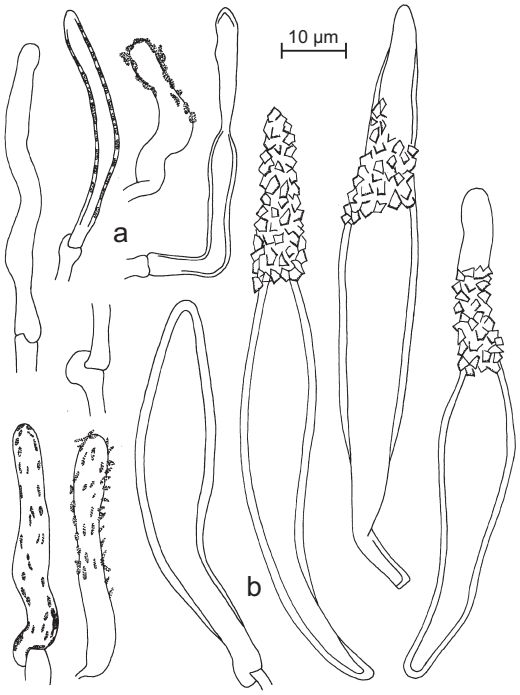


Fig. 67. *Hohenbuehelia approximans* (Peck) Singer: a – hyphae of cortical layer of pileus, b – hymenial metuloids (KRAM-F 53281).

Hohenbuehelia petalodes (‘*petaloides*’) (Bull.: Fr.) S. Schulz.

in S. Schulz., Kanitz & Knapp, Verh. Zool. Bot. Ges. Wien **16**: 45. 1866.

Agaricus petalodes Bull., Herb. Fr. **5**: 226. 1785. – *A. petalodes* Bull.: Fr., Syst. Mycol. **1**: 183. 1821. – *Hohenbuehelia geogenia* (DC. : Fr.) Singer, Lilloa **22**: 255. 1951(‘1949’). For further synonyms see Thorn & Barron (1986: 408).

Basidiocarps 20–70 × 25–50 mm, gregarious, petaloid, semiinfundibuliform. Pileus beige to pale brown, glabrous to finely pruinose. Margin inrolled. Flesh of pileus thin, white. Smell distinct, of meal or cucumber. Lamellae decurrent, very narrow, crowded, whitish, yellow-ochre when dry. Stipe 20–40 mm long, 6–11 mm thick, distinct, central or lateral, white, cream, in upper part concolorous with pileus. Flesh of stipe also white. Base of stipe with white rhizomorphs.

Hyphae of cortical layer of pileus 2–5 μm wide, with loose, vertical more or less hyaline hyphae sometimes ended with hour-glass cells. Gelatinous layer up to 300 μm thick. Pileocystidia metuloid 45–85 × 5–12 μm. Cheilocystidia fusoid-ventricose or lecythiform, capitate 20–35 × 5–8 μm. Hymenial metuloids 51.4–85.0 × 8.5–15.0 μm. Basidia 24–30 × 6–8 μm, with 4 sterigmata. Basidiospores 5.5–7.1 × 3.2–5.5 μm, elliptic to subglobose (Figs 68 & 69).

SPECIMEN EXAMINED. Myohyang-san Mts: near Pohyon Temple (16), lawn, on ground, among grass, 11 July 1986, *leg. W. Wojewoda*, KRAM-F 51392.

DISTRIBUTION IN ASIA. Japan, Mongolia and Russia (Siberia and Primorski Krai).

NOTES. New to North Korea. Known also from Europe, America (Canada, United States and Venezuela) and from New Zealand.

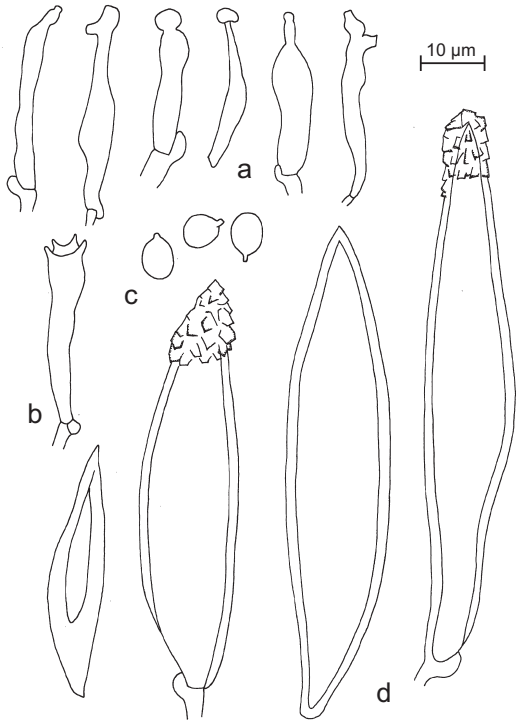


Fig. 68. *Hohenbuehelia petalodes* (Bull.: Fr.) S. Schulz.: a – cheilocystidia, b – basidium, c – basidiospores, d – hymenial metuloids (KRAM-F 51392).

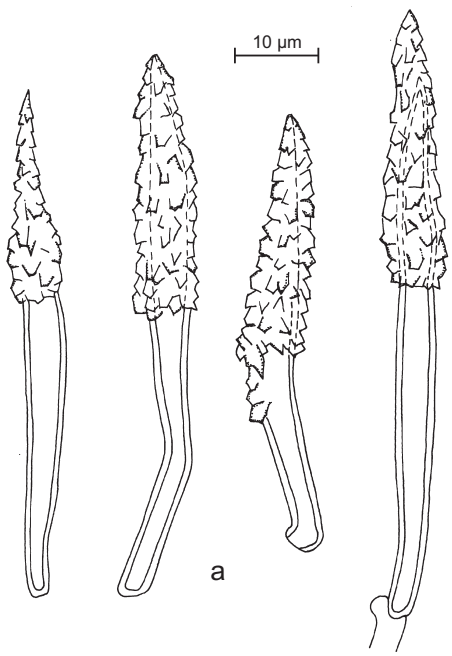


Fig. 69. *Hohenbuehelia petalodes* (Bull.: Fr.) S. Schulz.: a – metuloid pileocystidia (KRAM-F 51392).

REFERENCES. Breitenbach & Kränzlin (1991: 198, Pl. 223); Dähncke & Dähncke (1980: 219, as *H. petaloides*); Elborne (1995: 159, Fig. 164); Konrad & Maublanc (1937: Pl. 308); Malençon & Bertault (1975: 427); Michael *et al*. (1987: 252, Pl. 89, as *H. geogenia*); Singer (1951: 255); Thorn & Barron (1986: 408, Fig. 24A–M); Uranchimehg *et al*. (1983: 376); Vasilyeva (1973: 89, Fig. 16A).

Hohenbuehelia tremula (Schaeff.: Fr.) Thorn & Barron

Mycotaxon **25**: 414. 1986

Agaricus tremulus Schaeff., Fung. Bavariae **4**: 54. 1974 (illustrated without name, Schaeffer (1771: Pl. 224). – *Hohenbuehelia rickenii* Kühner *in* Kühner & Romagn., Fl. Anal. Champ. Sup. 70. 1953 (*nom. inval*.). For further synonyms see Thorn & Barron (1986: 414).

Basidiocarps solitary. Pileus 40–50 mm across, laterally stipitate, brown, finally rugose, viscous. Flesh thin, white to buff. Lamellae narrow, crowded, decurrent, dark yellow to buff. Stipe up to 15 mm long, lateral, with white rhizomorphs at base.

Hyphae of cortical layer of pileus 1.3–4.8 µm broad, repent, interwoven, smooth, with intracellular pigment 3.8–6.7 µm. Sometimes abundant ascending hyphae tipped with hour-glass cells, some with mucoid droplets. Cheilocystidia 20.0–35.0 × 4.2–7.5 µm, clavate-capitate, with hour-glass cells, commonly without mucoid ball, sometimes with 1 or 2 cylindric projections at tip. Hymenial metuloids 58–97(–116) × 10–23(–27) µm, hyaline. Basidia 20–25 × 5–7 µm. Basidiospores (5.8–)7.0–9.5 × 3.8–5.5 µm (Fig. 70).

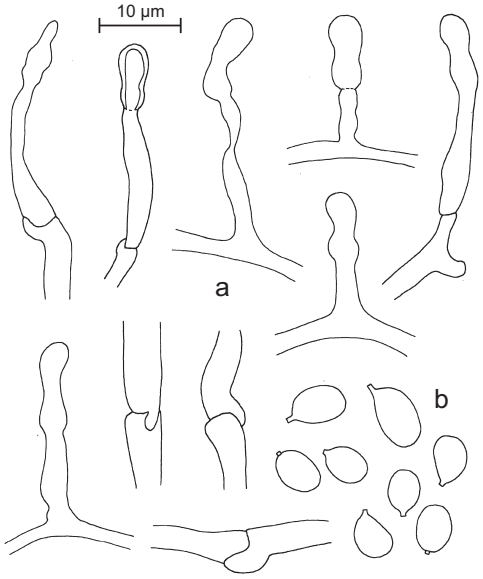


Fig. 70. *Hohenbuehelia tremula* (Schaeff.: Fr.) Thorn & Barron: a – hyphae of cortical layer of pileus, b – basidiospores (KRAM-F 28626).

SPECIMEN EXAMINED. Paekdu-san Mts: near Taehongdan (6), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, on ground, among mosses, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28626.

DISTRIBUTION. Europe and North America (Canada and United States).

NOTES. New to North Korea.

REFERENCES. Bresadola (1928: Pl. 292, as *Pleurotus geogenius*); Elborne (1995: 161); Thorn & Barron (1986: 414, Fig. 25A–L).

Pluteaceae Kotl. & Pouzar 1972, incl. Amanitaceae Heim *in* Pouzar 1983

Amanita caesarea (Scop.: Fr.) Pers.

Syn. Meth. Fung. 252. 1801.

Agaricus caesareus Scop., Fl. Carniol. **2**: 419. 1772. – *A. caesareus* Scop.: Fr., Syst. Mycol. **1**: 15. 1821.

Pileus up to 80 mm acrros, at first ovate-campanulate, then convex, finally plane, orange-chrome, some viscid, smooth. Margin acute, strongly striate. Flesh thin, whitish, yellow under cuticle. Smell pleasant. Taste mild. Lamellae up to 5 mm broad, free, yellow-citrine to pale gold-yellow. Stipe up to 70–150 × 10–30 mm, cylindric, solid to hollow, finely fibrillose-floccose, whitish, covered with floccose, yellow, citrine-yellow to gold-yellow scales. Annulus present, membranaceous, yellow, striate. Volva up to 65 mm long, up to 55 mm in diam., obtuse, white.

Hyphae of pileipellis 1–4 µm wide, smooth, hyaline, thin-walled, without clamps. Cystidia absent. Basidia 35–60 × 8–12 µm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 6.0–10.0 × 7.0–9.5 µm, broadly elliptic to subglobose, smooth, hyaline, thin-walled, with distinct apiculus. Spore-print white.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), 5 Aug. 1983, *leg. W. Wojewoda*, specimen not preserved; near Myohyang-san Hotel (20), under *Quercus mongolica*, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53112; near Habiro Temple, 6 Aug. 1983, *leg. W. Wojewoda*, specimen not preserved. – In deciduous forests, on ground.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (Primorski Krai).

NOTES. Known also from warm regions of Europe, North Africa, and southern part of North America.

REFERENCES. Anonymous (1978: 64; 1983a: 116); Breitenbach & Kränzlin (1995: 146, Pl. 145); Imazeki & Hongo (1975, **1**: 44, Pl. 17: 95); Michael *et al*. (1987: 168, Pl. 1); Teng (1996: 449); Wojewoda *et al*. (1993: 128) Ying *et al*. (1983: 139).

Amanita citrina (Schaeff.) Pers.

Syn. Meth. Fung. 251. 1801.

Agaricus citrinus Schaeff., Fl. Dan. 241. 1799. – *Amanita mappa* (Batsch) Quél., Champ. Jura Vosg. **1**: 98. 1872.

Pileus up to 50 mm in diam., white-yellow, convex. Upper surface covered with irregularly shaped, yellowish patches. Smell strongly reminiscent of raw potato. Lamellae white. Stipe 60 × 10 mm, enlarged toward the base, solid, white-yellow. Ring white.

Basidia 35–40 × 8–12 μm, clavate, with 4 sterigmata. Basidiospores 6.0–10.0 × 7.0–9.5 μm, subglobose, smooth, hyaline, thin-walled, with distinct apiculus. Spore-print white.

SPECIMENS EXAMINED. Myohyang-san Mts: near Habiro Temple (27), 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53113; shore of Soham-ho Lake (32), 8 Aug. 1984, *leg. W. Wojewoda*, KRAM-F 27889. – Mixed forests, on ground.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Japan, Kazakhstan, Korea, and Russia (Siberia).

REFERENCES. Anonymous (1983a: 116); Breitenbach & Kränzlin (1995: 146, Pl. 146); Doi (1991: 50); Imazeki & Hongo (1975, **1**: 46, Pl. 19: 104); Melik-Khachatrian (1980: 273); Syarzhanina (1994: 238).

Amanita fulva (Schaeff.) Pers.

Syn. Meth. Fung. 117. 1801.

Agaricus fulvus Schaeff., Fung. Bavar. **4**: 41. 1794. – *Amanitopsis fulva* (Schaeff.) Boud., Icon. Mycol. **1**: 9. 1905.

Pileus 40–70 mm across. Upper surface smooth, viscid, orange-brown. Margin obtuse, paler, translucent-striate. Flesh thin, white. Smell faint. Taste mild. Lamellae whitish, free, broad. Stipe cylindric, 70–100 × 5–10 mm, finely longitudinally fibrillose-floccose, whitish-cream toward apex, red-brown below. Ring absent. Volva red-brown, membranaceous.

Clamps absent. Basidia 45–60 × 12–18 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores oval, 9–12 μm. Spore-print white.

SPECIMEN EXAMINED. Pagyon Ravine (65), alt. *ca* 300 m, mixed forest, on ground, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53114.

DISTRIBUTION IN ASIA. Armenia, Caucasus, China, Japan, Kazakhstan, Russia (East and West Siberia, Far East).

REFERENCES. Anonymous (1983a: 117); Azbukina *et al.* (1984: 48); Breitenbach & Kränzlin (1995: 142, Pl. 139); Hansen & Knudsen (1992: 197, Fig. 349); Imazeki & Hongo (1975, **1**: 45, Pl. 18: 101); Melik-Khachatrian (1980: 273); Syarzhanina (1994: 233); Teng (1996: 451); Vasilyeva (1973: 160).

Amanita muscaria (L.: Fr.) Pers.

Tent. Disp. Meth. Fung. 67. 1797.

Agaricus muscarius L., Sp. Plant. Ed. 1. 1172. 1753. – *A. muscarius* L.: Fr., Syst. Mycol. **1**: 16. 1821.

Pileus 40–150 mm in diam., scarlet to orange, covered with white or yellowish fragments of volva. Margin slightly striate. Flesh white, yellow under the epidermis. Smell pleasant. Taste mild. Hymenophore lamellate. Lamellae white, free, crowded. Stipe 100–200 × 10–25 mm. Ring white, striate.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, mixed taiga, on ground, under *Betula platyphylla*, 3 Sept. 1983, *leg. W. Wojewoda*, specimen not preserved.

DISTRIBUTION IN ASIA. Caucasus, Kazakhstan, Korea, Mongolia, Russia (East and West Siberia and Far East).

NOTES. This species is widely distributed throughout the northern temperate regions (Europe, North America and Asia), also known from Australia. It has been introduced into Malawi (Africa) with conifer plantations.

REFERENCES. Anonymous (1983a: 116); Azbukina *et al.* (1984: 48); Breitenbach & Kränzlin (1995: 150, Pl. 152); Hansen & Knudsen (1992: 196); Imazeki & Hongo (1975, **1**: 44, Pl. 17: 97); Michael *et al.* (1983a: 146, Pl. 8); Morris (1990: 344); Syarzhanina (1994: 236); Uranchimehg *et al.* (1983: 376); Vasilyeva (1973: 157; 1978; 147, Pl. 104).

Amanita pantherina (DC.: Fr.) Krombh.

Naturg. Abbild. T. 29, Fig. 10–13. 1836.

Agaricus pantherinus DC., Flore Fr. **6**: 52. 1815. – *A. pantherinus* DC.: Fr., Syst. Mycol. **1**: 16. 1821.

Pileus 50–80 mm in diam., at first hemispherical, then convex. Upper surface brown, covered with whitish remnants of veil. Flesh white. Smell unpleasant. Taste insipid. Lamellae white, broad, free. Stipe 70–80 × 10–15 mm, cylindric, solid when young, hollow when old, white, with bulbous base. Volva white, forming 1 or 2 concentric rings at apex of globose base of stipe. Annulus membranous, white, upper surface smooth, not striate.

Hyphae of pileipellis 1.5–5.0 μm, hyaline, smooth, thin-walled, some with clamps. Cystidia (marginal cells cystidiole-like) cylindric-vesiculose, up to 12 μm, in diam. Basidia 35.0–48.0 × 8.0–11.5 μm, clavate, with 4 sterigmata, some with basal clamp. Basidiospores 10–12 × 7–8 μm, elliptic to oval, smooth, hyaline, thin-walled. Spore-print white.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53115; Kumgang-san Mts: below Onjong-ryong Pass (54), alt. *ca* 750 m, 16 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53116. – Mixed forests, on ground.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Kazakhstan, Korea and Russia (Primorski Krai).

REFERENCES. Anonymous (1983a: 117); Azbukina *et al*. (1984: 48); Breitenbach & Kränzlin (1995: 150, Pl. 153); Hansen & Knudsen (1992: 196, Fig. 351); Imazeki & Hongo (1975, **1**: 44, Pl. 17: 96); Melik-Khachatrian (1980: 274); Syarzhanina (1994: 236); Teng (1996: 450); Vasilyeva (1973: 158; 1978: 149, Pl. 109); Wen & Sun (1999: 363).

Amanita phalloides (Fr.) Link

in Willd., Grundr. Krauterk. **4**: 272. 1833.

Agaricus phalloides Fr., Syst. Mycol. **1**: 13. 1821.

Pileus *ca* 100 mm in diam., ovate-campanulatae. Upper surface greenish to yellowish olive, viscid, smooth, without fragments of volva. Flesh white. Smell foetid when old. Taste unpleasant. Hymenophore lamellate. Lamellae white, free, ventricose. Stipe 80–100 × 10–15 mm, white, with bulbous base. Ring membranaceous, white, slightly striate on upper surface. Volva at first white, then greyish, splitting into 3 or 4 acute segments.

Hyphae of pileipellis 1–5 μm wide, hyaline, thin-walled, without clamps. Marginal cells 25–40 × 10–20 μm. Basidia 45.0–55.0 × 11.0–13.5 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 7.5–10.0 × 6.5–9.5 μm, subglobose, ovoid to broadly elliptic, smooth, hyaline, thin-walled, with a large central oil-drop. Spore-print white.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, deciduous forest, on ground, under *Quercus mongolica*, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53118.

DISTRIBUTION IN ASIA. Armenia, Azarbaijan, China, Georgia, Japan, Kazakhstan, Kirghizia, Korea and Russia (Siberia and Primorski Krai).

NOTES.This species is widely distributed throughout northern temperate regions (Europe, North America and Asia).

REFERENCES. Anonymous (1983a: 116); Breitenbach & Kränzlin (1995: 152, Pl. 154); Imazeki & Hongo (1975, **1**: 44, Pl. 17: 98); Melik-Khachatrian (1980: 275); Michael *et al*. (1983a; 134, Pl. 1); Syarzhanina (1994: 239); Teng (1996: 448, Fig. 305); Vasilyeva (1973: 158; 1978: 148, Pl. 105); Wen & Sun (1999: 362).

Amanita rubescens (Pers.: Fr.) Gray

Nat. Arr. Brit. Pl. **1**: 600. 1821.

A. rubescens Pers., Syn. Meth. Fung. 254. 1801. – *Agaricus rubescens* Pers.: Fr., Syst. Mycol. **1**: 18. 1821.

Pileus 80–100 mm in diam. Upper surface reddish brown, covered with large, grey, white or yellowish mealy patches of volva. Margin slightly striate when old. Flesh white, becoming reddish when broken. Taste sweet, then acrid. Lamellae white, then spotted with red. Stipe 70–100 × 10–20 mm, reddish white, with bulbous base. Ring white, membranaceous, soft, striate. Volva evanescent.

Hyphae of pileipellis 1–3 μm wide, smooth, hyaline, thin-walled, without clamps. Cheilocystidia 15.0–28.0 × 9.5–17.5 μm, broadly clavate to vesicular, smooth, hyaline, thin-walled. Basidia 35.0–40.0 × 8.5–11.5 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 8–10 × 6–7 μm, ovoid to elliptic, smooth, hyaline, thin-walled, with 1–2 oil-drops. Spore-print white.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), deciduous forest with *Quercus mongolica* + *Pinus densiflora*, 5 Aug. 1984, *leg*. *W. Wojewoda*, KRAM-F 53119; Kumgang-san Mts: near Kuryong Falls (59), alt. *ca* 700 m, mixed forest, 14 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53120; shore of Samil-po Lake (62), alt. *ca* 100 m, pine forest with *Quercus mongolica*, under *Pinus densiflora*, 13 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53118. – On ground.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, Georgia, Kazakhstan, Korea and Russia (Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 117); Azbukina *et al*. (1984: 48); Breitenbach & Kränzlin (1995: 154, Pl. 157); Imazeki & Hongo (1975, **1**: 46, Pl. 19: 105); Melik-Khachatrian (1980: 277); Syarzhanina (1994: 240); Teng (1996: 450); Vasilyeva (1973: 158).

Amanita spissa (Fr.) P. Kumm.

Führ. Pilzk. 138. 1871.

Agaricus spisus Fr., Epicr. Syst. Mycol. 9. 1838. – *Amanita excelsa* (Fr.) Quél., Champ. Jura Vosg. **1**: 68. 1872.

Pileus 80–140 mm in diam. Upper surface reddish to brownish grey, covered with mealy, fugacious patches of volva. Flesh white, soft, fragile. Margin often finely striate. Lamellae white, free, broad, ventricose. Stipe 100–150 × 10–20 mm, greyish, often bulbous at base. Ring white, large. Volva whitish grey.

Hyphae of pileipellis 1.5–4.5 μm, smooth, hyaline, thin-walled, without clamps. Cheilocystidia 18–28 × 9–22 μm, vesicular to clavate, smooth, hyaline, thin-walled. Basidia 30.0–45.0 × 7.5–10.0 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 8–9 × 7–8 μm, broadly elliptic to subglobose, smooth, hyaline, thin-walled, with oil-drops. Spore-print white.

SPECIMEN EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100 m, deciduous forest, on ground, 4 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53121.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Japan, Korea, Kazakhstan and Russia (Siberia and Far East).

REFERENCES. Anonymous (1983a: 117); Breitenbach & Kränzlin (1995: 148, Pl. 149); Imazeki & Hongo (1975, **2**: 38); Melik-Khachatrian (1980: 277); Michael *et al*. (1983a: 142, Pl. 6); Syarzhanina (1994: 238); Teng (1996: 450); Vasilyeva (1973: 157); Wen & Sun (1999: 363).

Amanita vaginata (Bull.: Fr.) Vittad.

Tent. Mycol. Amanitarum **3**: 126. 1826.

Agaricus vaginatus Bull., Champ. Fr. 664. 1812. – *A. vaginatus* Bull.: Fr. Syst. Mycol. **1**: 14. 1821. – *Amanitopsis vaginata* (Bull.: Fr.) Roze, Bull. Soc. Bot. Fr. **23**: 111. 1876.

Pileus 30–70 mm in diam., ovoid to cylindric when young, then convex to plane with distinct umbo. Upper surface smooth, mouse grey. Margin obtuse, deeply striate. Flesh white, thin. Smell absent. Taste mild, pleasant. Lamellae white or greyish, free, ventricose. Stipe 100–120 × 10–15 mm, white or grey, floccose. Ring absent. Volva large, free, often lobed.

Hyphae of pileipellis 1.0–5.5 μm wide, smooth, hyaline, thin-walled, without clamps. Basidia 45–58 × 10–18 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 10–12 μm in diam., globose, smooth, hyaline, thin-walled, with a large central oil-drop. Spore-print white.

SPECIMENS EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest with *Pinus densiflora* and *Quercus mongolica*, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52123; Kumgang-san Mts: shore of Samil-po Lake (62), pine forest with *Quercus mongolica*, under *Pinus densiflora*, 13 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53122. – On ground.

DISTRIBUTION IN ASIA. Caucasus, China, Kazakhstan, Korea, Russia (East and West Siberia and Far East).

REFERENCES. Anonymous (1983a: 116); Azbukina *et al.* (1984: 49); Breitenbach & Kränzlin (1995: 144, Pl. 144); Gorbunova (1997: 17); Hansen & Knudsen (1992: 197); Imazeki & Hongo (1975, **1**: 45, Pl. 18: 101); Melik-Khachatrian (1980: 273); Syarzhanina (1994: 234); Teng (1996: 451, Fig. 306); Vasilyeva (1973: 160; 1978: 150, Pl. 111); Wen & Sun (1999: 363).

Pluteus atricapillus (Batsch) Fayod

Annls Sci. Nat. Bot., sér. VII, **9**: 364. 1889.

Agaricus atricapillus Batsch, Elench. Fung. Contin. **1**: 77. 1786. – *A. cervinus* Schaeff., Fung. Bavariae **4**: 6. 1774. – *Pluteus cervinus* (Schaeff.) P. Kumm., Führ. Pilzk. 99. 1871.

Pileus 60–90 mm broad, hemispherical. Upper surface brown, at centre appressedly squamulose. Lamellae fairly crowded, up to 10 mm broad, pink. Flesh with faintly raphanoid-potato-like smell. Taste mild. Stipe 70–95 × 3–15 mm, solid, smooth, with grey-black longitudinal fibrils on whitish backround.

Hyphae without clamps. Pleurocystidia 77.0–106.0 × 10.5–27.0 µm, with thick wall 2.0–3.8 µm, narrowly fusiform, walls in upper part up to 3 µm thick, with 2–5 acute hooks at apex, projecting 40–50 µm. Basidia 20.0–35.0 × 6.0–8.5 µm, cylindric to clavate, with 4 sterigmata, without basal clamp. Basidiospores 5.8–9.7 × 3.8–6.7 µm, broadly elliptic to ovoid, smooth, thin-walled, non-amyloid. Spore-print pinkish.

SPECIMENS EXAMINED. Paekdu-san Mts, *ca* 10 km NE of Samji-yon town (8), alt. *ca* 1500 m, taiga with *Betula*, *Larix* and *Picea*, on stump, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28466; Pagyon Ravine (65), deciduous forest, on stump, 26 July 1986, *leg. H. Komorowska*, KRAM-F 28263.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Japan, Kazakhstan, Korea, Russia (North Altai, Siberia, Primorski Krai and Sakhalin).

REFERENCES. Anonymous (1983a: 117); Azbukina *et al.* (1984: 49); Breitenbach & Kränzlin (1995: 118, Pl. 104); Gorbunova (1997: 17); Imazeki & Hongo (1975, **1**: 47, Pl. 20: 110); Jahn (1979: 208, Pl. 183); Melik-Khachatrian (1980: 285); Mukhin (1993: Tab. 1); Syarzhanina (1994: 224); Teng (1996: 456); Vasilyeva (1973: 164); Vellinga (1990: 35, Fig. 16).

Pluteus hispidulus (Fr.: Fr.) Gill.

Hyménomyc. 391. 1876.

Agaricus hispidulus Fr., Observ. Mycol. **2**: 97. 1818. – *A. hispidulus* Fr.: Fr., Syst. Mycol. **1**: 201. 1821.

Pileus 20 mm in diam., hemispherical, conic to applanate, with umbo. Upper surface dark brown-grey, covered with silvery grey squamules. Margin non-striate or slightly striate. Flesh thin, white. Smell none. Taste absent. Lamellae crowded, ventricose, at first white, then pink. Stipe 45 × 2 mm, cylindric with slightly thickened base, solid, silvery white, fibrillose.

Pileipellis with cylindric or fusoid cells 10–20 µm wide, with pale brown intracellular pigment. Cheilocystida 15–50 × 10–15 µm, inflated clavate, smooth, hyaline, thin-walled. Basidia 15.0–25.0 × 6.0–8.5 µm, clavate, with 4 sterigmata. Basidiospores 5.8–7.7 × 4.8–5,8 µm, broadly elliptic, elliptic or subglobose, thin-walled, smooth, non-amyloid. Spore-print pink.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), forest, on stump, 13 July 1986, *leg. H. Komorowska*, KRAM-F 28509.

DISTRIBUTION IN ASIA. Russia (Siberia and Far East: Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 49); Hansen & Knudsen (1992: 201); Syarzhanina (1994: 225); Vasilyeva (1973: 166); Vellinga (1990: 39, Fig. 20).

Pluteus podospileus Sacc. & Cub.

in Sacc., Syll. Fung. **5**: 672. 1887

– for. ***minutissimus*** (Maire) Vellinga

in Vellinga & Schreurs, Persoonia **12**: 362. 1985.

P. minutissimus Maire, Publicions Inst. Bot., Barcelona **3**: 94. 1937.

Pileus 20 mm broad, brown-blackish, with velvety scales. Stipe 20 × 2 mm, in lower part with minutely dark brownish scales. Cheilocystidia abundant, up to 90 µm long, 14.5–32.0 µm wide, clavate or fusoid, hyaline, thin-walled.

Pileipellis mixed, consisting of fusoid and

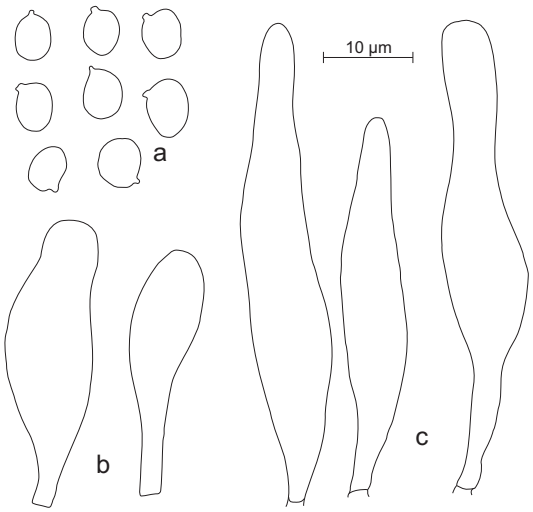


Fig. 71. *Pluteus podospileus* (Fr.: Fr.) Fr.: a – basidiospores, b – cheilocystidia, c – pleurocystidia (KRAM-F 28149).

spheropedunculate cells up to 23 µm broad. Basidiospores 5.8–7.7 × 4.8–5.8 µm, small, broadly elliptic, subglobose or globose, hyaline, smooth, thin-walled, non-amyloid (Fig. 71).

SPECIMENS EXAMINED. Near Sokdamgukok (47), forest, on stump, 7 July 1986, *leg. H. Komorowska*, KRAM-F 27923; Suian-san Mts (48), alt. *ca* 250 m, mixed forest, on stump, 7 June 1986, *leg. Z. Heinrich*, KRAM-F 28149.

DISTRIBUTION IN ASIA. Russia (Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 128, Pl. 118); Hansen & Knudsen (1992: 203, Fig. 377); Vasilyeva (1973: 166, Fig. 40B); Vellinga (1990: 45, Fig. 46).

Pluteus umbrosus (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 98. 1871.

Agaricus umbrosus Pers., Ic. Descr. Fung. **1**: 8. 1798. – *A. umbrosus* Pers.: Fr., Syst. Mycol. **1**: 200. 1821.

Pileus 20–40 mm broad, conic-campanulate to plane, covered with dark brown fibrillose scale on a brown background, with broad veins radiating and narrowing towards margin. Lamellae pink-browne, with black-brown-floccose edges. Stipe 30–40 mm long, 3–4 mm wide, with brown squamules.

Pileipellis hymeniderm of narrowly fusiform to narrowly clavate elements, 60–150 × 10–12 µm, rounded at apex. Basidiospores 4.8–7.5 × 3.8–5.8 µm, broadly elliptic or subglobose, smooth, hyaline, thin-walled, pink-brown in mass, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), mixed forest, on stump, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 27889.

DISTRIBUTION IN ASIA. Russia (Siberia and Far East: Primorski Krai).

NOTES. New to North Korea. A species known from the temperate zone of the Northern Hemisphere.

REFERENCES. Breitenbach & Kränzlin (1995: 134, Pl. 127); Syarzhanina (1994: 226); Vasilyeva 1973: 168); Vellinga (1990: 43, Fig. 23).

Schizophyllaceae Quél. 1888

Schizophyllum commune Fr.: Fr.

Syst. Mycol. **1**: 330. 1821.

S. commune Fr., Obs. Mycol. **1**: 103, 1815. For further synonyms see Pegler (1986: 12).

Basidiocarp effused-reflexed to pileate, pleurotoid, flabellifom or reniform, sessile or with a short, lateral stem-like base. Margin incurved. Upper surface greyish to white, tomentose to strigose. Flesh brownish, becoming whitish.

Hymenophore lamellate. Lamellae radiating from base, fuscous-grey, then purplish or whitish, splitting and revolute at edge, narrow. Hyphal system monomitic. Hyphae 3.6–9.6 µm wide, smooth, hyaline, thin- to thick-walled, with clamps. Cystidia absent. Basidia 18.0–21.0 × 4.8 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 3.6–6.0 × 1.8–2.4 µm, cylindric, straight or curved, smooth, hyaline, thin-walled, non-amyloid (Fig. 72).

SPECIMENS EXAMINED. Paekdu-san Mts: between Mubong (3) and Taehong-dan (6), alt. *ca* 1200 m, taiga, on fallen twigs of *Betula platyphylla*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28933; near Taehong-dan, alt.

ca 1300 m, near basalt mount, mixed taiga, on fallen twigs of deciduous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28932; alt. *ca* 1500 m, taiga with *Larix olgensis*, 29 June 1986, *leg. Z. Heinrich*, KRAM-F 27912; near Neagok village (13), alt. *ca* 800 m, mixed forest, 27 June 1986, *leg. Z. Heinrich*, KRAM-F 27876, 27880, 27882; Hyesan town (15), bank of Amnok-gang River, alt. *ca* 1000 m, park, on living trunk of *Picea koraiensis*, 7 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28931; Myohyang-san Mts: near Sangwon-am Monastery (19), mixed forest, 13 July 1986, *leg. Z. Heinrich*, KRAM-F 27939; alt. *ca* 500 m, forest with *Quercus mongolica*, on trunk of deciduous tree, 8 June 1985, *leg. B. Zarzycka*, KRAM-F 27785; Hyang-san River Valley, near Myohyang-san Hotel (20), mixed forest, on fallen twigs, 11 July 1986, *leg. W. Wojewoda*, KRAM-F 28926; shore of Soham-ho Lake (32), mixed forest with *Pinus densiflora*, on fallen twigs of ?*Pinus densiflora*, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28920; on stumps and fallen twigs of deciduous trees, 7 July 1986, *leg. W. Wojewoda*, KRAM-F 28922; Pyongyang town: Taesong-san Mts: below Chujak Mt. peak (35), forest park with *Pinus densiflora* and *Quercus mongolica*, on trunk of *Pinus densiflora*, 29 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28908; on fallen twigs of deciduous tree, 26 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28906; Central Botanical Garden (36), on living trunk of *Ailanthus* sp., 9 July 1986, *leg. W. Wojewoda*, KRAM-F 28914; on stump of deciduous tree, 3 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28909; on fallen and hanging dead twigs of *Juglans mandshurica*, 7 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28910, 9 July 1986, *leg. Z. Heinrich*, KRAM-F 27928; on stump of *Albizia*, 9 July1986, *leg. W. Wojewoda*, KRAM-F 28912; Moranbong Park (38) on living *Albizia*, 15 July 1986, *leg. W. Wojewoda*, KRAM-F 28911; on *Pinus* sp., 15 July 1986, *leg. W. Wojewoda*, KRAM-F 28907; on living *Prunus* sp. trunk, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28913; Taedong-gang Pleasure Park (40), right bank of Taedong-gang River, on living and dead trunks of *Salix babylonica*, 1 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28916; on twig of *Pinus densiflora*, 12 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28915; Ryongak-san Mt. (42), alt. *ca* 200 m, in forest with *Quercus*, on fallen twigs of

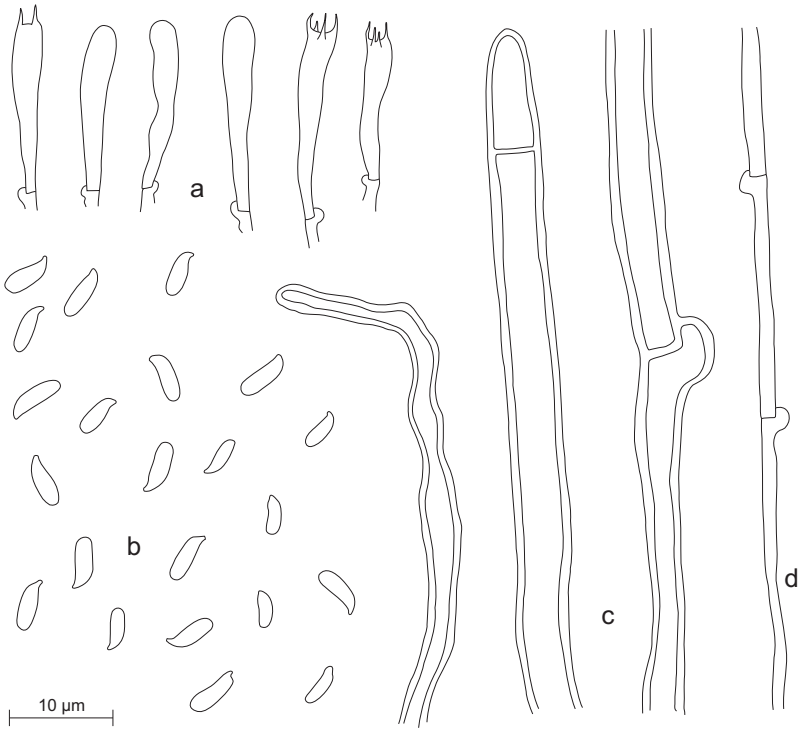


Fig. 72. *Schizophyllum commune* Fr.: Fr.: a – basidia, b – basidiospores, c – thick-walled hyphae, d – thin-walled hyphae (KRAM-F 28911).

deciduous tree, 20 June 1985, *leg. B. Zarzycka*, KRAM-F 28925; alt. *ca* 250 m, mixed forest with *Quercus mongolica* and *Pinus densiflora*, on fallen dead deciduous twig, 16 July 1986, *leg. W. Wojewoda*, KRAM-F 28253; shore of Taesong-ho Lake (43), alt. *ca* 80 m, on fallen twigs of *Populus davidiana*, 23 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28918; Nampo (44), park, on living trunk of *Albizia*, 25 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28917; Sariwon town (45), at street, on fallen twigs of deciduous tree, 5 July 1986, *leg. W. Wojewoda*, KRAM-F 28921; Sokdamgukok (47), 7 July 1986, *leg. Z. Heinrich*, KRAM-F 28924; Suian-san Mts (48), alt. *ca* 150 m, mixed forest, on stump of *Pinus densiflora*, 26 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28922; deciduous forest, on fallen twigs of *Fraxinus rhynchophylla*, 5 July 1986, *leg. W. Wojewoda*, KRAM-F 28923; deciduous forest with *Acer ginnala*, *A. mono*, *Aralia elata*, *Carpinus cordata*, *C. laxiflora*, *Fraxinus mandshurica*, *Magniolia sieboldii*, *Quercus aliena*, *Q. glandulifera*, *Q. mongolica*, *Q. serrata*, *Ulmus davidiana*, *Viburnum pubinerve*, 14 June 1985, *leg. B. Zarzycka*, KRAM-F 27772; deciduous forest, on fallen twigs of deciduous tree, 15 June 1985, *leg. B. Zarzycka*, KRAM-F 53135; Kumgang-san Mts: near Manmulsang Rocks peak (55), alt. *ca* 900 m, mixed forest, on fallen twigs of deciduous tree, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 28930; near Chonson-dae Rock (57), alt. *ca* 900 m, mixed forest, on fallen twigs, 18 July 1986, *leg. W. Wojewoda*, KRAM-F 28928; near Myonggyong-dae Rock (58), alt. *ca* 900 m, mixed forest, on fallen dead trunk of *Fraxinus rhynchophylla*, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28927; near Onjong-ri village (60), forest with *Pinus densiflora*, on fallen twigs, 21 July 1986, *leg. W. Wojewoda*, KRAM-F 28929; Pagyon Ravine (65), alt. *ca* 300 m, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28185.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Iran, Japan, Kazakhstan, Kirghizia, Korea, Malaysia, Mongolia, Russia (Siberia and Primorski Krai), Sri Lanka, Turkey and Turkmenistan.

NOTES. An extremely widespread species found virtually throughout the world: North and South America, Australasia, Indonesia, Europe, as well as throughout tropical Africa.

REFERENCES. Anonymous (1978: 37; 1983a: 112); Azbukina *et al*. (1984: 42); Bondartseva & Parmasto (1986: 176); Breitenbach & Kränzlin (1991: 318, Pl. 404); Ginns & Lefebvre (1993: 138); Hjortstam *et al*. (1990: 318); Imazeki & Hongo (1975, **1**: Pl. 30: 61); Kotlaba (1976: 158); Melik-Khachatrian (1980: 262); Morris (1990: 337); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 34); Pegler (1986: 12); Teng (1996: 423, Fig. 295); Uranchimehg *et al*. (1983: 375); Vasilyeva (1973: 94); Wen & Sun (1999: 366); Wojewoda *et al*. (1993: 128); Ying *et al*. (1983: 122, Pl. 21: 1–3).

Strophariaceae Singer & A. H. Sm. 1946

Pholiota adiposa (Batsch: Fr.) P. Kumm.

Führ. Pilzk. 83. 1871.

Agaricus adiposus Batsch, Elench. Fung. Contin. **1**: 147. 1786. – *A. adiposus* Batsch: Fr., Syst. Mycol. **1**: 242. 1821. – *Pholiota aurivella* var. *abietis-nordmannianae* Singer, Beih. Bot. Centralblatt 46 Abt.2: 108. 1930. – *Ph. lilacifolia* P.D. Orton, Kew Bull. 31(3): 719. 1977. For further synonyms see Holec (2001: 40).

Pileus 50–100 mm, hemispherical, expanding, then convex with broad umbo, yellow to ochre-yellow covered with abundant upraised or appressed reddish brown, gelatinous squamules, veil light yellow, fibrillose in young specimens. Context light yellow, firm, thick. Smell indistinct, taste mild. Lamellae crowded, broadly adnate, subventricose, cream, cinnamon-brown to dark rust-brown, edge concolorous, smooth to slightly crenate. Stipe 50–90 × 10–20 mm, cylindrical, attenuated towards the base, whitish, pale yellow, becoming reddish brown towards base, with fibrillose annuliform zone, covered with reddis brown squamules.

Pileipellis an ixocutis, upper layer thin, of narrow (1.2–3.5 μm broad) cylindrical hyphae, middle layer thick, gelatinous, of parallel to slightly flexuose hyphae 3.0–9.0 μm broad, with yellow membranal pigment and yellow incrustations, lower layer of densely arranged, cylicdrical, 3.0–10.0 μm broad hyphae with yellow brown incrusted walls. Clamp-connections present. Cheilocystidia 20.0–45.0 × 5.0–15.0 μm, cylindric, clavate, to broadly clavate, thin walled, hyaline, rarely with yellow inclusion. Pleurocystidia (chrysocystidia) 30–49 × 7–11 μm, numerous, clavate, clavate-mucronate with yellow pigment. Basidia 20.0–30.0 × 7.0–9.4 μm, narrowly clavate, 4-sterigmata. Basidiospores 6.9–9.5 × 4.3–5.6 μm, el-

lipsoid, thick walled, ochre brown, with distinct germ-pore. Spore print rust brown.

SPECIMEN EXAMINED. Wonsan town (50), pine forest, on dead wood, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 50405.

DISTRIBUTION IN ASIA. Armenia, China (Tibet), Kazakhstan, Korea, Russia (Siberia, North Altai and Primorski Krai) and Turkmenistan.

REFERENCES. Anonymous (1983a: 120); Breitenbach & Kränzlin (1995: 330, Pl. 421 as *Pholiota cerifera*); Holec (2001:40, Pl. 2, 3, p. 43, fig. 3); Marchand (1980: 182, Fig. 589 (as *Pholiota aurivella*); Ryman & Holmĺsen (1984: 457, as *Pholiota aurivella*) Syarzhanina (1994: 324).

Pholiota lignicola (Peck) Jacobsson

Mycotaxon **36**: 138. 1989.

Agaricus lignicola Peck, N. Y. State Cab. Rep. **23**: 91. 1872. – *Agaricus vernalis* Peck, N. Y. State Cab. Rep. **23**: 91. 1872. – *Kuehneromyces lignicola* (Peck) Redhead, Sydowia **37**: 247. 1984. – *K. vernalis* (Peck) Singer & A. H. Sm., Mycologia **38**: 514. 1946. – *Pholiota vernalis* (Peck) A. H. Sm. & Hesler, N. Amer. Spec. *Pholiota*. 118. 1968. – *Galerina myriadophylla* P. D. Orton, Notes R. Bot. Gdn Edinburgh **29**: 101, Figs a, d, k. 1969.

Pileus 10–45 mm, conic, conico-convex to plano-convex, sometimes obtusely umbonate, hygrophanous, cinnamon or yellowish brown when moist, pale yellow or cream when dry, margin strongly striate when moist, smooth, acute. Context thin, watery brownish. Smell faintly fungous, taste mild, not distinctive. Lamellae crowded, narrow, adnate-decurrent or adnate, ochraceous, later dark red-brown, edge paler, flocculose. Stipe 25–60 × 1–4 mm, cylindric, surface smooth or slightly fibrillose, dark red to umber brown, with a fugacious membranous annulus, apex whitish pruinose, base white tomentose.

Pileipellis a cutis of filamentous, branched hyphae, encrusted pigmented, sometimes slightly gelatinized. Clamps present. Cheilocystidia 25–47 × 6–11 µm, lageniform, fusiform, with subcapitate or irregularly nodulose apex. Pleurocystidia absent. Basidia 17.0–25.0 × 5.6–7.0 µm, cylindric to clavate, with 4 sterigmata. Basidiospores 6.0–7.5 × 3.8–4.5 µm, ovoid, subelliptic, smooth, yellow-brown, thick-walled, with small germ-pore. Spore-print rusty brown (Fig. 73).

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 25 km N of Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix*

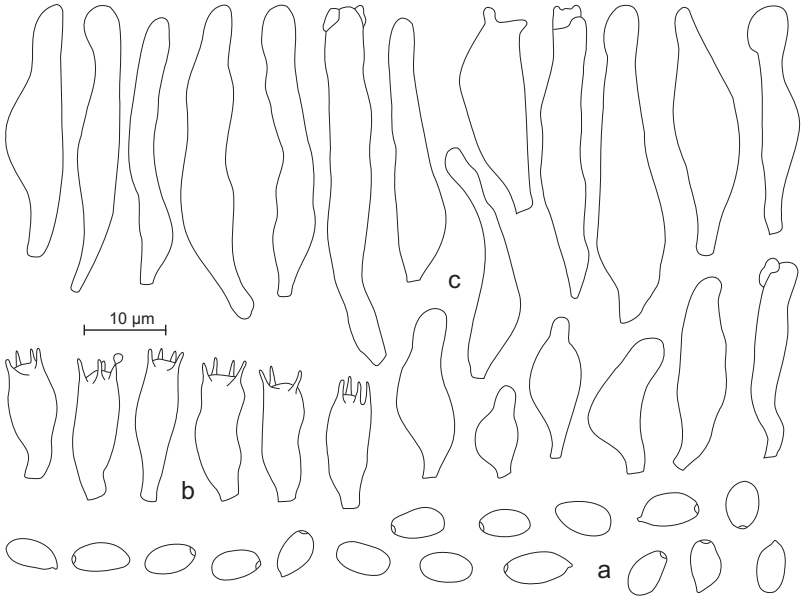


Fig. 73. *Pholiota lignicola* (Peck) Jacobsson: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 28069).

and *Picea*, 30 June 1986, *leg. Z. Heinrich*, KRAM-F 28069, 28076, 28079; Chongbong Mt. (9), alt. *ca* 1300 m, rich taiga with *Larix* and *Betula*, 1 July 1986, *leg. Z. Heinrich*, KRAM-F 28096. – On rotten wood.

DISTIRIBUTION. Reported from Europe, Asia and North America.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 336, Pl. 430); Favre (1960: 544, Fig. 92, as *Kuehneromyces vernalis*); Jacobsson (1990: 58, figs 41, 42); Noordeloos (1999: 106); Orton (1969: 101, Fig. 7a, d, k., as *Galerina myriadophylla*); Redhead (1984: 247, Fig. 5, as *Kuehenromyces lignicola*).

Pholiota spumosa (Fr.) Singer

Lilloa **22**: 517. 1951('1949').

Agaricus spumosus Fr., Syst. Mycol. **1**: 252. 1821. – *Flammula spumosa* (Fr.) P. Kumm., Führ. Pilzk. 81. 1871. For further synonyms see Holec (2001: 101).

Pileus 25–60 mm, obtusely conic to convex, plano-convex, applanate, with or without low umbo, with thin scales from veil, soon glabrous, glutinous when moist, viscid when dry, centre light brown, towards margin lemon yellow. Context yellow. Smell indistinct. Taste mild. Lamellae adnate, slightly emarginate, subventricose, crowded, yellow then cinnamon to rusty brown. Stipe 40–75 × 5–7 mm, cylindric or attenuated downwards, pale to lemon yellow, ring zone persistent, base rusty brown.

Pileipellis an ixocutis of narrow, cylindric, gelatinized hyphae. Clamps present. Cheilocystidia 30–55 × 10–14 μm, lageniform, sometimes subcapitate, often with yellow contents. Pleurocystidia 50–70 × 10–18 μm, abundant, lageniform to tibiform, thin-walled, with yellow contents. Chrysocystidia absent. Basidia 23.0–28.0 × 6.0–7.5 μm, narrowly clavate, with 4 sterigmata. Basidiospores 6.0–8.0 × 3.8–4.3 μm, elliptic-oblong to phaseoliform, pale, with distinct small germ-pore. Spore-print rusty brown.

SPECIMENS EXAMINED. Kumgang-san Mts: near Samil-po Lake (62), forest with *Pinus densiflora*, on coniferous wood, 3 July 1985, *leg. B. Zarzycka*, KRAM-F 50403; 19 July 1986, *leg. W. Wojewoda*, KRAM-F 30928.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan, Korea and Russia (North Altai, Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 120); Azbukina *et al*. (1984: 50); Breitenbach & Kränzlin (1995: 342, pl. 439); Dähncke & Dähncke (1980: 366); Gorbunova (1997: 18); Holec (2001: 101, Pl. 22, 23, Fig. 14); Imazeki & Hongo (1975, **1**: 63, Pl. 28: 157); Jacobsson (1990: 65, Fig. 47); J. E. Lange (1939: 8, Pl. 121C); Mukhin (1993: Tab. 1); Noordeloos (1999: 94, Fig. 70); Teng (1996: 470); Vasilyeva (1973: 209).

Pleuroflammula flavomarginata (Berk. & Broome) Singer

Sydowia **6**: 349. 1952.

Agaricus flavomarginatus Berk. & Broome, J. Linn. Soc. **11**: 546. 1871. – *Crepidotus flavomarginatus* (Berk. & Broome) Sacc., Syll. Fung. **5**: 884. 1887.

Pileus 7–18 mm, reniform, convex to applanate, ochraceous, slightly fibrillose squamose. Context thin, yellow-brown, not gelatinized. Smell not distinctive. Taste slightly bitterish. Lamellae adnate, ventricose, crowded, yellow-brown, edge serrate, concolorous or whitish yellow. Stipe 1–2 × 1 mm, eccentric, ochraceous, base floccose. Annulus not distinct.

Pileipellis a cutis of subregular, interwoven, cylindric, thin-walled, branching hyphae, membranes not gelatinized, encrusted with ferruginous-fulvous pigment. Clamps present. Cheilocystidia 20–50 × 5–9 μm, clavate, cylindric, subcapitate, also rastrate (rare), thin-walled, with yellow plasmatic pigment. Pleurocystidia 25–37 × 6–7 μm, rare, thin-walled, fusoid, subcapitate. Basidia 25–30 × 6–7 μm, with 4 sterigmata. Basidiospores 7.0–8.6 × 4.7–5.6 μm, elliptic to ovate, thick-walled, smooth, rust brown, germ-pore lacking. Spore-print ferruginous (Fig. 74).

SPECIMENS EXAMINED. Myohyang-san Mts: valley near Sangwon-am Monastery (19), mixed forest, on rotten wood, 13 July 1986, *leg. Z. Heinrich*, KRAM-F 27933; below Isonnam Falls, near Habiro Temple (27), alt. *ca* 200 m, on rotten wood, 13 July 1986, *leg. Z. Heinrich*, KRAM-F 32550.

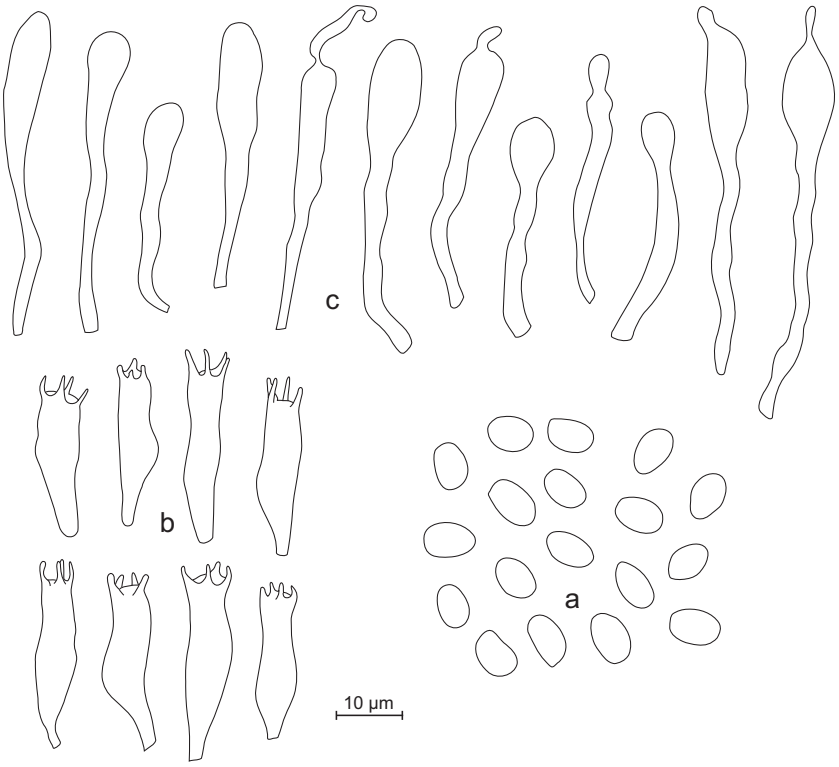


Fig. 74. *Pleuroflammula flavomarginata* (Berk. & Broome) Singer: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 27933).

DISTRIBUTION IN ASIA. India and Sri Lanka.

NOTES. New to North Korea. Known also from South America. The genus *Pleuroflammula* Singer occurs in the tropical and subtropical belt to temperate zones (both hemispheres). *P. flavomarginata* also spreads from Colombia and Ecuador.

REFERENCES. Horak (1978: 445, Fig. 5a–c); Pegler (1986: 423, Fig. 93G–J); Singer (1952: 348–349; 1978: 63); Wojewoda *et al*. (1993: 125, 128).

Psilocybe capnoides (Fr.: Fr.) Noordel.

Persoonia **16**: 128. 1995.

Agaricus capnoides Fr., Observ. Mycol. **2**: 27. 1818. – *A. capnoides* Fr.: Fr., Syst. Mycol. **1**: 289. 1821. – *Hypholoma capnoides* (Fr.: Fr.) P. Kumm., Führ. Pilzk. 72. 1871. – *Nematoloma capnoides* (Fr.: Fr.) P. Karst., Meddn. Soc. Fauna Fl. Fenn. **5**: 61. 1879. – *Dryophila capnoides* (Fr.: Fr.) Quél., Fl. Mycol. France. 154. 1888. – *D. fascicularis* var. *capnoides* (Fr.: Fr.) Quél., Fl. Mycol. France. 478. 1888. – *Geophila capnoides* (Fr.: Fr.) Quél., Enchir. Fung. 113. 1886; Kühner & Romagn., Fl. Anal. Champ. Supér. 335. 1953.

Pileus (25–)30 × 50(–70) mm, dimidiate, expanded, broadly expanded to plane, slightly umbonate in central part, cinnamon-ochraceous, buff-ochraceous, orange rufous with yellowish-brown tinge in central part; margin at first strongly involute, later straight, pale yellowish, covered with whitish yellow or yellowish brown small scales disappearing fairly quickly, non-hygrophanous or slightly hygrophanous. Context 3.5–5.0 mm thick in central part, slightly thinner at margin, white or whitish, mild in taste, odourless. Lamellae 2.5–3.5 mm wide, crowded, adnexed or slightly rounded at top, easily falling off the stipe, whitish, whitish grey, greyish lilac to greyish purple-brown, edge concolorous, smooth. Stipe 50–70(–90) × 5–8(–9) mm, cylindric, sometimes

slightly broadened at base, slightly whitish pruinose in upper part, yellowish downward, brownish yellow to rusty brown, hollow, context whitish in upper part, slighty russet at base.

Pileipellis a cutis composed of elongate, rusty yellow hyphae 1.7–3.4(–4.0) μm broad, subpellis formed of 2–3 layers of short hyphae, ovate or polygonal in outline, measuring (16–)30–40 × 25–30 μm, rusty brown. Context formed by cylindric hyphae 6–10(–14) μm broad, loosely intertwined, hyaline or light yellow. Hymenophoral trama regular, formed by elongate hyphae 3–5(–6) μm broad, hyaline or pale yellow. Subhymenial layer 4–5 μm thick, formed of short, spherical in section, strongly intertwined hyphae, 2–4 μm broad. Chrysocystidia numerous, scattered, variable in shape, broadly lanceolate, clavate, clavate mucronate 18.0–35.0 × 10.0–12.0 × 4.3–5.1 μm. Cheilocystidia resembling pleurocystidia (chrysocystidia), cylindric, rather fusiform, with rounded or capitate apex 20.0–29.0 × 5.6–7.5 μm, hyaline or yellow. Basidia with 4 sterigmata, hyaline, cylindric, slightly narrower in middle part, 17.0–21.0 × 5.5–6.4 μm. Basidiospores 6.5–8.5(–9.0) × 4.3–5.1 μm, smooth, thin-walled, elliptic, with distinct germ-pore, pale purple in water, yellowish-brown in KOH. Spore-print dark purplish brown.

SPECIMENS EXAMINED. Paekdu-san Mts: SE slope of Paekdu-san Mt. (1), slightly below upper forest line, scattered forest of *Larix olgensis*, on rotten stumps, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28728; *ca* 5 km S of Samji-yon Lake (7), taiga with *Larix* and *Picea*, on rotten wood, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28724, 28725, 28726, 28727; Chongbong Mt. (9), alt. *ca* 1300 m, rich taiga with *Larix* and *Betula*, on rotten wood, 1 July 1986, *leg. Z. Heinrich*, KRAM-F 28098; Myohyang-san Mts: between Habiro Temple (27) and Wonman Mt. peak (31), mixed forest, on coniferous stumps, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28734.

DISTRIBUTION IN ASIA. Armenia, Kazakhstan, Mongolia and Russia (Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 52); Breitenbach & Kränzlin (1995: 320, Pl. 408); Jahn (1979: 222, Pl. 198); Melik-Khachatrian (1980: 350); Noordeloos (1999: 69, Fig. 47); Petrov & Belova (1999: 28); Syarzhanina (1994: 314); Vasilyeva (1973: 202).

Psilocybe coronilla (Bull.: Fr.) Noordel.

Persoonia **16**: 128. 1995.

Agaricus coronillus Bull., Hist. Champ. Fr. **2**: 633. 1812. – *A. coronillus* Bull.: Fr., Syst. Mycol. **1**: 282. 1821. – *Agaricus obturatus* Fr., Syst. Mycol. **1:** 283, 1821. – *Stropharia coronilla* (Bull.: Fr.) Quél., Mém. Soc. (mul. Montbéliard, Sér. II, **5**: 110. 1872 (Champ. Jura Vosges **1**). For further synonyms see Noordeloos (1999: 59).

Pileus 20–50 mm, at first convex but soon expanded to become plano-convex, slightly viscid, with white wavy margin, pale ochraceous to ochraceous, tinged sometimes with yellow. Context thick, white unchanging. Taste and smell indistinct. Lamellae adnate or sinuate-adnate, fairly broad, pale milky coffee colour then purplish date or purple-chestnut with white margin, rather crowded. Stipe 30–40 × 4–8 mm, narrowed downwards, white becoming tinged with colour of pileus with age, smooth or slightly floccose-roughened towards base, solid annulate, ring white narrow, striate above, usually median.

Pileipellis of filamentous, cylindric hyphae 2–4 μm broad. Context formed of loosely intertwined, cylindric, hyaline hyphae 4–15 μm broad. Clamps present. Lamellar trama regularly formed with cylindric hyphae 6–10 μm broad. Subhymenial layer not too clearly visible. Pleurocystidia 22.0–43.0 × 8.0–10.5 μm, clavate, mucronate, hyaline but with central refractive body (chrysocystidia). Cheilocystidia 35–40 × 7–9 μm, varying from lageniform to subcapitate. Basidia with 4 sterigmata, 22.0–26.0 × 5.5–7.7 μm. Basidiospores 7.0–9.0 × 4.3–5.0 μm, elliptic, brown vinaceous in water and alkali, with germ-pore. Spore-print purplish date (Fig. 75).

SPECIMEN EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest, 16 July 1986, *leg. H. Komorowska*, KRAM-F 28249.

DISTRIBUTION IN ASIA. Kazakhstan and Russia (Primorski Krai).

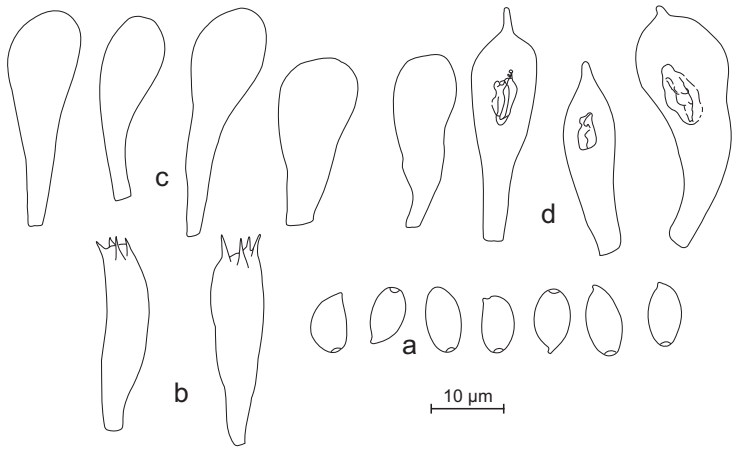


Fig. 75. *Psilocybe coronilla* (Bull.: Fr.) Noordel.: a – cheilocystidia, b – basidia, c – pleurocystidia, d – basidiospores (KRAM-F 28249).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 352, Pl. 456); Noordeloos (1999: 59, Fig. 37); Syarzhanina (1994: 312); Vasilyeva (1973: 200).

Psilocybe elongata (Pers.: Fr.) J. E. Lange

Dansk Bot. Ark. **9**(11): 30. 1936.

Agaricus elongatus Pers., Syn. Meth. Fung. 384. 1801. – *A. udus* ['var.'] *elongatus* (Pers.: Fr.) Fr., Syst. Mycol. **1**: 292. 1821. – *Hypholoma elongatum* (Pers.: Fr.) Ricken, Blätterpilze. 250. 1912. – *H. elongatipes* (Peck) A. H. Sm., Mycologia **33**: 5. 1941 (non *H. elongatipes* Parker 1933). For further synonyms see Noordeloos (1999: 73).

Pileus 5–20 mm, dimidiate, later expanded and almost flat, pale yellow to dark yellow with melleous-yellow colouring in central part; margin straight, with slight olivaceous tinge and remains of disappearing veil, strongly translucently striated. Context 1.5–2.0 mm thick, pale yellowish. Smell and taste absent. Lamellae 3–4 mm wide, evenly adnexed, loosely spaced, whitish, later pale yellowish to tawny brown, edges of same colour. Stipe 40.0–110.0 × 1.5–2.5 mm, cylindric, straight or bent at base, stiff, cartilaginous, pale, yellowish, sericeous in upper part, later light brown at base, hollow, context watery whitish in upper part, watery brownish at base.

Epicutis very thin (3–8 µm), composed of 2–3 layers of cylindric hyphae, 2.5–4.3 µm broad, loosely intertwined. Hypodermium well differentiated, formed of spherical hyphae 26–30 × 17–23 µm. Context of loosely intertwined, elongate, cylindric hyphae, 7–13 µm broad. Chrysocystidia narrowly fusiform or almost cylindric, only slightly broadened in central part and gently narrowing upward, fairly long, mucronate, 25–36 × 6–13 µm. Cheilocystidia cylindric or narrowly fusiform with rounded apex, hyaline 20–35 × 6–8 µm. Basidia 24.0–32.0 × 7.5–9.5 µm, cylindric, with 4 sterigmata. Basidiospores (8–)9–13 × 5–6(–7) µm, elliptic, hyaline, brown in water, pale reddish brown in KOH, smooth, thin-walled, with narrow germ-pore. Spore-print brown without lilaceous tinge.

SPECIMEN EXAMINED. Paekdu-san Mts: near Mupo (4), on Tuman-gang River, *ca* 40 km E of Paekdu-san Mt. peak, alt. *ca* 1500 m, taiga, in *Sphagnum*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29126.

DISTRIBUTION. Widespread all over Europe and North America.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 322, Pl. 409); J. E. Lange (1939: 81, Pl. 148A); Noordeloos (1999: 73, Fig. 51); Ryman & Holmĺsen (1984: 449); Smith (1951: 491); Watling & Gregory (1987: 16).

Psilocybe fascicularis (Huds.: Fr.) Noordel.

Persoonia **16**: 128. 1995.

Agaricus fascicularis Huds., Fl. Angl. **2**: 615. 1778. – *A. fascicularis* Huds.: Fr., Syst. Mycol. **1**: 288. 1821. – *Hypholoma fasciculare* (Huds.: Fr.) P. Kumm., Führ. Pilzk. 72. 1871. – *Nematoloma* (‘*Naematoloma*’) *fasciculare* (Huds.: Fr.) P. Karst., Meddn. Soc. Fauna Fl. Fenn. **5**: 61. 1879.

Pileus 30–60(–70) mm in diam., resembling a truncated cone to campanulate, later expanded, slightly umbonate in central part or almost flat, ochraceous to amber brown in central part, lemon-yellow toward margin, greenish to straw colour; margin involute, later straight, yellowish, covered with silky, quickly disappearing remains of partial veil. Context 3.0–4.5(–5.0) mm thick in the central part, thinner at margin, yellow to sulphureous, with bitter taste and disagreeable, fusty, sourish odour. Lamellae 3.0–3.5 mm wide, crowded, evenly adnexed or slightly rounded at stipe, pale yellow, sulphureous, olivaceous-yellow to greenish brown-blackish, edges smooth. Stipe 50–120 × 4–7 mm, cylindric, slightly narrowing toward base, in upper part slightly whitish pruinose or smooth, yellowish downward to rusty-brown at base, hollow, context in upper part yellow to rusty brunneous at base.

Pileipellis a cutis of elongate, cylindric, golden yellow hyphae, 2.5–5.5 μm broad, subpellis formed of 3–4 layers of short hyphae 21–39 × 17–35 μm, circular or polyhedral in outline, of orange-brown colour. Context composed of elongate, fairly strongly intertwined hyphae 3.6 μm broad, of dark orange-brown or yellow-olivaceous colour. Hymenophoral trama regular, formed of elongate, hyaline or yellow hyphae 2.0–3.8(–4.7) μm broad. Subhymenial layer 3–4 μm thick, of short, strongly intertwined hyphae 2–3 μm broad. Chrysocystidia numerous, clavate or almost equi-narrow 22–39 × 6–10 × 4–6 μm, mucronate. Cheilocystidia fusiform with evenly truncate, broad base and rounded apex, or cylindric with narrow base, evenly truncate, and rounded apex, hyaline or yellow, 18.0–31.0 × 5.2–8.0 μm. Basidia 17–24 × 5–6 μm, ± cylindric, hyaline or yellow, with 4 sterigmata. Basidiospores 6.0–7.7(–8.3) × 3.4–4.7 μm, elliptic to ovate, smooth, yellowish brown in water, dark yellowish brown in KOH, thin-walled, with small germ-pore. Spore-print purplish brown.

SPECIMENS EXAMINED. Shore of Soham-ho Lake (32), coniferous forest, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28722; Ryongak-san Mt. (42), alt. *ca* 250 m, 3 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 28721; 16 July 1986, *leg. Z. Heinrich*, KRAM-F 27969, 27976; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, 6 July 1986, *leg. Z. Heinrich*, KRAM-F 28138; Pagyon Ravine (65), alt. *ca* 300 m, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28723. – On wood.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Kirghizia, Korea, Mongolia, Russia (North Altai Siberia and Primorski Krai) and Tadzhikistan.

REFERENCES. Anonymous (1978: 95; 1983a: 120); Breitenbach & Kränzlin (1995: 322, Pl. 411); Gorbunova (1997: 17); Imazeki & Hongo (1975, **1**: 62, Pl. 27: 153); Jahn (1979: 222, Pl. 197); Melik-Khachatrian (1980: 351); Mukhin (1993: Tab. 1); Noordeloos (1999: 68, Fig. 46); Petrov & Belova (1999: 28); Syarzhanina (1994: 316); Teng (1996: 481); Vasilyeva (1973: 202; 1978: 157, Pl. 133); Wen & Sun (1999: 366); Ying *et al*. (1983: 158).

Psilocybe phillipsi (Berk. & Broome) Vellinga & Noordel.

in Noordel., Persoonia **16**: 129. 1995.

Agaricus phillipsi Berk. & Broome, Ann. Mag. Nat. Hist., Ser. V, **1**: t. 21. 1878. – *Melanotus phillipsi* (Berk. & Broome) Singer, Beih. Sydowia **7**: 84. 1973.

Pileus 2–5 mm, convex to plano-convex, pale cinnamon, smooth, glabrous, margin translucently striate then radious and glutinous. Context very thin, concolorous with pileus and stipe. Smell and taste not known. Lamellae narrowly ventricose, adnate, moderately crowded, pale brown, edge white, later flocculose. Stipe 1.0–2.5 × 0.5 mm, cylindric, concolorous with pileus, base white tomentose.

Pileipellis a thin cutis of cylindric, filamentous, branched, hyaline or cinnamon hyphae. Clamps present in all tissues. Cheilocystidia 15–30 × 3–5 μm, hyaline, narrowly lageniform to cylindric,

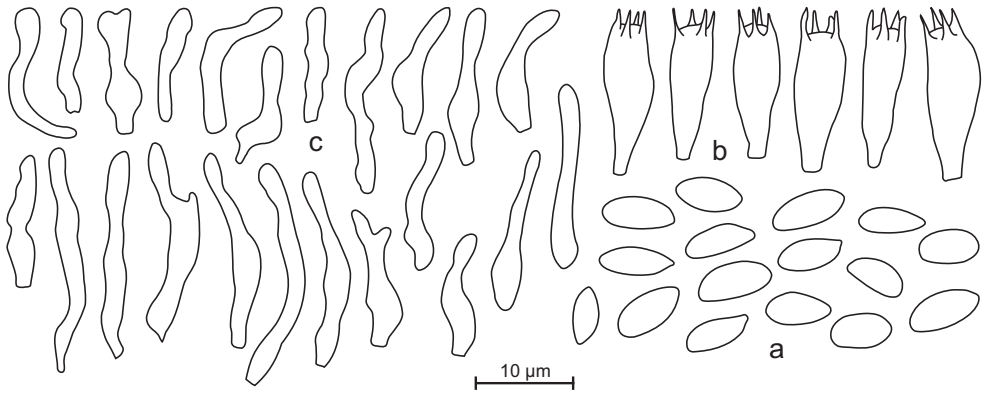


Fig. 76. *Psilocybe phillipsi* (Berk. & Broome) Vellinga & Noordel.: a – cheilocystidia, b – basidia, c – basidiospores (KRAM-F 50407).

with sometimes branched neck. Pleurocystidia absent. Basidia 11.0–19.0 × 4.0–5.5 µm, with 4 sterigmata. Basidiospores 5.0–6.5 × 2.8–3.5 µm, narrowly amygdaliform, pale brown, thin-walled, germ-pore indistinct. Spore-print fawn (Fig. 76).

SPECIMEN EXAMINED. Near tomb of King Kongmin (64), on grasses and other herbaceous plants, 26 July 1986, *leg. W. Wojewoda*, KRAM-F 50407.

DISTRIBUTION. Probably not rare in temperate zones of the Northern Hemisphere.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1995: 328, Pl. 418); Horak (1977: 309, Figs 5–9); Noordeloos (1999: 52, Fig. 28); Watling & Gregory (1987: 26, as *Melanotus caricicola* and *M. phillipsi*).

Psilocybe rugosoannulata (Farlow *ex* Murrill) Noordel.

Persoonia **16**: 129. 1995.

Stropharia rugosoannulata Farlow *ex* Murrill., Mycologia **14**: 139. 1922. – *S. ferrii* Bres., Riv. Sci. Naturali Nat., Milano **19**: 17. 1928. – *Naematoloma ferrii* (Bres.) Singer, Lilloa **22**: 503. 1951 (‘1949’). For further synonyms see Noordeloos (1999: 61).

Pileus 60–90 mm in diam., conic, subglobose to convex or applanate with flat umbo, pale to dark grey-brown with wine-red to purple tinge, covered with pallid pruina and whitish veil remnants. Margin involute, later deflexed, undulate with traces of veil. Context white, rather thick. Smell distinctly herbaceous, faintly raphanoid. Taste mild to slightly raphanoid, astringent. Lamellae broad, crowded, broadly adnate, pale grey, violaceous grey to black violet with white, fimbriate edge. Stipe 80–130 × 10–25 mm, cylindric to slightly clavate, with subbulbous base, annulate, at apex and base white, pale yellowish in middle part, annulus white, thick, pendent, the upper surface distinctly striate.

Pileipellis a cutis of narrowly, cylindric, 2–12 µm broad hyphae, with brownish pigment. Clamps present, not abundant. Cheilocystidia 30–55 × 10–20 µm, clavate or lageniform with rostrate to acute apex. Pleurocystidia similar to cheilocystidia. Basidia 25.0–30.0 × 8.0–9.5 µm, cylindric clavate, with 4 sterigmata. Basidiospores 9.5–13.3 × 7.3–9.0 µm, elliptic to ovoid, violaceous brown, thick-walled with truncate apex, germ-pore large. Spore-print dark brown-violet (Fig. 77).

SPECIMEN EXAMINED. Near Sokdamgukok (47), mixed forest, on ground, 7 July 1986, *leg. H. Komorowska*, KRAM-F 27925.

DISTRIBUTION IN ASIA. Japan, Korea and Russia (Primorski Krai).

REFERENCES. Anonymous (1983a: 120); Benedix (1959: 49–54); Breitenbach & Kränzlin (1995: 354, Pl. 459); Cetto (1980a: 191, Pl. 54); Dähncke & Dähncke

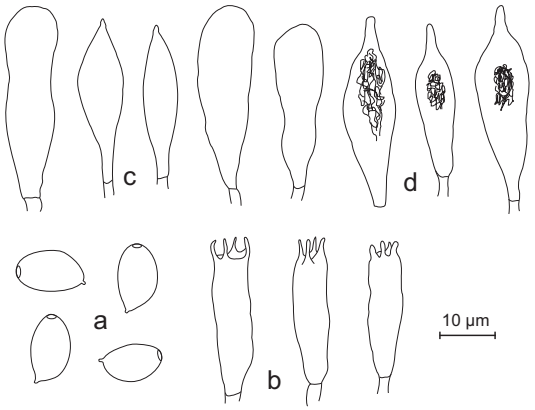


Fig. 77. *Psilocybe rugosoannulata* (Farlow *ex* Murrill) Noordel.: a-basidiospores, b-basidia, c-cheilocystidia, d-pleurocysidia (KRAM F27925).

(1980: 347); Imazeki & Hongo (1975, **1**: 60, Pl. 27: 150; **2**: 68, Pl. 20: 124); Michael *et al*. (1985: 424, Pl. 259); Noordeloos (1999: 61, Fig. 39); Vasilyeva (1973: 201, Fig. 49B; 1978: 157, Pl. 134); Watling & Gregory (1987: 60).

Psilocybe subviridis (Berk. & M. A. Curtis) Sacc.

Syll. Fung. **5**: 1051. 1887.

Agaricus subviridis Berk. & M. A. Curtis, J. Linn. Soc. Bot. **10**: 292. 1869. – *Nematoloma subviride* (Berk. & M. A. Curtis) A. H. Smith, Mycologia **43**: 519, Fig. 54, 55. 1951. – *Hypholoma subviride* (Berk. & M. A. Curtis) Dennis, Kew Bull. **15**: 134. 1961; Fungus Fl. Venezuela 69, Fig. 14/10. 1970; Pegler, Prelim. Agar. Fl. Africa. 466, Fig. 105/1a–c. 1977; Agar. Fl. Sri Lanka 407, Fig. 91 A-D. 1986; Pouzar, Mykol. Listy **5**: 4. 1981. – *H. fasciculare* (Huds.: Fr.) P. Kumm. var. *subviride* (Berk. & M. A. Curtis) Krieglst., Z. Mycol. **50**: 59. 1984.

Pileus 5–30 mm, convex, later expanded to broadly expanded, slightly umbonate in central part, smooth or sometimes rugose, pale greenish yellow, with darker yellow-orange apex; margin straight with remains of partial veil in the form of whitish fine fibrils. Context thin, 1–3 mm, pale yellow, bitter in taste and characteristic odour of Russian leather. Lamellae crowded, strictly repent, narrow (1.2–3.0 mm), olivaceous-yellow, later purplish brown, edges smooth, concolorous with surface of lamellae.

Pileipellis a cutis composed of elongate hyphae 2.0–5.5(–6.8) µm broad, subpellis formed of spherical hyphae 10–18 × 7–15 µm. Clamps present. Cheilocystidia 15.0–19.0 × 2.5–5.0 µm, lenticular, fusiform, or cylindric, hyaline. Context of elongate hyphae 5–10(–14) µm broad. Hymenophoral trama regular, of cylindric hyphae 3–9 µm broad. Subhymenial layer 9 µm thick, of short, strongly intertwined hyphae 3–4(–5) µm broad. Chrysocystidia 21–43 × 7–10(–12) µm, clavate, fusiform, cylindric, rounded or mucronate at the

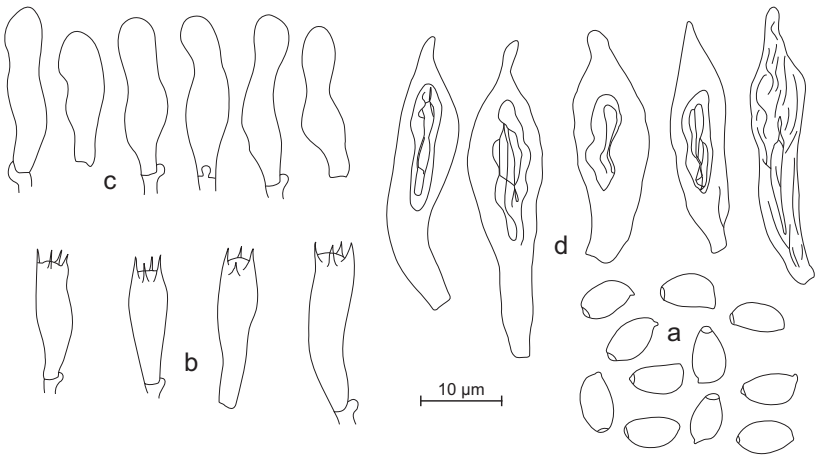


Fig. 78. *Psilocybe subvirdis* (Berk. & M. A. Curtis) Sacc.: a – basidiospores, b – basidia, c – cheilocystidia, d – pleurocystidia (KRAM-F 29686).

apex. Basidia 15–18 × 5–6 µm, cylindric, ± clavate, hyaline, with 4 sterigmata. Basidiospores (6.0–)7.0–8.0 × 3.5–4.0 µm, elliptic, smooth, thin-walled, with a clearly visible germ-pore, yellowish brown in water, dark yellowish brown in KOH. Spore-print purplish brown (Fig. 78).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, taiga with *Larix olgensis*, on stump of deciduous tree, 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29686; *ca* 5 km S of Samji-yon Lake (7), alt. *ca* 1400 m, taiga with *Larix olgensis*, 28 June 1986, *leg. Z. Heinrich*, KRAM-F 27908; Myohyang-san Mts: valley near Sangwon-am Monastery (19), mixed forest, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 28731; Manpok Valley, below Unson Falls (23), alt. *ca* 500 m, mixed forest, on stump, 14 July 1986, *leg. Z. Heinrich*, KRAM-F 27958; Isonnam Falls (29), near Habiro Temple (27), alt. *ca* 200 m, mixed forest, on stump, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28730; 13 July 1986, *leg. W. Wojewoda*, KRAM-F 28732; *leg. Z. Heinrich*, KRAM-F 27954, 27955; Ryongak-san Mt. (42), 16 July 1986, mixed forest, on deciduous tree, *leg. H. Komorowska*, KRAM-F 28319; Kumgang-san Mts: near Kumgang-mun Gate (59), 5 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28733; Onjong-ri village (60), near hotel, pine forest, on stump, 21 July 1986, *leg. Z. Heinrich*, KRAM-F 28038, 28048, *leg. W. Wojewoda*, KRAM-F 28729; Pagyon Ravine (65), alt. *ca* 300 m, deciduous forest, on stump, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28162.

DISTRIBUTION IN ASIA. Sri Lanka.

NOTES. New to North Korea.

REFERENCES. Dennis (1970: 69, Fig. 14: 10); Pegler (1977: 466, fig. 105a–e; 1986: 407, fig. 91A–D); Smith (1951: 519).

Tricholomataceae R. Heim *ex* Pouzar 1983, incl. Hygrophoraceae Roze *ex* Lotsy 1907

Asterophora lycoperdoides (Bull.: Fr.) Ditm.

J. Bot. **3**(3): 56. 1809.

Agaricus lycoperdoides Bull., Herb. Fr. **4**: Fasc. 37–48, Pl. 166. 1789. For further synonyms see Redhead & Seifert (2001a: 248).

Basidiocarps gregarious. Pileus 5–20 mm, hemispherical, whitish to cream-coloured, with cinnamon-coloured powder. Margin inrolled. Flesh whitish cream. Lamellae thick, distant, whitish, reduced or lacking. Stipe 20–35 × 3–5 mm, cylindric, whitish, bent, cottony at all.

Hyphae of cortical layer of pileus absent, completely broken up into chlamydospores. Cystidia absent. Basidia 14–17 × 5–7 µm, with 4 sterigmata. Basidiospores 4.8–6.2 × 3.5–4.2 µm, hyaline, smooth, amyloid. Chlamydospores 15–19 × 11–15 µm, echinate.

SPECIMENS EXAMINED. Suian-san Mts (48), alt. *ca* 150 m, deciduous forest, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51408; Kumgang-san Mts: shore of Samil-po Lake (62), alt. *ca* 50 m, mixed forest with *Pinus densiflora* and *Quercus mongolica*, 13 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51407. – On blackened remnants of old mushrooms.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Korea and Russia (North Altai, Siberia and Far East).

REFERENCES. Anonymous (1978: 41; 1983a: 113); Azbukina *et al*. (1984: 42); Brand (1990: 87); Breitenbach & Kränzlin (1991: 298, Pl. 375); Bresadola (1929: Pl. 486, as *Nyctalis asterophora*); Gorbunova (1997: 16); Imazeki & Hongo (1975, **1**: 18, Pl. 4: 25); J. E. Lange (1940: 8, Pl. 162E); Melik-Khachatrian (1980: 219); Michael *et al*. (1987: 398, Pl. 236); Redhead & Seifert (2001a: 248; 2001b: 279); Syarzhanina (1994: 95); Teng (1996: 307).

Camarophyllus pratensis (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 117.1871.

– var. ***pratensis***

Agaricus pratensis Pers., Syn. Meth. Fung. 304. 1801. – *A. pratensis* Pers.: Fr., Syst. Mycol. **1**: 99. 1821. – *Hygrophorus pratensis* (Pers.: Fr.) Fr., Epicr. Syst. Mycol. 326. 1809. – *Hygrocybe pratensis* (Pers.: Fr.) Murrill, Mycologia **6**(1): 2. 1914. – *Cuphophyllus pratensis* (Pers.: Fr.) M. Bon, Doc. Mycol. **14**(56): 10. 1984.

Pileus 20–50 mm in diam., flattened-conic, with involute margin. Upper surface smooth, pale orange, at margin slightly paler, not viscid. Flesh cream-orange. Smell weak, polyporoid. Taste mild, weak, disntictive. Lamellae very distant, short-decurrent, broad, rather thick, cream-

orange. Stipe 30–60 × 4–10 mm, cylindric, whitish cream to pale orange.

Hyphae with clamps. Cystidia absent. Basidia 38–50 × 4–6 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 5.5–7.0 × 4.0–5.5 μm, elliptic, hyaline, smooth, thin-walled, non-amyloid. Spore-print white.

SPECIMEN EXAMINED. Paekdu-san Mts: near Chongbong Mt. (9), meadow, on ground, among grass, 31 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28393.

DISTRIBUTION IN ASIA. Japan, Korea and Russia (Far East: Primorski Krai).

REFERENCES. Anonymous (1983a: 110); Arnolds (1990: 76, Fig. 47, as *Hygrocybe pratensis*); Azbukina *et al.* (1984: 41); Breitenbach & Kränzlin (1991: 100, Pl. 76); Gumińska (1997: 89. Pl. VIII: 4–7); Hansen & Knudsen (1992: 77); Imazeki & Hongo (1975, **1**: 13, Pl. 2: 6); J. E. Lange (1940: 17, Pl. 165F, F[1]); Vasilyeva (1973: 74).

Clitocybe bresadolana (‘*bresadoliana*’) Singer

Rev. Mycol. **2**: 228. 1937.

Basidiocarps solitary. Pileus 50 mm across, plano-convex with central depression, colour as *Lepista inversa* (Scop.) Pat., not hygrophanous, margin inrolled. Flesh thin, whitish. Lamellae up to 3 mm broad, decurrent, crowded, concolorous with pileus.

Hyphae of cortical layer of pileus 3–5 μm broad, parallel, sometime ± interwoven, walls thin, hyaline, with only very scant pigment. Hyphae of cortical layer of stipe 4–5 μm broad. Basidia with 4 sterigmata. Basidiospores 6.5–10.0 × 3.8–6.3 μm, single (not in tetrads), variable in size and shape with acute or confluent base, lacrymoid or eliptical to oblong. Spore-print white (Fig. 79).

SPECIMEN EXAMINED. Paekdu-san Mts: near Taehongdan (6), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, on ground, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28630.

DISTRIBUTION IN ASIA. Russia (e.g. Altai and Caucasian Mts), Turkey.

NOTES. New to North Korea. Harmaja (2003: 216) proposed new genus and new combination for that taxon – *Infundibulicybe bresadolana* (Singer) Harmaja.

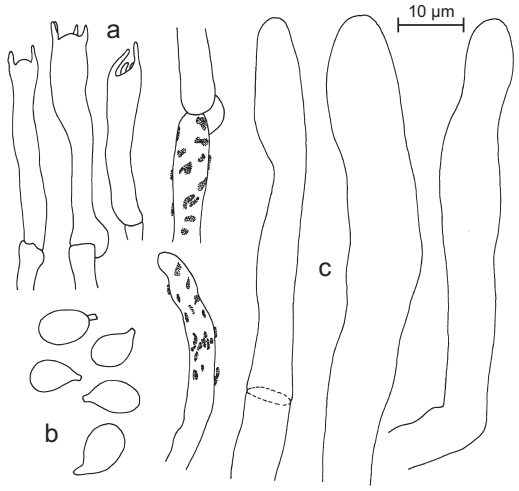


Fig. 79. *Clitocybe bresadolana* Singer: a – basidia, b – basidiospores, c – hyphae of cortical layer of pileus (KRAM-F 28630).

REFERENCES. Bon (1997: 39, as *C. bresadoliana*); Harmaja (1969: 67, Figs 48 and 96; 2003: 216).

Clitocybe candicans (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 122. 1871.

Agaricus candicans Pers., Syn. Meth. Fung. 456. 1801, non. *A. candicans* Schaeff., 1774. – *A. candicans* Pers.: Fr., Syst. Mycol. **1**: 91. 1821. – *Clitocybe aberrans* Velen., Novit. Mycol. 74. 1939. For further synonyms see Kuyper 1995a: 49.

Basidiocarps solitary. Pileus 30–45 mm across, plane to slightly depressed, pale buff (ground colour) white-pruinose with watery spots or circles; margin inrolled to horizontal, weakly hygrophanous. Flesh thin, watery white. Lamellae narrow, up to 3 mm broad, decurrent, white (in exsiccates yellow). Stipe 30–60 × 3–5 mm, equal, enlarged downward, concolorous with pileus, matte or slightly shining, base with white tomentum or few rhizoids.

Hyphae of cortical layer of pileus 3–6 μm broad, cylindric, ± parallel, loose, gelatinized, coralloid with colourless intracellular pigment, terminal elements ascending. Clamps present. Basi-

dia 18.6–23.5 × 4.8–6.5 µm, with 4 sterigmata. Basidiospores 3.7–6.0 × 3.0 µm, single or in tetrads, ± homogenous.

SPECIMENS EXAMINED. Myohyang-san Mts: Manpok Valley, near Kuchung Falls (26), alt. *ca* 850 m, mixed forest, on litter, 14 July 1986, *leg. H. Komorowska*, KRAM-F 28532; Kumgang-san Mts: *ca* 5 km NW of Onjong-ri village (60), near Manmulsang Rocks peak (55), alt. *ca* 900 m, mixed forest, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 27771, 53099.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, Georgia, Japan, Kazakhstan, Russia (e.g. Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 43); Bigelow (1982: 83, Figs 16,17); Breitenbach & Kränzlin (1991:150, Pl. 152); Harmaja (1969: 74, Figs 16, 53, 101); Imazeki & Hongo (1975, **2**: 19, Pl. 5: 29); Kuyper (1995a: 49, Fig. 22); Melik-Khachatrian (1980: 168); Syarzhanina (1994: 112); Vasilyeva (1973: 104).

Clitocybe clavipes (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 124. 1871.

Agaricus clavipes Pers., Syn. Meth. Fung. 353. 1801. – *A. clavipes* Pers.: Fr., Syst. Mycol.**1**: 86. 1821. – *Clavicybe clavipes* (Pers.: Fr.) Harmaja, Karstenia **42**(2): 42. 2002. For further synonyms see Kuyper (1995a: 50).

Basidiocarps solitary or in groups. Pileus 35–45 mm across; slightly convex or plane with depressed centre, greyish brown to olive brown; dry, mat, faintly fibrillose-reticulate (under lens) not hygrophanous. Margin inrolled. Flesh thick, especially on disc. Smell fragrant. Taste mild. Lamellae up to 4 mm broad; moderately deccurent; white to pale yellowish. Stipe 55–60 × 6 mm, broad at base (17–23 mm), concolorous with pileus, longitudinally fibrillose; base with white tomentum.

Hyphae of cortical layer of pileus 3–5 µm broad ± parallel with intracellular pigment or hyphae very finely encrusted. Basidia 25–35 × 5–8 µm, with 4 sterigmata. Basidiospores 5.6–8.6 × 3.2–4.8 µm, often very variable in size and shape, elliptic, ovoid, obtuse-based, smooth, cyanophilous, non-amyloid, single (Fig. 80).

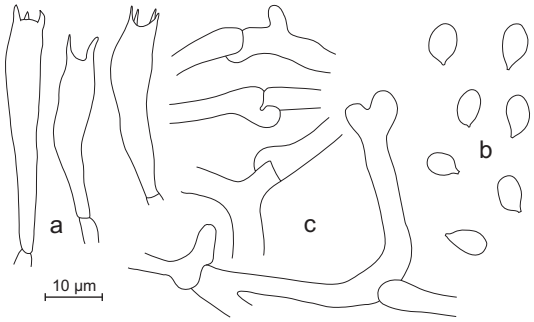


Fig. 80. *Clitocybe clavipes* (Pers.: Fr.) P. Kumm.: a – basidia, b – basidiospores, c – hyphae of cortical layer of pileus (KRAM-F 52693).

SPECIMENS EXAMINED. Paekdu-san Mts: near Paekdu-san Mt. peak (1), taiga with *Larix*, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52693; *ca* 15 km N of Samji-yon, near Mupo (4), *ca* 20–30 km of Paekdu-san Mt. peak (1), taiga, on litter, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53098.

DISTRIBUTION IN ASIA. Japan, Kazakhstan, Korea, Mongolia and Russia (e.g. Siberia and Primorski Krai).

NOTES. Redhead *et al*. (2002: 36) proposed new genus and new combination for that taxon – *Ampulloclitocybe clavipes* (Pers.: Fr.) Redhead.

REFERENCES. Anonymous (1983a: 113); Azbukina *et al*. (1984: 43); Bigelow (1982: 55, Figs 1, 2); Breitenbach & Kränzlin (1991: 152, Pl. 154); Harmaja (1969: 59, Figs 11, 42, 90); Imazeki & Hongo (1975, **1**: 20, Pl. 5: 29); Kuyper (1995a: 50, Fig. 24); Syarzhanina (1994: 106); Uranchimehg *et al*. (1983: 376); Vasilyeva (1973: 104).

Clitocybe gibba (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 123. 1871.

Agaricus gibbus Pers., Syn. Meth. Fung. 449. 1801. – *A. gibbus* Pers.: Fr., Syst. Mycol. **1**: 81. 1821. – *Clitocybe infundibuliformis* (Fr.) Quél., Champ. Jura Vosges 1: 88. 1872. – *C. australis* Murrill, Lloydia **7**: 303. 1944.

Basidiocarps solitary. Pileus 45–55 mm across; plane to ± infundibuliform; dry, matte, pale buff to various shades of pale brown, not hygrophanous. Lamellae 3–5 mm wide, moderately broad; decurrent; whitish to pale yellowish. Flesh thin,

white; odour and taste faintly fungous. Stipe 30–50 × 3–8 mm, equal, sometimes distinctly clavate, terete, solid; colour paler then pileus or white; dry, matte, indistinctly palely fibrillose; at base white tomentum.

Hyphae of cortical layer of pileus 2–7 μm broad, interwoven to ± parallel, frequently with encrusting pigments. Hyphae of cortical layer of stipe 3–5 μm broad. Clamps present. Basidia 25.0–35.0 × 6.0–8.5 μm, with 4 sterigmata. Basidiospores 6.0–8.0 × 3.5–5.0 μm smooth, non-amyloid, single (not in tetrads), variable in size.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon town (8), mixed forest, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52694; Chongbong Mt. (9), alt. *ca* 1300–1400 m, 31 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52695.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Kirghizia, Korea, Mongolia and Russia (e.g. Siberia and Primorski Krai).

NOTES. Harmaja (2003: 217) proposed new genus and new combination for that taxon – *Infundibulicybe gibba* (Pers.: Fr.) Harmaja.

REFERENCES. Anonymous (1978: 45; 1983a: 113, as *C. infundibuliformis*); Azbukina *et al*. (1984: 43); Bigelow (1985: 291, Figs 103–106, 180); Breitenbach & Kränzlin (1991: 158, Pl. 163); Harmaja (1969: 164, Figs 13, 46, 94); Imazeki & Hongo (1975, **1**: 20, Pl. 5: 31); Kuyper (1995a: 52, Fig. 28); Malençon & Bertault (1975: 162); Melik-Khachatrian (1980: 172); Syarzhanina (1994: 109); Teng (1996: 440); Uranchimehg *et al*. (1983: 376); Vasilyeva (1973: 105; 1978: 139, Pl. 80).

Clitocybe phaeophthalma (Pers.) Kuyper

Persoonia **11**: 385. 1981.

Agaricus phaeophthalmus Pers., Mycol. Eur. **3**: 72. 1828. – *A. fritilliformis* Lasch: Fr., Epicr. Syst. Mycol. 74. 1838. – *Singerocybe phaeophthalma* (Pers.) Harmaja, Karstenia **27**: 72. 1987. For further synonyms see Kuyper (1995a: 54).

Basidiocarps in small groups. Pileus 25–35 mm across; cyathiform with deeply depressed disc, pale cream grey, glabrous, fibrillose, hygrophanous. Margin incurved, non-striate. Flesh thin, firm but brittle. Smell and taste strongly unpleasant: fishy to rancid-farinaceous. Lamellae narrow to moderately broad, up to 4 mm, decurrent; whitish or concolorous with pileus. Stipe 25.0–40.0 × 3.0–4.5 mm, central, terete; glabrous; concolorous with pileus; base with whitish tomentum.

Hyphae of cortical layer of pileus 2–5 μm broad, ± parallel, with conspicuous subglobose to fusiform vesicles up to *ca* 30 μm diam. Clamps present. Basidia 25–30 × 3–7 μm with 4 sterigmata. Basidiospores 5.6–6.8 × 2.5–3.8 μm, elliptic to pyriform with acute base, smooth non-amyloid, single (not in tetrads), variable in size and shape.

SPECIMEN EXAMINED. Suian-san Mts (48), alt. *ca* 150–200 m, on litter, 26 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52696.

DISTRIBUTION. Widespread and fairly common in North America (Eastern United States and Southern Canada), also in Europe.

NOTES. New to North Korea.

REFERENCES. Bigelow (1982: 196, Figs 64 & 101, as *C. hydrogramma*); Breitenbach & Kränzlin (1991: 166, Pl. 175); Clemençon (1984: 51); Kuyper (1995a: 54, Fig. 32); Singer (1961: 38).

Clitocybe sinopica (Fr.: Fr.) P. Kumm.

Führ. Pilzk. 123. 1971.

Agaricus sinopicus Fr., Observ. Mycol. **2**: 197. 1818. – *A. sinopicus* Fr.: Fr., Syst. Mycol. **1**: 83. 1821.

Basidiocarps solitary or in groups. Pileus 25–80 mm, plane or slightly depressed. Margin inflexed, sometimes undulate, dry, mat, red-brown to dirty orange, disc darker. Flesh thin only on disc thick, whitish. Smell and taste strongly farinaceous. Lamellae 3–5 mm broad; decurrent, whitish to cream. Stipe 20–40 × 5–13 mm, equal or the apex enlarged and tapered downward; concolorous with pileus. Base with white tomentum.

Hyphae of cortical layer of pileus 3.0–6.8 μm diam., ± parallel (a cutis) with brown to yellowish pigment (intracellular) or finely encrusted. Clamps present. Basidia 24–35 × 6–8 μm, with 4 sterigmata. Basidiospores 7.5–10.6 × 4.8–6.3 μm, elliptic to broadly elliptic, smooth, non-amyloid, single (not in tetrads), ± homogeneous (Fig. 81).

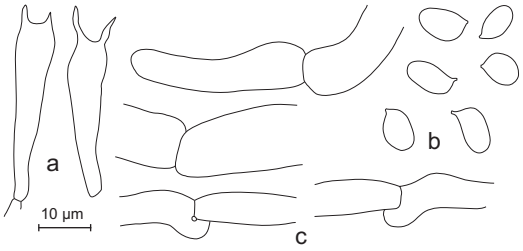


Fig. 81. *Clitocybe sinopica* (Fr.: Fr.) P. Kumm.: a – basidia, b – basidiospores, c – hyphae of cortical layer of pileus (KRAM-F 28454).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 27778; 28 June 1986, *leg. H. Komorowska*, KRAM-F 28454, 28660; 29 June 1986, *leg. W. Wojewoda*, KRAM-F 52691; *leg. H. Komorowska*, KRAM-F 28605; 30 June 1986, *leg. W. Wojewoda*, KRAM-F 28465, 52690. – Taiga with *Larix olgensis* and *Picea*, some basidiocarps in peat-bog, on ground.

DISTRIBUTION IN ASIA. Armenia, China, and Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea. Widespread in Europe, known also from North America (Canada and United States).

REFERENCES. Bigelow (1985: 308, Figs 117 & 119); Breitenbach & Kränzlin (1991: 166, Pl. 177); Harmaja (1969: 69, Figs 15, 50, 98); Kuyper (1995a: 51); Melik-Khachatrian (1980: 176); Syarzhanina (1994: 110); Teng (1996: 440); Vasilyeva (1973: 106); Ying *et al*. (1983: 128).

Clitocybe squamulosa (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 123. 1871.

Agaricus squamulosus Pers., Syn. Meth. Fung. 499. 1801. – *A. squamulosus* Pers.: Fr., Syst. Mycol. **1**: 82. 1821. *Omphalia infundibuliformis* (Schaeff.: Fr.) Quél. var. *squamulosa* (Pers.: Fr) Quél., Enchir. Fung. 23. 1886.

Basidiocarps in groups. Pileus 30–50 mm across, infundibuliform, cinnamon-buff, dry, mat, scaly, largest in centre, not hygrophanous. Margin involute (young specimens). Flesh thin, whitish. Lamellae 3–4 mm broad, narrow, decurrent, whitish, contrasting distinctly with darker colour of stipe. Stipe 40–60 × 3–6 mm, equal, only the base enlarged, concolorous with pileus, dry, mat, fibrillose striate. Basal mycelium present.

Hyphae of cortical layer of pileus 3–8 µm broad, interwoven to subparallel with brown to yellowish pigment (intracellular), encrusted at times. Hyphae of cortical layer of stipe finely encrusted. Clamps present. Basidia 25–40 × 6–8 µm. Basidiospores 6.0–7.8 × 3.6–4.2 µm, smooth, non- amyloid, single (not in tetrads), variable in size and shape (Fig. 82).

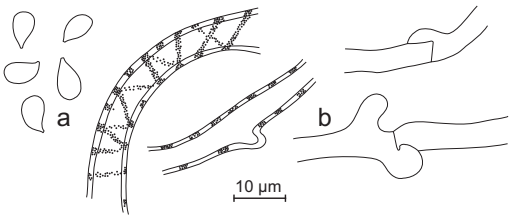


Fig. 82. *Clitocybe squamulosa* (Pers.: Fr.) P. Kumm.: a – basidiospores, b – hyphae of cortical layer of pileus (KRAM-F 28611).

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 25 km NW of Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix* and *Picea*, on ground, among mosses, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28611.

DISTRIBUTION IN ASIA. Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea. Known from Europe and North America (Canada and United States). Harmaja (2003: 217) proposed new genus and new combination for that taxon – *Infundibulicybe squamulosa* (Pers.: Fr.) Harmaja.

REFERENCES. Azbukina *et al*. (1984: 43); Bigelow (1985: 297, Figs: 10, 111, 183); Harmaja (1969: 65, Figs 14, 47, 95); Kuyper (1995a: 54, Fig. 30); Syarzhanina (1994: 110); Vasilyeva (1973: 106).

Cystoderma amianthinum (Scop.: Fr.) Fayod

Ann. Sci. Nat. Bot., VII, **9**: 351. 1889.

Agaricus granulosus subsp. *amianthinus* Scop., Fl. Carniol. **2**: 434.1772. – *A. granulosus* susbsp. *amianthinus* Scop.: Fr., Epicr. Syst. Mycol. 18. 1836. – *Lepiota amianthina* (Scop.: Fr.) P. Karst., Hattsvampar **1**: 15. 1879.

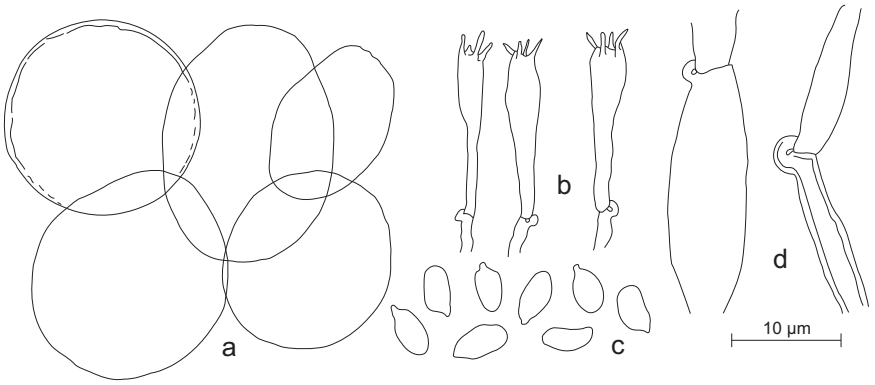


Fig. 83. *Cystoderma amianthinum* (Scop.: Fr.) Fayod: a – cells of pileipellis, b – basidia, c – hyphae (KRAM-F 53005).

Basidiocarps up to 30 mm in diam. Upper surface yellow-orange, densely covered with fine granules when young, smooth when old. Flesh orange-yellow. Lamellae pale yellow, broad, with smooth edge. Stipe 25–50 × 3–5 mm, cylindric, hollow, cream-coloured, fibrillose-floccose.

Hyphae 2.0–15.5 µm wide, smooth, hyaline, thin- or thick-walled, some septa with clamps. Pileipellis composed with globose, subglobose to oval cells (spherocysts) 13.5–30.0 × 10.0–20.0 µm, yellow to orange-brownish, thin- to thick-walled. Cystidia absent. Basidia 17.5–25.0 × 4.8–7.0 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 4.3–6.7 × 3.0–3.8 µm, elliptic to ovoid, smooth, hyaline, thin-walled. Spore-print cream-coloured (Fig. 83).

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 25 km SE of Paekdu-san Mt. peak (1), alt. *ca* 1500 m, taiga with *Larix olgensis* and other coniferous trees, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53125; near Mupo (4), alt. *ca* 1400 m, taiga, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53124; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, mixed taiga, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53005. – On ground, among mosses.

DISTRIBUTION IN ASIA. Caucasus, Georgia, Japan, Kirghizia, Korea and Russia (North Altai, East and West Siberia and Far East).

NOTES. Cosmopolitan species, known also from Europe, North America (United States, Canada and Greenland), South America (Argentina, Bolivia, Brazil, Chile, Venezuela), Africa and Australia.

REFERENCES. Anonymous (1983a: 118); Azbukina *et al*. (1984: 50); Breitenbach & Kränzlin (1995: 184, Pl. 202); Hansen & Knudsen (1992: 119, Fig. 126); Imazeki & Hongo (1975, **1**: 52, Pl. 23: 127); Michael *et al*. (1983a: 184, Pl. 35); Moser (1983: 250); Syarzhanina (1994: 257); Vasilyeva (1973: 184); Vasser (1980: 200, Fig. 109, Pl. XVI: 1; 1985: 81, Pl. VII: 4a–g).

Cystodermella cinnabarinum (Alb. & Schwein.: Fr.) Harmaja

Karstenia **42**(2): 45. 2002.

Agaricus granulosus var. *cinnabarinus* Alb. & Schwein., Consp. Fung. Lusat. 147. 1805. – *A. cinnabarinus* (Alb. & Schwein.): Fr., Syst. Mycol. **3**: Index: 12. 1832. – *Cystoderma cinnabarinum* (Alb. & Schwein.: Fr.) Konrad & Maublanc, Icon. Sel. Fung. **3**(3): Pl. 238. 1927. – *C. terrei* (Berk. & Broome) Harmaja, Karstenia **19**: 25–29. 1979. For further synonynms see Vasser (1980; 1985).

Pileus 25–40 mm in diam. Upper surface orange-cinnabar or red-cinnabar, densely covered with fine granules or conic varts. Flesh whitish-cream. Lamellae whitish to cream-coloured, narrow, with undulating edge. Stipe 25–45 × 5–10 mm, cylindric, sometimes with subbulbose base, orange-cinnabar, sparsely covered with dark orange squamules.

Hyphae 2.0–7.0 µm, smooth, hyaline, thin- or thick-walled, with clamps. Pileipellis composed

with globose, subglobose to oval cells (spherocysts) 17–27 μm in diam., yellow to orange-brownish, thick-walled. Pleurocystidia 30.0–50.0 × 4.0–13.5 μm (including crystals at apex), slightly ventricose below, tapering to long, narrow neck with spear-shaped apex covered with crystals, with basal clamp. Basidia clavate, 16.0–20.0 × 4.5–5.5 μm, with 4 sterigmata and basal clamp. Basidiospores 3.0–4.8 × 2.0–3.0 μm, elliptic to ovoid, smooth, hyaline, thin-walled. Spore-print white (Fig. 84).

SPECIMENS EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1500 m, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28601, 28636; near Chongbong Mt. (9), alt. *ca* 1400 m, 1 July 986, *leg. W. Wojewoda*, KRAM-F 53277. – Mixed taiga with *Larix* and *Picea*, on ground, among mosses.

DISTRIBUTION IN ASIA. Japan, Mongolia and Russia (North of Altai, Siberia and Far East).

NOTES. New to North Korea. Known also from Europe, North America (United States and Canada) and Africa.

REFERENCES. Breitenbach & Kränzlin (1995: 188, Pl. 208); Gorbunova (1997: 17); Hansen & Knudsen (1992: 119, Fig. 131); Moser (1983: 251); Petrov & Belova (1999: 28); Syarzhanina (1994: 258); Vasilyeva (1973: 185); Vasser (1980: 213, Fig. 114, Pl. XVI: 2; 1985: 85, Pl. VIII: 4a–b).

Cystodermella granulosum (Batsch: Fr.) Harmaja

Karstenia **42**(2): 46. 2002.

Agaricus granulosus Batsch, Elench. Fung. **1**: 170. 1783. – *A. granulosus* Batsch: Fr., Syst. Mycol. **1**: 24. 1821. – *Armillaria granulosa* (Batsch: Fr.) Gray, Nat. Arr. Brit. Pl. **1**: 602. 1821. – *Lepiota granulosa* (Batsch: Fr.) Gray, Nat. Arr. Brit. Pl. **1**: 602. 1821. – *Cystoderma granulosum* (Batsch: Fr.) Kühner, Botaniste **17**: 125. 1926.

Basidiocarps scattered to gregarious. Pileus up to 30 mm in diam., convex, then expanded. Upper surface orange or reddish-orange, densely covered with granular floccose warts, margin paler. Pileipellis composed with globose, subglobose to oval cells (spherocysts) 15.5–30.0 × 13.5–21.0 μm, yellow to orange-brownish, thin- to thick-walled. Flesh white to cream-coloured. Smell absent. Lamellae crowded, white to cream-coloured. Stipe 20–45 × 3–5 mm, cylindric, solid, reddish-brown, smooth or with brownish squamules.

Hyphae 2.0–6.7 μm wide, smooth, hyaline, thin- or thick-walled, some septa with clamps. Cystidia absent. Basidia 16–24 × 4–5 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 3.8–4.8 × 2.5–3.0 μm, elliptic to ovoid, smooth, hyaline, thin-walled. Spore-print white (Fig. 85).

SPECIMEN EXAMINED. Kumgang-san Mts: on shore of Samil-po Lake (62), alt. *ca* 100 m, mixed forest with

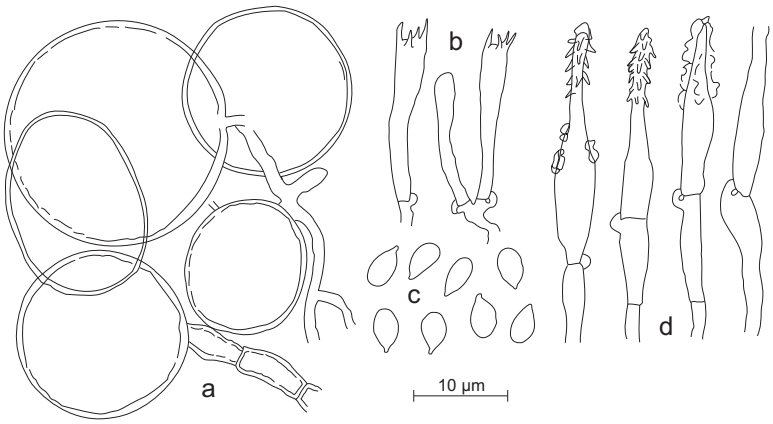


Fig. 84. *Cystodermella cinnabarinum* (Alb. & Schwein.: Fr.) Harmaja: a – cells of pileipellis, b – basidia, c – basidiospores, d – cheilocystidia, e – hyphae (KRAM-F 28601).

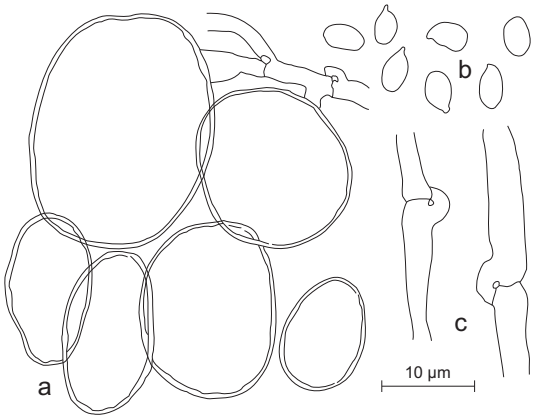


Fig. 85. *Cystodermella granulosum* (Batsch: Fr.) Harmaja: a – cells of pileipellis, b – basidiospores, c – hyphae (KRAM-F 28353).

Pinus densiflora and *Quercus mongolica*, on ground, among mosses, 19 July 1986, *leg. H. Komorowska*, KRAM-F 28353.

DISTRIBUTION IN ASIA. China, Georgia, Japan, Korea, Mongolia, Russia (North of Altai, Siberia and Far East) and Sri Lanka.

NOTES. Cosmopolitan species, known also from Europe, North America (United States and Canada), Africa and Australia.

REFERENCES. Anonymous (1983a: 118); Azbukina *et al*. (1984: 50); Breitenbach & Kränzlin (1995: 184, Pl. 202); Gorbunova (1997: 17); Hansen & Knudsen (1992: 119, Fig. 126); Imazeki & Hongo (1975, **1**: 52, Pl. 23: 127); Michael *et al*. 1983a: 184, Pl. 35); Moser (1983: 250); Pegler (1986: 315); Syarzhanina (1994: 257); Teng (1996: 437); Uranchimehg *et al*. (1983: 376); Vasilyeva (1973: 184); Vasser (1980: 211, Fig. 113; 1985: 81, Pl. VII: 4a–g).

Gymnopus dryophilus (Bull.: Fr.) Murrill

N. Amer. Fl. **9**: 362. 1916.

Agaricus dryophilus Bull., Herb. Fr. Pl. 434. 1790. – *A. dryophilus* Bull.: Fr., Syst. Mycol. **1**: 124. 1821. – *Collybia dryophila* (Bull.: Fr.) P. Kumm., Führ. Pilzk. 115. 1871. – *Marasmius dryophilus* (Bull.: Fr.) P. Karst., Bidr. Finl. Nat. Folk **48**: 103. 1889.

Basidiocarps solitary or gregarious. Pileus 10–40 mm, convex, broadly campanulate to plane with incurved margin, reddish brown, then pinkish to greyish orange. Flesh thin, white. Lamellae adnexed to nearly free, whitish to pinkish. Stipe 20.0–70.0 × 2.5–6.0 mm, cylindric or compressed, yellowish, apex paler, basal part darker, with white or ochre basal tomentum.

Hyphae of cortical layer of pileus 4.9–10.0 µm wide, with scattered encrusting pigment; terminal elements lobed to coralloid ('Dryophila' structure) up to 20 µm wide. Hyphae of cortical layer of stipe 4.8–10.0 µm wide. Clamps present. Cheilocystidia 14.5–49.0 µm long, irregularly clavate-coralloid, with broad apical lobes or finger-like projections, forming sterile band along edge. Basidia 16.5–22.5 × 5.6–7.8 µm, with 4 sterigmata. Basidiospores 4.8–6.4 × 2.8–3.5 µm.

SPECIMENS EXAMINED. Paekdu-san Mts: SE slope of Paekdu-san Mt. peak (1), *ca* 30 km NW of Samji-yon town, alt. *ca* 1900 m, scattered forest of *Larix olgensis*, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28462; near Taehong-dan (6), taiga with *Larix olgensis* and *Picea*, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28635, 28638, 28644; shore of Samji-yon Lake (7), near Samji-yon Hotel, taiga with *Larix olgensis*, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 27777; 28 June 1986, *leg. Z. Heinrich*, KRAM-F 27893, 27894, 27895; *leg. H. Komorowska*, KRAM-F 28649, 28674, 28680, 28686, 28694; near Naegok (13), alt. *ca* 800 m, mixed forest, 27 June 1986, *leg. Z. Heinrich*, KRAM-F 27866, 27867; alt. *ca* 1000 m, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28438; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 500 m, forest with *Quercus mongolica*, 8 June 1985, *leg. B. Zarzycka*, KRAM-F 27796; near Myohyang-san Hotel (20), mixed forest, 12 July 1986, *leg. H. Komorowska*, KRAM-F 28473; Kumgang-san Mts: Okryu-dong Valley, *ca* 1.5 km before Kuryong Falls (59), 20 July 1986, *leg. H. Komorowska*, KRAM-F 28238; near Manmulsang Rocks peak (55), alt. *ca* 900 m, mixed forest, 18 July 1986, *leg. H. Komorowska*, KRAM-F 28340. – On ground.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Japan, Kazakhstan and Russia (e.g. Far East).

NOTES. New to North Korea. Cosmopolitan. Known also from Europe, North and South America, Africa and Australia.

REFERENCES. Antonín & Noordeloos (1997: 84, Fig. 25, Pl. 20); Breitenbach & Kränzlin (1991: 174, Pl. 189); Halling (1983: 49, Figs 37–40, 103, 105, as *Collybia dryophila*); Imazeki & Hongo 1975, **1**: 22, Pl. 6: 36); Konrad & Maublanc (1928: Pl. 200: II); Melik-Khachatrian (1980: 214); Noordeloos (1995a: 115, Fig. 112, as *Collybia dryophila*); Phillips (1981: 55); Poelt & Jahn (1963: 104); Romagnesi (1971: 205); Syarzhanina (1994: 155); Teng (1996: 435); Vasilyeva (1978: 141, Fig. 88); Ying *et al.* (1983: 130).

Gymnopus subnudus (Ellis *ex* Peck) Halling

Mycotaxon **63**: 365. 1997.

Marasmius peronatus var. *subnudus* Ellis, North Amer. Fungi. 909. 1883. **–** *M. subnudus* Ellis *ex* Peck, Ann. Rept. N. Y. State Mus. **51**: 287. 1898. – *Collybia subnuda* (Ellis *ex* Peck) Gilliam, Mycotaxon **4**: 136.1976.

Pileus 10–15 mm, obtusely convex to broadly subumbonate, glabrous, cinnamon brown, vinaceus. Flesh thin, whitish. Taste bitter in dry specimen. Lamellae adnate to adnaxed narrow, whitish. Stipe 25.0–35.0 × 1.5–2.5 mm, dry, subglabrous at apex, whitish to greyish pubescent below.

Hyphae of cortical layer of pileus 3.2–6.8 µm wide, cylindric, repent, frequently encrusted with spiral, annular or irregular bands of brown pigment. Hyphae of cortical layer of stipe 2.5–5.8 µm wide, parallel, with brown pigmented walls. Clamps present. Cheilocystidia 30.0–40.0 × 7.2–8.6 µm, ventricose-fusoid. Basidia 20.0–35.0 × 5.6–10.0 µm, with 4 sterigmata. Basidiospores 8.6–9.2 × 3.2–4.2 µm.

SPECIMEN EXAMINED. Shore of Soham-ho Lake (32), coniferous forest, on ground, 17 July 1986, *leg. H. Komorowska*, KRAM-F 28573.

DISTRIBUTION. Known from North America (Canada and United States).

NOTES. New to North Korea.

REFERENCES. Halling (1983: 69, Figs 56–59, 107–108, as *Collybia subnuda*); Wojewoda *et al.* (1993: 125, 128).

Hemimycena gracilis (Quél.) Singer

Ann. Mycol. **41**: 121. 1943.

Omphalia gracilis Quél., Bull. Ass. Fr. **9**: 2, 1880. – *Mycena gracilis* (Quél.) Kühner, Genre *Mycena*. 650. 1938. – *Marasmiellus gracilis* (Quél.) Singer, Lilloa **22**: 299. 1951 (‘1949’). For further synonyms see Watling & Turnbull (1998: 119).

Basidiocarps solitary, scattered. Pileus 3–6 mm in diam., convex to broadly umbonate, with papilla. Upper surface whitish, glabrous. Margin slightly sulcate. Flesh very thin, hyaline. Lamellae moderately broad, adnate, white. Stipe 20.0–50.0 × 0.5–1.0 mm, equal, fragile, pure white, base white strigose.

Hyphae of cortical layer of pileus 5–15 µm broad, cylindric, with numerous fine projections. Hyphae of cortical layer of stipe 2.5–3.6 µm broad. Cheilocystidia poorly developed, basidium-like 15–25 × 3–5 µm, cylindric, hyaline. Pleurocystidia not differentiated. Basidia 20–30 × 5–6 µm with 2 sterigmata. Basidiospores 9.0–11.0 × 2.5–3.0 µm, cylindric, hyaline (Fig. 86).

SPECIMEN EXAMINED. Paekdu-san Mts: near Naegok (13), alt. *ca* 1000 m, mixed forest, on litter, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28414.

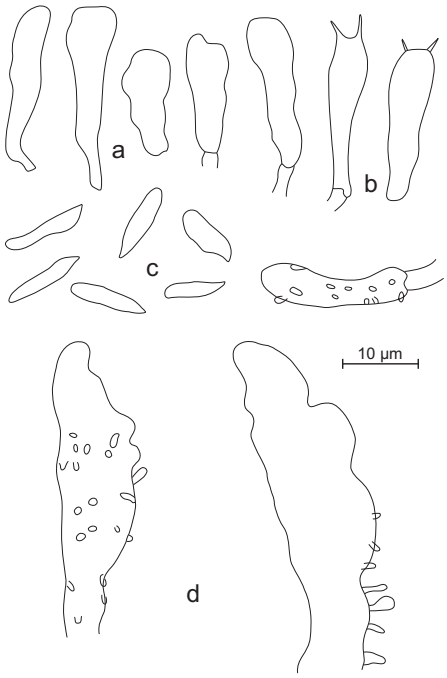


Fig. 86. *Hemimycena gracilis* (Quél.) Singer: a – cheilocystidia, b – basidia, c – basidiospores, d – hyphae of cortical layer of pileus (KRAM-F 28414).

DISTRIBUTION. Europe and North America.

NOTES. New to North Korea.

REFERENCES. Kühner (1938: 650); Smith (1947: 90); Watling & Turnbull (1998: 119).

Hemimycena cfr. ***pseudolactea*** (Kühner) Singer

Ann. Mycol. **41**: 121. 1943.

Mycena pseudolactea Kühner, Genre *Mycena*. 632. 1938.

Basidiocarps gragarious. Pileus 3–12 mm in diam., convex, sometimes apex slightly depressed. Upper surface white, pruinose, to minutely pubescent. Margin incurved, then plane, translucent-striate. Flesh thin, watery milk-white. Lamellae narrow, subdistant, subdecurrent to deeply decurrent, white. Stipe 10–30 × 0.5–1.0 mm, cylindric, straight, basal mycelium white.

Hyphae of cortical layer of pileus branched with strongly inflated, clavate, pyriform or contorted, erected terminal cell (pileocystidia), 32.0–45.0 × 9.8–15.6 μm, often encrusted amorphous, resinous substance. Hyphae of cortical layer of stipe 2–4 μm wide, diverticulate. Caulocystidia numerous and similar to pileocystidia. Cheilo- and pleurocystidia similar, 54–72 × 9–12 μm, nearly cylindric or ventricose, apex obtuse or rounded into small head, some ± encrusted. Basidia 30–35 × 5–8 μm, with 2 sterigmata. Basidiospores 10.2–12.0 × 3.6–4.8 μm (Fig. 87).

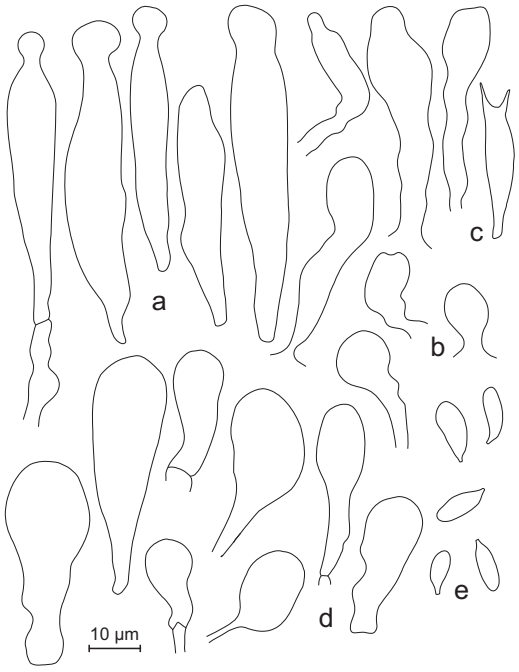


Fig. 87. *Hemimycena* cfr. *pseudolactea* (Kühner) Singer: a – cheilo- and pleurocystidia, b – caulocystidia, c – basidium, d – pileocystidia, e – basidiospores (KRAM-F 28692).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed taiga with *Larix olgensis*, on fallen needles of *Larix*, 28 June 1986, *leg. H. Komorowska*, KRAM-F 28691, 28692.

DISTRIBUTION. Europe and North America (Canada, United States).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1991: 196, Pl. 221); Maas Gesteranus (1992a: 62; 1992b: 437); Smith (1947: 159, Fig. 15, Pl. 11A, as *Mycena pseudolactea*).

Hygrocybe conica (Schaeff.: Fr.) P. Kumm.

Führ. Pilzk. 111. 1871.

– var. ***conica***

Agaricus conicus Schaeff., Fungi Bavariae **4**: 2. 1774. – *A. conicus* Schaeff.: Fr., Syst. Mycol. **1**: 103. 1821. – *Hygrocybe nigrescens* ss. auct. – *Hygrophorus nigrescens* ss. auct.

Basidiocarp blackening when touched and with age. Pileus 20–50 mm in diam., conic. Upper surface slightly viscid when moist, radially fibrillose, yellow-orange to red-orange. Flesh yellowish white, orange-yellow under cuticle. Smell indistinct. Taste mild. Hymenophore lamellate. Lamellae broad, ventricose, whitish to yellow. Stipe 30–70 × 2–5 mm, cylindric, longitudinally fibrillose, orange-yellow to orange-red, blackening with age.

Hyphae with clamps. Cystidia absent. Basidia 30.0–45.0 × 7.5–8.5 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 7.5–9.0 × 5.0–7.5 μm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Wonsan town (50), Botanical Garden, 22 July 1986, *leg. Z. Heinrich*, KRAM-F 28061; near tomb of King Kongmin (64), 26 July 1986, *leg. H. Komorowska*, KRAM-F 28117; Pagyon Ravine (65), 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28201. – On ground, among grass.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Kazakhstan, Kirghizia, Korea, Russia (North Altai and Far East: Primorski Krai) and Sri Lanka.

REFERENCES. Anonymous (1983a: 111); Arnolds (1990: 83, Fig. 57); Azbukina *et al*. (1984: 41); Breitenbach & Kränzlin (1991: 106, PL. 85); Candusso (1997: 404, 732); Gorbunova (1997: 16); Gumińska (1997: 113 & 129, Figs 18 & 21, Pls. IX: 4–6 & XIII: 1–7); Hansen & Knudsen (1992: 78); Melik-Khachatrian (1980: 156); Pegler (1986: 56); Teng (1996: 411); Vasilyeva (1973: 77).

Hygrocybe lepida Arnolds

Persoonia **13**: 139. 1986.

Agaricus cantharellus Schwein., Schr. Nat. Ges. Lepzig **1**: 88. 1822. – *Camarophyllus cantharellus* (Schwein.: Fr.) Murrill, North Amer. Flora **9**: 388. 1916. – *Hygrocybe cantharellus* (Schwein.: Fr.) Murrill, Mycologia **3**: 196. 1911.

Basidiocarp infundibuliform. Pileus 5–10 mm in diam., convex. Upper surface dry, orange-red, covered with fine fibrillose squamules. Flesh yellow, under cuticle orange-yellow. Smell absent. Taste mild. Hymenophore lamellate. Lamellae cream to yellow, decurrent, with smooth edges. Stipe 20–30 × 1–2 mm, cylindric, dry, dull, orange-red to orange-yellow, paler toward base.

Hyphae with clamps. Cystidia absent. Basidia 30.0–55.0 × 7.0–9.5 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidia with 2–4 sterigmata and basal clamp. Basidiospores 7.5–10.5 × 5.5–7.5 µm, elliptic to cylindric-elliptic, smooth, hyaline, non-amyloid. Spore-print white.

SPECIMENS EXAMINED. Near tomb of King Kongmin (64), on ground, among grass, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28108, 28112.

DISTRIBUTION IN ASIA. Caucasus, Japan, Korea and Russia (e.g. Siberia and Far East: Primorski Krai).

REFERENCES. Anonymous (1983a: 111); Arnolds (1990: 98, Fig. 78); Azbukina *et al*. (1984: 41); Breitenbach & Kränzlin (1991: 108, Pl. 90); Candusso (1997: 552, 754); Doi (1991: 56); Gumińska (1997: 106, Pl. XIII: 15–17); Hansen & Knudsen (1992: 83); Imazeki & Hongo (1975, **1**; 14, Pl. 2: 9); J. E. Lange (1940: 28, Pl. 167B); Syarzhanina (1994: 58); Vasilyeva (1973: 76, Fig. 11A).

Hygrophorus lucorum Kalchbr.

Ic. Sel. Hymenomyc. Hungariae. 35. 1874.

Limacium lucorum (Kalchbr.) P. Hennig, Natürl. Pflanz. **1**: 213. 1898. – *Tricholoma luteocitrinum* Rea, Trans. Brit. Mycol. Soc. **3**: 125. 1909.

Pileus 30–40 mm in diam., hemispheric to convex-conic. Upper surface with fine flakes, viscid when moist, lemon-yellow, paler with age. Flesh whitish, under the cuticle orange-yellow. Smell pleasant, fungous. Taste mild, fungous. Hymenophore lamellate. Lamellae whitish to yellowish, broad, broadly adnate to subdecurrent. Stipe 30–80 × 4–10 mm, cylindric, somewhat fibrillose, cream-coloured to whitish, slimy, hollow to solid, with remnants of glutinous veil.

Hyphae with clamps. Cystidia absent. Basidia 20.0–45.0 × 4.5–6.0 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 6–9 × 4–5 µm, elliptic, smooth, hyaline, thin-walled, with oil-drops. Spore-print white.

SPECIMENS EXAMINED. Paekdu-san Mts: slightly below upper forest line under Paekdu-san Mt. peak (1), alt. *ca* 1900 m, taiga with *Abies nephrolepis*, *Larix olgensis*, *Picea jezoensis*, *P. koreana* and *Pinus koreaiensis*, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29178; bank of Tuman-gang River (5), alt. *ca* 1350 m, taiga with *Larix olgensis*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29179; *ca* 15 km N of Samji-yon town (8), alt. *ca* 1400 m, taiga with *Larix olgensis*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29180. – On ground, under *Larix olgensis*.

DISTRIBUTION IN ASIA. Japan, Korea and Russia (e.g. Primorski Krai).

NOTES. In North Korea (Paekdu-san Mts) collected as edible mushroom.

REFERENCES. Anonymous (1978: 20; 1983a: 111), Arnolds (1990: 127, Fig. 110); Azbukina *et al*. (1984:

41); Breitenbach & Kränzlin (1991: 128, Pl. 118); Candusso (1997: 232); Hansen & Knudsen (1992: 89); Gumińska (1997: 58, Pl. VII: 3–9); Imazeki & Hongo (1975, **2**: 10, Pl. 1: 1); J. E. Lange (1940: 13, Pl. 163C); Vasilyeva (1973: 49; 1978: 131, Pl. 50); Wojewoda *et al*. (1993: 128).

Lepista irina (Fr.) Bigelow

Can. J. Bot. **37**: 775. 1959.

Agaricus irinus Fr., Epicr. Syst. Mycol. **1**: 48. 1838. – *Clitocybe irina* (Fr.) Bigelow & A. H. Sm., Brittonia **21**: 172. 1969. For further synonyms see Bigelow (1982: 159).

Basidiocarps gregarious. Pileus 70–80 mm across, convex to plano-convex, umbonate, hygrophanous, pale beige-brown. Margin involute. Flesh thick, firm, white. Smell strong, pleasant. Taste unpleasant. Lamellae moderately crowded, adnaxed, yellow-brown. Stipe 70–60 × 20–25 mm, cylindric with slightly swollen base, concolorous with pileus or paler, fibrillose, striate.

Hyphae of cortical layer of pileus 2–5 μm broad, cylindric, parallel with scattered, ascending, inflated ends. Clamps present. Cystidia absent. Basidia 32.0–38.0 × 6.3–8.5 μm, with 4 sterigmata. Basidiospores 6.3–8.5 × 3.8 μm, elliptic, verruculose, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, taiga, on ground, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52692.

DISTRIBUTION IN ASIA. Japan and Russia (e.g. East Siberia).

NOTES. New to North Korea.

REFERENCES. Bigelow (1982: 159, Fig. 74, as *Clitocybe irina*); Breitenbach & Kränzlin (1991: 212, Pl. 245); Dähncke & Dähncke (1980: 147); Imazeki & Hongo (1975, **2**: 22, Pl. 6: 35); Kühner (1976: 22); Noordeloos & Kuyper (1995: 70, Fig. 56); Phillips (1981: 114); Romagnesi (1971: 151, as *Rhodopaxillus irinus*); Ryman & Holmĺsen (1984: 278); Syarzhanina (1994: 138).

Lepista sordida (Schum.: Fr.) Singer

Lilloa **22**: 193. 1951 (‘1949’).

Agaricus sordidus Schum., Enum. Plant. 341. 1803. – *A. sordidus* Schum.: Fr., Syst. Mycol. **1**: 51. 1821; *Tricholoma sordidum* (Schum.: Fr.) P. Kumm, Führ. Pilzk. 134. 1871. – *Clitocybe tarda* Peck, Bull. Torrey Club **24**: 110. 1897. For further synonyms see Bigelow (1982: 169).

Basidiocarps caespitose. Pileus 23–55 mm in diam., broadly conico-campanulate, slightly depressed, greyish lilac, hygrophanous, glabrous and smooth. Margin paler, incurved, slightly striate. Flesh thin, aqueous, greyish brown. Lamellae up to 5 mm broad, sinuato-adnate, crowded, pale greyish brown (paler than pileus and stipe). Stipe 30–50 × 3–5 mm, terete, equal or slightly tapering towards apex, broadened at base, often curved, ± concolorous with pileus, substriate (with brown streaks), longitudinally fibrillose. Base with tomentum.

Hyphae of cortical layer of pileus 4–8 μm broad, repent, cylindric, hyaline, thin-walled, with pale grey-brown intracellular pigment. Cystidia absent. Basidia 20–25 × 5–7 μm, with 4 sterigmata. Basidospores 5.7–7.0 × 3.0–4.5 μm, oblong elliptic, hyaline, with fine ruguloso-verruculose ornamentation.

SPECIMEN EXAMINED. Wonsan town (50), Botanical Garden, on ground, 22 July 1986, *leg. H. Komorowska*, KRAM-F 28557.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Russia (e.g. West and East Siberia and Primorski Krai) and Sri Lanka.

NOTES. New to North Korea. Common and widespread all over the Northern Hemisphere.

REFERENCES. Arnolds (1983: Pl. 6a); Bigelow (1982:169, Figs 85, 86, as *Clitocybe tarda*); Breitenbach & Kränzllin (1991: 216, Pl.250); Melik-Khachatrian (1980: 249); Noordeloos & Kuyper (1995: 73, Fig. 59); Pegler (1986: 79); Syarzhanina (1994: 121); Teng (1996: 443); Vasilyeva (1973: 115).

Megacollybia platyphylla (Pers.: Fr.) Kotl. & Pouzar

Česká Mykol. **26**: 220. 1972.

Agaricus platyphyllus Pers., Obs. Mycol. **1**: 47. 1796. – *A. platyphyllus* Pers.: Fr., Syst. Mycol. **1**: 117. 1821. – *Collybia platyphylla* (Pers.: Fr.) P. Kumm, Führ. Pilzk. 117. 1871. – *Oudemansiella platyphylla* (Pers.: Fr.) M. Moser, Kl. Krypt. Flora. 156. 1983. – *Tricholomopsis*

platyphylla (Pers.: Fr.) Singer, Schweiz. Z. Pilzk. **17**: 13. 1939.

Basidiocarps solitary. Pileus 65 mm in diam., plane, with slightly depressed centre, dark brown, shiny, radially rimose-fibrillose. Margin involute. Flesh whitish. Lamellae up to 6 mm broad, distant, free, white, with brown edge. Stipe 60 × 9 mm, cylindric, with widespread base, shiny, white, finely longitudinally striate, with dark fibrils, white pruinose at apex. Base with white rhizomorphs.

Hyphae of cortical layer of pileus 4–6 μm, compressed, parallel, with clavate terminal elements with brown intracellular pigment. Hyphae of cortical layer of stipe 2–4 μm broad. Cheilocystidia 20.0–55.0 × 7.5–15.0 μm, prominent, lageniform, hyaline or with brown pigment, thin-walled. Pleurocystidia absent. Basidia 28.0–38.0 × 6.5–7.5 μm, clavate, with 4 sterigmata. Basidiospores 6.5–7.5 × 6.0–7.0 μm, subglobose or globose, smooth, hyaline, thin-walled (Fig. 88).

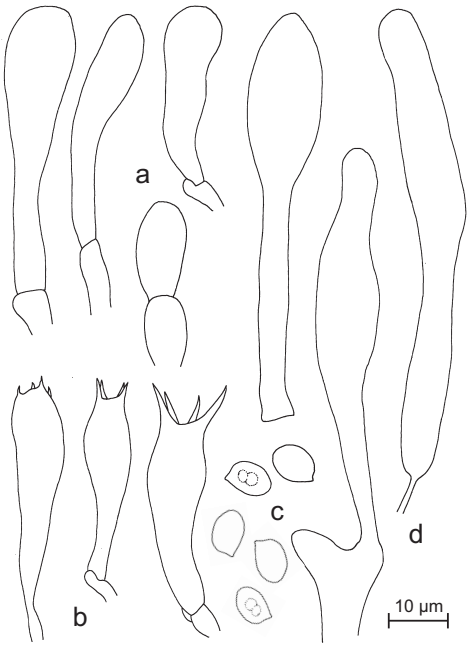


Fig. 88. *Megacollybia platyphylla* (Pers.: Fr.) Kotl. & Pouzar: a – cheilocystidia, b – basidia, c – basidiospores, d – terminal cells of hyphae of cortical layer of pileus (KRAM-F 28350).

SPECIMEN EXAMINED. Kumgang-san Mts: shore of Samil-po Lake (62), mixed taiga, on ground, 19 July 1986, *leg. H. Komorowska*, KRAM-F 28350.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Japan, Kazakhstan, Korea and Russia (e.g. Far East: Primorski Krai).

REFERENCES. Anonymous (1978: 51; 1983a: 116); Azbukina *et al*. (1984: 47); Breitenbach & Kränzllin (1991: 246, Pl. 296); Hansen & Knudsen (1992: 147, Figs 236, 269); Imazeki & Hongo (1975, **2**: 21, Pl. 5: 33); Jahn (1979: 196, Pl. 170); Melik-Khachatrian (1980: 222, Pl. 2: 2); Rexer & Kost (1989: 216); Teng (1996: 446); Vasilyeva (1973: 126).

Mycena adonis (Bull.: Fr.) Gray

Nat. Arrang. Br. Pl. **1**: 620. 1821.

Agaricus adonis Bull., Hist. Champ. Fr. 445. 1792–1973. – *A. adonis* Bull.: Fr., Syst. Mycol. **1**: 152. 1821. – *Hemimycena adonis* (Bull.: Fr.) Singer, Ann. Mycol. **41**: 123. 1943. For further synonyms see Maas Geesteranus (1992b: 429).

Basidiocarps solitary. Pileus 7 mm across, campanulate, pink-salmon, apex with orange tinge, slightly translucent-striate. Flesh thin. Smell and taste not distinctive. Lamellae reaching stipe, 2 mm broad, delicately pink-white. Stipe 24 × 1 mm, equal, fragile, whitish, base strigose.

Hyphae of pileipellis 2–7 μm wide, with simple cylindric excrescences 1.5–10.5 × 1.5–3.5 μm. Hyphae of cortical layer of stipe 2–3 μm wide. Caulocystidia 20.0–50.0 × 4.0–13.5 μm, clavate or fusiform. Cheilocystdia 50–80 × 8–12 μm, fusiform, long- to short-stalked, pleurocystidia similar. Basidiospores 6.6–9.6 × 3.6 μm, smooth, non-amyloid (Fig. 89).

SPECIMEN EXAMINED. Paekdu-san Mts: valley of stream near Naegok (13), near Onsu-pyong village, alt. *ca* 1000 m, mixed forest, in wet place, on ground, among grass and moss, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28426.

DISTRIBUTION IN ASIA. Japan, Russia (e.g. Far East: Primorski Krai).

NOTES. New to North Korea. Also known from Europe, Africa (Algeria and Tenerife Islands) and North America (United States).

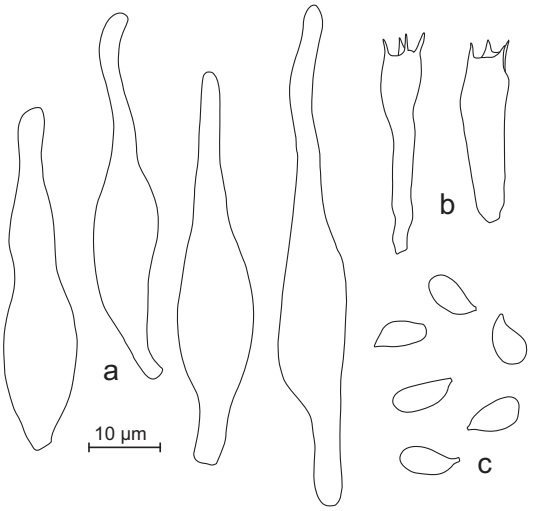


Fig. 89. *Mycena adonis* (Bull.: Fr.) Gray: a – cheilocystidia, b – basidia, c – basidiospores (KRAM-F 28426).

REFERENCES. Azbukina *et al*. (1984: 46); Breitenbach & Kränzlin (1991: 258, Pl.313); Imazeki & Hongo (1975, **2**: 15); Maas Geesteranus (1992b: 429, Figs 1–17); Syarzhanina (1994: 181); Smith (1947: 177, Fig. 17, Pl. 19B); Vasilyeva (1973: 143).

Mycena chlorophos (Berk. & M. A. Curtis) Sacc.

Syll. Fung. **5**: 301. 1887.

Agaricus chlorophos Berk. & M. A. Curtis, Proc. Amer. Acad. Arts Sci. **4**: 113. 1860. For further synonyms see Maas Geesteranus (1992b: 468) and Pegler (1986: 190).

Basidiocarps solitary. Pileus 5–15 mm across, convex, becoming plano-convex and depressed to umbilicate at centre, translucent-striate, pruinose, pale fuscous to mouse grey. Flesh very thin but firm. Lamellae 3 mm broad, free, white. Stipe 10.0–20.0 × 0.5–1.5 mm, watery white, arising from swollen white-pubescent basal disc 2–3 mm wide.

Hyphae of pileipellis 4–9 µm wide. Pileocystidia 20.0–55.8 × 7.2–28.0 µm, ± densely covered with simple, cylindric excrescences. Hyphae of cortical layer of stipe 4.5–10.0 µm wide. Caulocystidia 45–70 × 16–20 µm, fusiform, clamped, smooth. Cheilocystidia 45.0–70.0 × 10.5–19.0 µm, forming a sterile band along edge, fusiform, apically narrowed or acute, near pileus margin narrowed into a slender neck 2.0–5.5 µm wide, and possibly ± strongly branched at top. Pleurocystidia absent. Basidia 30.0–38.0 × 7.2–8.0 µm, with 4 sterigmata and basal clamps. Basidiospores 7 × 4 µm, smooth, weakly amyloid (Fig. 90).

SPECIMENS EXAMINED. Pagyon Ravine (65), alt. *ca* 300 m, forest, on rotten wood, 26 July 1986, *leg. H. Komorowska*, KRAM-F 28293; *leg. Z. Heinrich*, KRAM-F 28189.

DISTRIBUTION IN ASIA. Tropical and subtropical regions of southeast Asia, e.g. known from Japan (Bonin Islands, Hachijo Islands, Chichibu Province of Honshu) and Sri Lanka.

NOTES. New to North Korea.

REFERENCES. Maas Geesteranus (1992b: 468, Figs 65–71); Pegler (1986: 190, Fig. 39G–L).

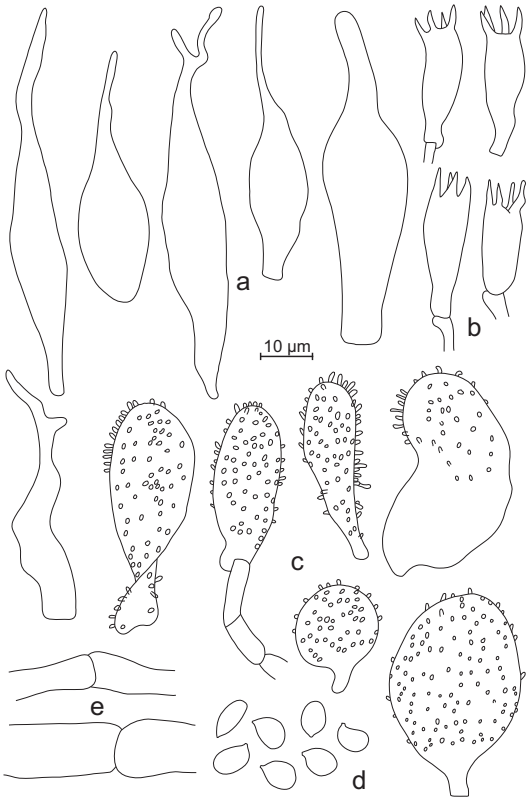


Fig. 90. *Mycena chlorophos* (Berk. & M. A. Curtis) Sacc.: a – cheilocystidia, b – basidia, c – pileocystidia, d – basidiospores, e – hyphae of cortical layer of stipe (KRAM-F 28189).

Mycena epipterygia (Scop.: Fr.) Gray

Nat. Arrang. Br. Pl. **1**: 619. 1821.

Agaricus epipterygius Scop., Fl. Carniol. **2**: 455. 1772. – *A. epipterygius* Scop.: Fr., Syst. Mycol. **1**: 155. 1821. For further synonyms see Maas Geesteranus (1992b: 347).

Basidiocarps scattered to gregarious. Pileus 17–27 mm across, conic, broadly conic to planoconvex, with or without umbo, ± viscid, dark grey, grey-brown or olive-grey. Margin pallid, sometimes with tinge of blue, translucent-striate, striate or plicate-striate. Flesh thin. Smell and taste disagreeable, resembling rancid fish (iodoform) or faint fresh cucumber. Lamellae white or grey-tinged, then faintly pinkish, with or without reddish brown spots. Stipe 4.0–6.0 × 1.5–2.5 mm, elastic to fragile, yellow to brown, below brown, dark brown or yellowish, base faintly strigose, sometimes rooting, viscid.

Hyphae of cortical layer of pileus 1.8–5.8 µm broad, cylindric, with excrescences, ± branched. Terminal elements somewhat erected and surrounded by gelatinous matter. Hyphae of cortical layer of stipe 1.2–2.4 µm broad, smooth or diverticulate. Terminal elemnts of stipe 4.8–12.8 × 2.4–4.6 µm, clavate to cylindric, with numerous excrescences. Clamps present. Cheilocystidia 16.2–60.0 × 4.8–9.6 µm, cylindric, with much-branched apex, forming sterile band embedded in gelatinous matter. Pleurocystidia absent. Basidia 25.6–36.0 × 7.2–9.6 µm, with 4 sterigmata. Basdiospores 7.2–10.2 × 6.0–7.2 µm, amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), taiga with *Larix olgensis*, 28 June 1986, *leg. H. Komorowska*, KRAM-F 28658, 28672, 28677, 28684; *ca* 25 km NW of of Samji-yon town (8), alt. *ca* 1700 m, forest with *Picea*, 28 June 1985, *leg. B. Zarzycka*, KRAM-F 52954; taiga with *Larix* and *Picea*, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28606, 28618; between Rimyongsu (10) and Potae (11), ca 14 km SE of Chonbong Hill, alt. *ca* 1250 m, taiga with *Larix*, 1 July 1986, *leg. H. Komorowska*, KRAM-F 52955. – On wood debris and stumps.

DISTRIBUTION IN ASIA. China, Japan, Russia (e.g. Far East).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 46); Breitenbach & Kränzlin (1991: 268, Pl. 329); Maas Geesteranus (1992b: 347, Figs 1–16); Smith (1947: 425, Fig. 51, Pl. 95A); Syarzhanina (1994: 173).

Mycena haematopus (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 108. 1871.

Agaricus haematopus Pers., Obs. Mycol. **2**: 56. 1799; *A. haematopus* Pers.: Fr., Syst. mycol. **1**: 149. 1821. – *Galactopus haematopus* (Pers.: Fr.) Earle, Bull. N. Y. Bot. Gdn. **5**: 426. 1909.

Basidiocarps in small groups to fasciculate. Pileus 10–25 mm across, campanulate with umbo, pinkish brown. Margin dingy yellowish, hygrophanous, translucent-striate, shallowly sulcate, pruinose. Flesh thin, watery brownish vinaceous. Lamellae 3 mm broad, decurrent with a tooth, smooth to ribbed, whitish with purplish spots. Stipe 40–60 × 2 mm, fragile, equal, smooth, at first densely white-floccose-powdered all over, soon glabrescent, with a dark red-brown fluid when cut (the same holds for the lamellae and young pileus). Base densely covered with long, coarse, whitish fibrils. In the herbarium blackening.

Hyphae of pileipellis 2.0–4.5 µm wide, repent, with excrescences, ± strongly diverticulate to tuberculate. Hyphae of cortical layer of stipe 2.0–3.5 µm wide, with clamps, smooth. Terminal cells (caulocystidia) 30.0–60.0 × 3.5–12.0 µm, occurring densely clustred, clavate to irregularly shaped, with clamps, branched to very coarsely diverticulate. Cheilocystidia 40–70 × 9–15 µm forming a sterile band, fusiform, with colourless or reddish brown contents, with clamps, apically passing into a usually slender neck (2.0–3.5 µm). Basidia 30–37 × 8–11 µm clavate, with 4 sterigmata up to 10 µm long, with basal clamp. Basidiospores 7.8–10.8 × 6.0–7.2 µm smooth, amyloid (Fig. 91).

SPECIMEN EXAMINED. Paekdu-san Mts: Chongbong Mt. (9), alt. *ca* 1400 m, mixed taiga, on decayed wood, 31 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52983.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, Georgia, Japan, Korea and Russia (e.g. North Altai and Primorski Krai).

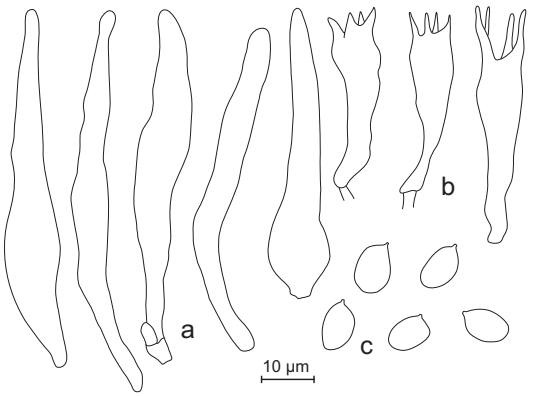


Fig. 91. *Mycena haematopus* (Pers.: Fr.) P. Kumm.: a – cheilocystidia, b – basidia, c – basidiospores (KRAM-F 52983).

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 115); Azbukina *et al*. (1984: 47); Gorbunova (1997: 17); Breitenbach & Kränzlin (1991: 276, Pl. 340); Imazeki & Hongo (1975, **1**: 40, Pl. 15: 85); Jahn (1979: 204, Pl. 179); Maas Geesteranus (1992b: 334, Figs 100–109); Melik-Khachatrian (1980: 240); Smith (1947:140, Fig. 12, Pls. 13–14A); Vasilyeva (1973: 147).

Mycena hiemalis (Osbeck) Quél.

Mém. Soc. Émul. Montbéliard Sér. II, **5**: 110. 1872 (Champ. Jura Vosges **1**).

Agaricus hiemalis Osbeck apud Retz., Obs. Bot. **2**: 19. 1791. – *A. galericulatus* [var.] *hiemalis* (Osbeck) Rabenh., Deutschl. Krypt. Flora **1**: 526, 1844. – *Hemimycena hiemalis* (Osbeck) Singer, Revue Mycol. **3**: 195. 1938. For further synonyms see Maas Geesteranus (1992b: 454).

Basidiocarps solitary. Pileus 10–13 mm across, campanulate to plano-convex, shallowly sulcate, translucent-striate, glabrous, entirely white. Flesh *ca* 1 mm thick, membranous but fragile, watery whitish. Lamellae tender, up tp 1.5 mm broad, thick, ventricose, adnate, smooth to rugulose, white. Stipe 10.0–12.0 × 0.5 mm, fragile, equal, cylindric, minutely puberulous throughout, whitish, the base covered with long, coarse, whitish fibrils.

Hyphae of pileipellis 2–5 µm wide, with clamps, covered with usually simple, more rarely furcate, cylindric, straight to curved excrescences 2–9 × 2–3 µm. Hyphae of cortical layer of stipe 2–6 µm wide, with clamps. Terminal cells (caulocystidia) variously shaped, often lobed or branched. Cheilocystidia 30.0–60.0 × 5.5–12.5 µm fusiform to somewhat utriform, with clamps, smooth, apically usually broadly rounded but some also considerably narrowed. Basidia 25–35 × 7–9 µm clavate, 4-spored, with sterigmata 4.5–6.5 µm long and with clamps. Basidiospores 7.2–9.2 × 5.0–6.5 µm, ellipsoid, smooth, non-amyloid (Fig. 92).

SPECIMEN EXAMINED. Ryongak-san Mt. (42), alt. *ca* 200 m, mixed forest, on bark of living *Quercus* sp., 16 July 1986, *leg. H. Komorowska*, KRAM-F 28318.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, Georgia and Russia.

NOTES. New to North Korea. Known also from Europe and North America (United States).

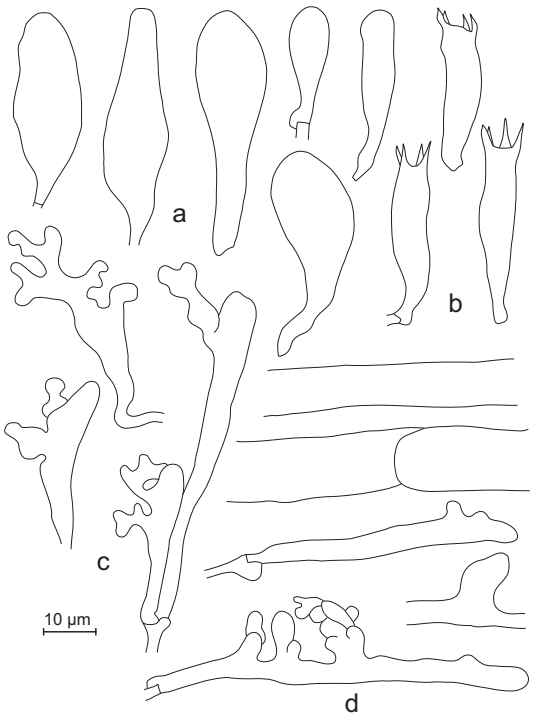


Fig. 92. *Mycena hiemalis* (Osb.: Fr.) Quél.: a – cheilocystidia, b – basidia, c – caulocystidia, d – hyphae of cortical layer of stipe (KRAM-F 28318).

REFERENCES. Breitenbach & Kränzlin (1991: 276, Pl. 341); Melik-Khachatrian (1980: 240); Maas Geesteranus (1992b: 454, Figs 4–18); Smith (1947: 358, Fig. 14, Pl. 53B).

Mycena inclinata (Fr.) Quél.

Mém. Soc. Émul. Montbéliard Sér. II, **5**: 105. 1872 (as '*inclinatus*') (Champ. Jura Vosges **1**).

Agaricus inclinatus Fr., Epicr. Syst. Mycol. 107. 1838. – *A. galericulatus* var. *calopus* Fr., Icon. Sel. Hym. **1**: 86, Pl.80. 1867. **–** *Mycena calopus* (Fr.) Ricken, Blätterp. 437, Pl.111. 1915. For further synonyms see Maas Geesteranus (1992b: 98).

Basidiocarps fasciculate. Pileus 20–30 mm across, conic then campanulate, with or without umbo, finely radially rugulose to sulcate, hygrophanous, translucent-striate. Flesh thin, cartilaginous. Lamellae 3–6 mm broad, elastic but tough, ventricose, adnate. Stipe 110–150 × 2–3 mm watery greyish, under pileus silvery white, below darker, yellow-brown to reddish brown.

Hyphae of pileipellis 2.0–3.5 µm wide, with clamps, the narrower smooth, the wider sparsely diverticulate, with excrescences, verrucose to cylindric. Hyphae of cortical layer of stipe 2.0–2.5 µm wide, with clamps, smooth to diverticulate, terminal cells enlarged up to 5 µm, scattered, variously shaped and diverticulate. Cheilocystidia 25–35 × 6–12 µm, clavate to subcapitate, apices covered with cylindric, simple to branched, curved to flexuous excrescences. Pleurocystidia absent. Basidia 25.0–30.0 × 6.5–8.0 µm, clavate, with 4 sterigmata and clamps. Basidiospores 7.2–9.0 × 5.0–7.2 µm broadly elliptic, smooth, amyloid (Fig. 93).

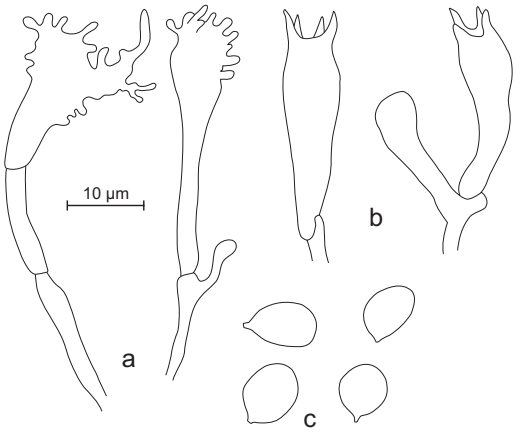


Fig. 93. *Mycena inclinata* (Fr.) Quél.: a – cheilocystidia, b – basidia, c – basidiospores (KRAM-F 28625).

SPECIMEN EXAMINED. Paekdu-san Mts: near Taehongdan (6), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, on stump, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28625.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Japan, Russia (e.g. Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1991: 276, Pl. 342); Jahn (1979: 204, PL. 180); Maas Geesteranus (1992b: 98, Figs 57–67); Melik-Khachatrian (1980: 241); Smith (1947: 338, Fig 41, Pls 77–79); Syarzhanina (1994: 188); Vasilyeva (1973: 147).

Mycena laevigata (Lasch) Gill.

Hyménomycètes. 274. 1876.

Agaricus laevigatus Lasch, Linnaea **3**: 388. 1828.

Basidiocarps caespitose to subcaespitose. Pileus 7–35 mm across, conic to hemispherical, often umbonate, at times with slightly depressed centre, glabrous, lubricous when wet, white to whitish, with dark disc (grey to cream), at fading becoming cream-coloured, hygrophanous. Margin striate. Flesh thin, white. Lamellae 2–3 mm broad, adnate to decurrent, white or slightly tinged cream, with age sometimes becoming spotted pale tawny. Gill trama vinaceous brown. Stipe 20.0–80.0 × 1.5–3.0 mm equal, cartilaginous and brittle, watery grey to white, the base ± rooting with whitish fibrils.

Hyphae of pileus 8.0–12.5 µm wide, smooth. Hyphae of stipe 11.5–15.0 µm wide. Cheilocystidia 20.0–40.0(–50.0) × 3.5–8.0 µm, of two types: (1) short and clavate subfusiform to cylindric, or (2) greatly elongated into a narrow lanceolate apex, forming a sterile band. Basidia 18.0–25.0 × 5.5–8.0 µm clavate, with 4 sterigmata. Basidiospores 6.0–8.4 × 3.6–4.8 µm, broadly elliptic, amyloid (Fig. 94).

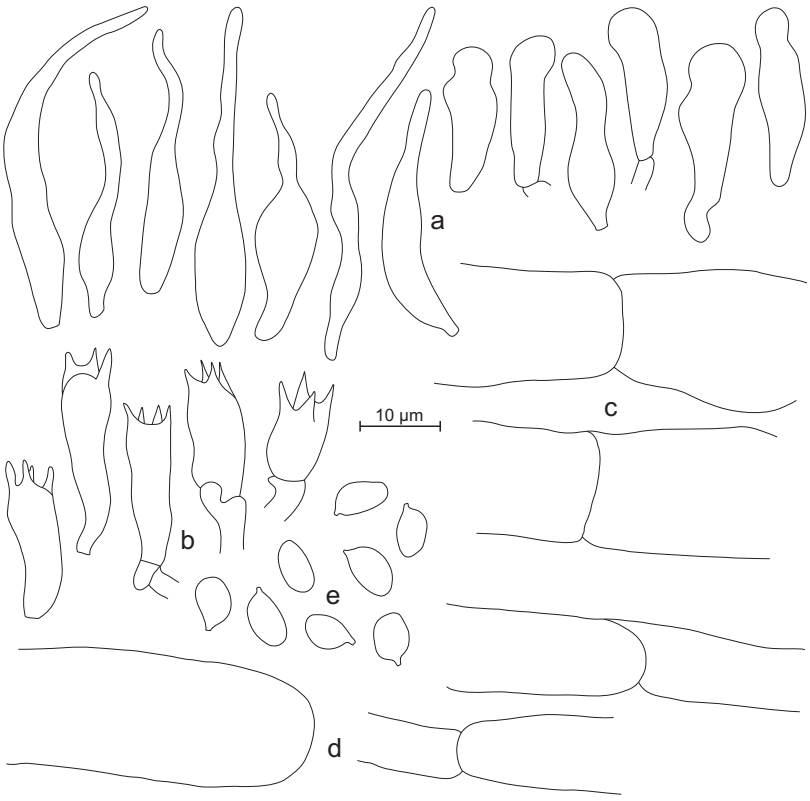


Fig. 94. *Mycena laevigata* (Lasch) Gill.: a – two types of cheilocystidia, b – basidia, c – hyphae of cortical layer of stipe, d – hyphae of cortical layer of pileus, e – basidiospores (KRAM-F 28613).

SPECIMENS EXAMINED. Paekdu-san Mts: SE slope of Paekdu-san Mt. (1), *ca* 30 km NW of Samji-yon town, alt. *ca* 1900 m, scattered forest with *Larix olgensis*, on wood, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28464; near Taehong-dan (6), taiga with *Larix* and *Picea*, on wood, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28627; shore of Samji-yon Lake (7), taiga with *Larix olgensis*, on rotten logs, 28 June 1986, *leg. H. Komorowska*, KRAM-F 28659, 28665, 28667, 28685, 28690, 28720; 28 June 1986, *leg. Z. Heinrich*, KRAM-F 27907, 27903; *ca* 28 km NE of Samji-yon town (8), taiga with *Larix* and *Picea*, on wood, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28598; *ca* 25 km NW of Samji-yon town, alt. *ca* 1700 m, taiga with *Larix* and *Picea*, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28613, 28620, 28623; *leg. Z. Heinrich*, KRAM-F 52953; S of Samji-yon town, alt. *ca* 1400 m, taiga with *Larix olgensis* and *Ledum palustre*, 26 June 1985, *leg. B. Zarzycka*, KRAM-F 27768; 10 km S of Samji-yon town, taiga with *Abies nephrolepis*, 26 June 1985, *leg. B. Zarzycka*, KRAM-F 52951; Chongbong Mt. (9), alt. *ca* 1400 m, mixed taiga with *Larix* and *Betula*, 1 July 1986, *leg. H. Komorowska*, KRAM-F 52952; between Rimyongsu (10) and Potae (11), alt. *ca* 1250 m, taiga with *Larix olgensis*, 1 July 1986, *leg. H. Komorowska*, KRAM-F 52950; Onsu-pyong near Naegok (13), alt. *ca* 800 m, mixed forest, on rotten stump, 27 June 1986, *leg. Z. Heinrich*, KRAM-F 27860, 27868, 27870, 27871, 27872, 27879; valley of stream near Naegok, alt. *ca* 1000 m, mixed forest, on wood, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28423, 28425, 28427, 28431, 28440, 28446.

DISTRIBUTION IN ASIA. China, Japan and Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 47); Breitebach & Kränzlin (1991: 78, Pl. 343); Gorbunova (1997: 17); Imazeki & Hongo (1975, **2**: 33, Pl. 10: 62); Maas Gees-

teranus (1992b: 252, Figs 168–180); Smith (1947: 322, Fig. 40, Pl. 73); Syarzhanina (1994: 193); Vasilyeva (1973: 147).

Mycena macrocystidiata Singer

Ann. Mycol. **34**: 430. 1936, ss. Smith (1947: 313).

Basidiocarps gregarious. Pileus 20–45 mm in diam., up to 15 mm high, conic to campanulate, with age broadly campanulate. Upper surface brown, pale greyish brown, pruinose, then glabrous. Margin paler, plane, slightly translucent-striate. Flesh thin, whitish. Lamellae 5–7 mm broad, ventricose with age, close, adnate, with decurrent tooth, whitish. Stipe 45–70 × 3–4 mm, equal, cylindric, longitudinally striate, pruinose, especially at apex, brownish, then pallid, with white, strigose base.

Hyphae of the cortical layer of pileus 5–10 μm broad, repent, upper layer gelatinizing, all pale vinaceous brown in iodine. Cheilo- and pleurocystidia 96.0–102.0 × 14.4–16.8 μm, hyaline, subcylindric to fusoid ventricose. Basidia 25.0–30.0 × 6.0–9.5 μm, with 4 sterigmata. Basidiospores 7.0–9.5 × 5.5–6.0 μm, elliptic, amyloid (Fig. 95).

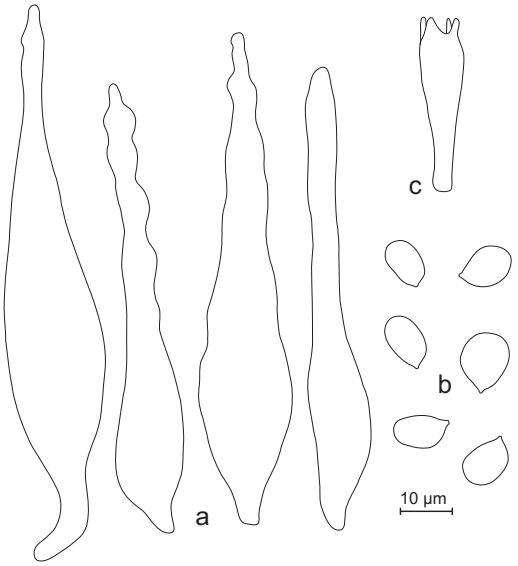


Fig. 95. *Mycena macrocystidiata* Singer: a – cheilo- and pleurocystidia, b – basidiospores, c – basidium (KRAM-F 28420).

SPECIMEN EXAMINED. Paekdu-san Mts: valley of stream near Naegok (13), in vicinity of Onsu-pyong village, *ca* 10 km NE of Pochon-bo town (14), alt. *ca* 1000 m, mixed forest, on mossy log, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28420.

DISTRIBUTION. North America.

NOTES. New to North Korea. According to Maas Geesteranus (1992b: 258) *M. macrocystidiata* from Smith collections represent *M. leptocephala* (Pers.: Fr.) Gill. and some species of *Hydropus* (Kühner) Singer.

REFERENCES. Maas Geesteranus (1992b: 258); Singer (1983: 282); Smith (1947: 313, Fig. 39, Pl. 69).

Mycena oregonensis A. H. Sm.

Mycologia **28**: 413, fig. 1(3). 1936.

Basidiocarps gregarious. Pileus up to 5 mm across, conic to convex, umbonate. Upper surface translucent-striate, orange to orange-red. Flesh thin, yellowish. Lamellae whitish. Stipe 20.0–45.0 × 0.5–1.0 mm concolorous with pileus or paler, fragile, straight to flexuous.

Hyphae of cortical layer of pileus covered with cylindric to irregularly shaped excrescences. Hyphae of cortical layer of stipe 2–3 μm wide, with clamps. Cheilocystidia 26.4–31.6 × 4.8–12.0 μm, clavate, fusiform, lageniform, occurring mixed with basidia. Pleurocystidia if present similar (very difficult to locate on sections of revived material). Caulocystidia 34.4–52.8 × 10.8– 14.2 μm, globose, elliptic, fusiform or subcylindric. Basidia 20.0–27.0 × 5.5–7.2 μm, clavate, with 4 sterigmata. Basidiospores 6.0–7.2 × 3.0–3.6 μm, smooth, non-amyloid (Fig. 96).

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 25 km NW of Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix* and *Picea*, on litter, 30 June 1986, *leg. H. Komorowska*, KRAM-F 28624.

DISTRIBUTION. Known from Europe and North America (United States).

NOTES. New to North Korea. In European specimens basidia 2-spored but in North America 2 or 4-spored.

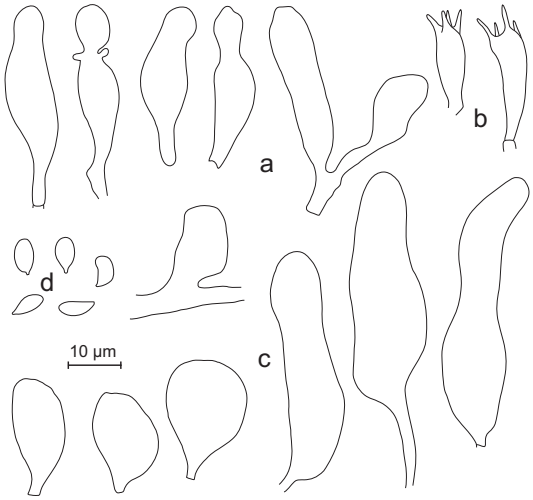


Fig. 96. *Mycena oregonensis* A. H. Sm.: a – cheilocystidia, b – basidia, c – caulocystidia, d – basidiospores (KRAM-F 28624).

REFERENCES. Kühner (1938: 605); Maas Geesteranus (1992b: 446, Figs 119–131); Ronikier (2003: 127, Figs 1–2); Smith (1947: 117, Fig. 8, Pl. 7B).

Mycena polygramma (Bull.: Fr.) Gray

Nat. Arrang. Br. Pl. **1**: 619. 1821.

Agaricus polygrammus Bull., Herb. Fr. Pl. 395. 1788 (according to Mass Gesteranus 1992: 272 not 1788 but 1792/1793). – *A. polygrammus* Bull.: Fr., Syst. Mycol. **1**: 146. 1821. – *Marasmius polygrammus* (Bull.: Fr.) Schultz., Verh. Zool.-bot. Ges. Wien **16**(Abh.): 44. 1866.

Basidiocarp solitary. Pileus up to 40 mm in diam., broadly conic, umbonate. Upper surface brownish grey, hygrophanous, pruinose. Margin plane, slightly striate. Flesh thin, flexible, pallid. Lamellae narrow, close, adnate, whitish. Stipe 65.0 × 3.5 mm, terete, equal, cartilaginous, greyish, glabrous and longitudinally grooved, base white-strigose.

Hyphae of cortical layer of pileus 2–4 µm broad, compressed parallel to surface, cylindric, covered with irregularly arranged excrescences, often embedded in gelatinous matter. Hyphae of cortical layer of stipe 2–4 µm broad, smooth or with a few scattered excrescences. Clamps present. Cheilocystidia 38.4–62.4 × 9.6–10.8 µm, narrowly clavate to cylindric, apex smooth or often with few contorted fingerlike projections, forming a sterile band along the edge. Pleurocystidia absent. Basidia 35–45 × 8–10 µm, clavate, with 4 sterigmata. Basidiospores 8.4–9.6 × 5.4–6.0 µm, amyloid (Fig. 97).

SPECIMEN EXAMINED. Paekdu-san Mts: near Taehongdan (6), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, near base of stump, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28628.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Japan, Kazakhstan, Russia (e.g. Primorski Krai and Sakhalin).

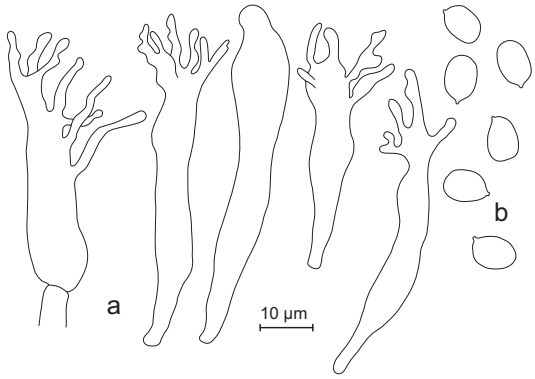


Fig. 97. *Mycena polygramma* (Bull.: Fr.) Gray: a – cheilocydtidia, b – basidiospores (KRAM-F 28628).

REFERENCES. Anonymous (1983a: 115); Breitenbach & Kränzlin (1991: 286, Pl. 355); Imazeki & Hongo (1975, **2**: 34, Pl. 11: 65); Maas Geesteranus (1992b: 272, Figs 274–288); Melik-Khachatrian (1980: 242); Smith (1947: 292, Fig. 34, Pls 58–59); Syarzhanina (1994: 194); Vasilyeva (1973: 150).

Mycena pura (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 110. 1871.

Agaricus purus Pers., Syn. Meth. Fung. 339. 1797. – *A. purus* Pers.: Fr., Syst. Mycol. **1**: 151. 1821. – *Mycenula pura* (Pers.: Fr.) P. Karst., Meddn. Soc. Fauna Fl. Fenn. **16**: 89. 1890. For further synonyms see Maas Geesteranus (1992b: 416).

Basidiocarps scattered or gregarious. Pileus 10–20 mm ± campanulate to convex, with or with-

out umbo, sometimes with concentric depression around umbo, hygrophanous, translucent-striate, smooth, glabrous, pale pink with a more lilaceous or more beige shade. Flesh moderately thick, sordid lilac to whitish. Smell and taste like radish. Lamellae 3–5 mm broad, whitish to pale pink. Stipe 25–30 × 3–4 mm, equal, sometimes broadens below, glabrous or slightly pruinose, whitish to pinkish, base with whitish fibrils.

Hyphae of cortical layer of pileus 2–6 μm broad, repent, cylindric. Hyphae of cortical layer of stipe 2–4 μm broad, cylindric, parallel. Terminal elements ascending, ventricose, with obtuse apices. Cheilocystidia 52.8–69.6 × 13.2–10.4 μm, ventricose, with rounded apices or elongated neck, occasionally with one or two obtuse appendices. Pleurocystidia similar. Basidia 24.0–30.0 × 6.0–7.8 μm, clavate, with 4 sterigmata. Basidiospores 6.0–7.8 × 3.0–3.6 μm, smooth, amyloid (Figs 98 & 99).

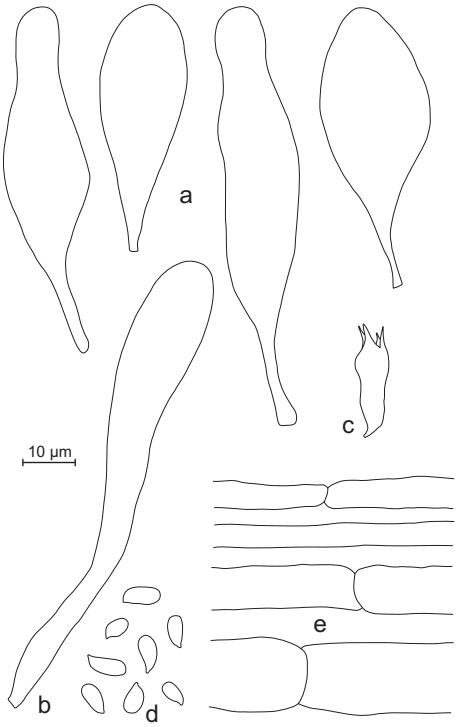


Fig. 98. *Mycena pura* (Pers.: Fr.) P. Kumm.: a – cheilo- and pleurocystidia, b – caulocystidium, c – basidium, d – basidiospores, e – hyphae of cortical layer of stipe (KRAM-F 28629).

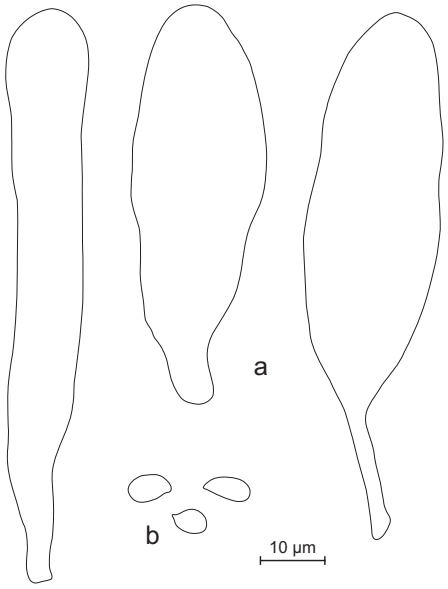


Fig. 99. *Mycena pura* (Pers.: Fr) P. Kumm.: a – cheilo- and pleurocystidia, b – basidiospores (KRAM-F 28428).

SPECIMENS EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28629; shore of Samji-yon Lake (7), taiga with *Larix olgensis*, 28 June 1986, *leg. H. Komorowska*, KRAM-F 28656; *ca* 10 km S of Samji-yon town (8), taiga with *Larix* and *Picea*, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52993; valley of stream near Naegok, near Onsu-pyong village (13), *ca* 10 km NE of Pochon-bo town, alt. *ca* 1000 m, in mixed forest, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28428, 28445, 28413; Suian-san Mts (48), alt. *ca* 250 m, mixed forest, 6 July 1986, *leg. H. Komorowska*, KRAM-F 28295; Kumgang-san Mts: Onjong-ri village (60), near hotel, in pine forest, 21 July 1986, *leg. H. Komorowska*, KRAM-F 28380, 28381; shore of Samil-po Lake (62), in forest, 19 July 1986, *leg. H. Komorowska*, KRAM-F 28348. – On ground.

DISTRIBUTION IN ASIA. Armenia, Japan, Russia (e.g. North Altai and Far East: Primorski Krai).

NOTES. New to North Korea. Collected specimens are various (see Figs 98 & 99) and need further examinations.

REFERENCES. Azbukina *et al*. (1984: 47); Breitenbach & Kränzlin (1991: 288, Pl. 358); Gorbunova

(1997: 17); Imazeki & Hongo (1975, **2**: 34, Pl. 11: 63); Maas Geesteranus (1992b: 416, Figs 58–75); Melik-Khachatrian (1980: 243); Smith (1947: 187, Fig. 19, Pls 23, 24A); Syarzhanina (1994: 185); Vasilyeva (1973: 150).

Mycena purpureofusca (Peck) Sacc.

Syll. Fung. **5**: 225. 1887.

Agaricus purpureofuscus Peck, Rep. N. Y. St. Mus. nat. Hist. **38**: 85. 1885. – *Prunulus purpureofuscus* (Peck) Murrill, N. Am. Flora **9**: 333. 1916. For further synonyms see Maas Geesteranus (1992b: 197).

Basidiocarp solitary. Pileus 20 mm across, conic, translucent-striate, moist purplish grey, hygrophanous. Flesh thin, pliant, pale purplish. Smell and taste not distinctive. Lamellae narrow, moderately crowded, adnate, greyish, with dark, purplish edges. Stipe 40.0 × 1.5 mm, equal, terete, concolorous with pileus but darker.

Hyphae of cortical layer of pileus 2–4 μm broad, with gelatinized walls, smooth or with ascending, cylindric excrescences. Hyphae of cortical layer of stipe 2–3 μm broad, smooth or diverticulate. Cheilocystidia 50.0–60.0 × 8.0–9.6 μm, with lilaceous contents. Basidia 24–28 × 7–9 μm, with 4 sterigmata. Basidiospores 7.2–9.6 × 5.5–7.2 μm, amyloid (Fig. 100).

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), taiga with *Larix olgensis*, on stump, 28 June 1986, *leg. H. Komorowska*, KRAM-F 28661.

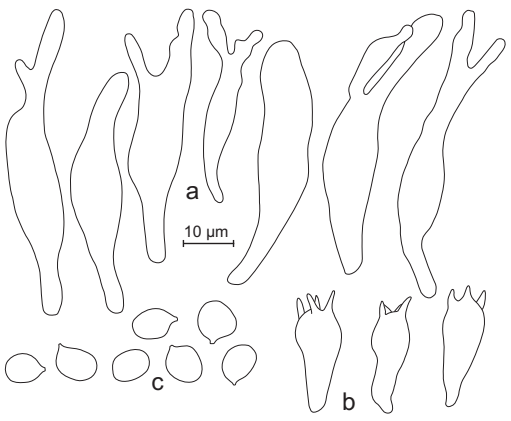


Fig. 100. *Mycena purpureofusca* (Peck) Sacc.: a – cheilocystidia, b – basidia, c – basidiospores (KRAM-F 28661).

DISTRIBUTION IN ASIA. Russia (e.g. Far East: Primorski Krai).

NOTES. New to North Korea. Known also from Europe and North America (United States).

REFERENCES. Maas Geesteranus (1992b: 197, Figs 79–95); Smith (1947: 207, Fig. 22, Pl. 31); Syarzhanina (1994: 186); Vasilyeva (1973: 150).

Mycena cfr. ***stylobates*** (Pers.: Fr.) P. Kumm.

Führ. Pilzk. 108. 1871.

Agaricus stylobates Pers., Syn. Meth. Fung. 390. 1801. – *A. dilatatus* Fr., Obs. Mycol. **1**: 40. 1815. – *A. stylobates* Pers.: Fr., Syst. Mycol. **1**: 153. 1821. – *Pseudomycena stylobates* (Pers.: Fr.) Cejp, Publ. Fac. Sci. Univ. Charles **104**: 150. 1930. For further synonyms see Maas Geesteranus (1992b: 18).

Basidiocarps solitary. Pileus 10 mm across, conic, pale grey-brown to ashen, pruinose, translucent-striate, centrally distinct hispid. Flesh very thin, pallid. Smell none. Lamellae 2 mm broad, whitish, narrowly adnate. Stipe 40 × 1 mm, concolorous with pileus but apex white, basal disc white-pilose.

Hyphae of pileipellis 3.0–4.5 μm wide, partly smooth, partly ± densely covered with warts or short, cylindric excrescences. Hyphae of cortical layer of stipe 5.0–8.5 μm wide. Caulocystidia 73–100 × 8–12 μm, ± fasciculate, frequently with inflated, onion-shaped base, thin-walled. Cheilocystidia 18–25 × 10–14 μm, bulliform, sometimes with short finger projections. Basidia 22.0–36.0 × 6.5–8.0 μm, with 2 sterigmata. Basidiospores 6.0–12.0 × 2.5–5.0 μm, smooth (Fig. 101).

SPECIMEN EXAMINED. Suian-san Mts (48), alt. *ca* 350 m, mixed forest, 6 July 1986, *leg. H. Komorowska*, KRAM-F 28273.

DISTRIBUTION IN ASIA. Armenia, Georgia, Japan, Russia (e.g. Primorski Krai and Sakhalin) and Sri Lanka.

NOTES. New to North Korea. Collected material had similar in shape and color to *M. stylobates*, but it differs from there having 2-spored basidia, without clamps (or with clamps difficult to ob-

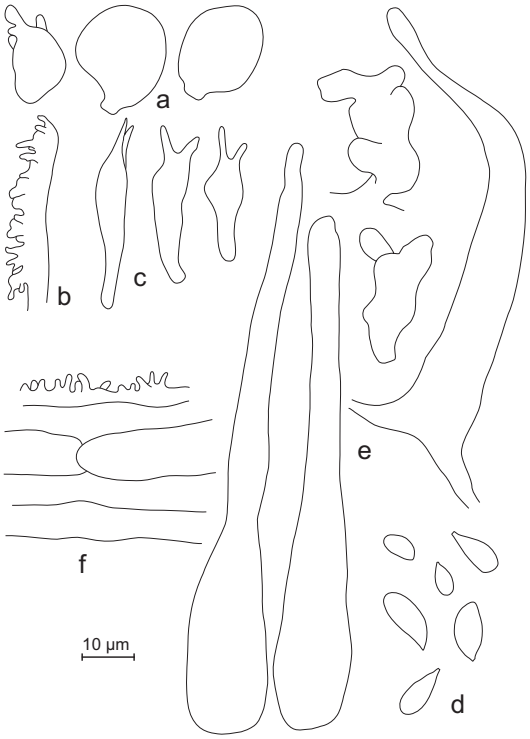


Fig. 101. *Mycena* cfr. *stylobates* (Pers.: Fr.) P. Kumm.: a – cheilocystidia, b – hyphae of cortical layer of pileus, c – basidia, d – basidiospores, e – caulocystidia, f – hyphae of cortical layer of stipe (KRAM-F 28273).

serve) and small bulliform cheilocystidia sometimes with finger projections.

REFERENCES. Azbukina *et al*. (1984: 47); Breitenbach & Kränzlin (1991: 294, Pl. 369); Imazeki & Hongo (1975, **2**: 33, Pl. 10: 59); Maas Geesteranus (1992b: 18, Figs 29–32); Melik-Khachatrian (1980: 245); Pegler (1986: 191, Fig. 39M–Q); Smith (1947: 53, Fig. 2, Pl. 1C, E-F); Vasilyeva (1973: 151).

Panellus stypticus (Bull.: Fr.) P. Karst.

Ryssl. Finl. Skand. Halföns Hattsvamp. **1**: 96, Figs 39–42. 1879.

Agaricus stypticus Bull., Herb. Fr. Pl. 140, 557. 1782. – *A. stypticus* Bull.: Fr., Syst. Mycol. **1**: 188. 1821. – *Panus stypticus* (Bull.: Fr.) Fr., Epicr. Syst. Mycol. 339. 1838.

Basidiocarps gregarious. Pileus 10–30 mm in diam., flabelliform to circular. Upper surface yellowish brown to pale ochraceous. Margin involute. Flesh thin, cream-coloured. Smell fungous. Taste bitter. Lamellae narrow, crowded, pale brown, with whitish edge. Stipe reduced, 2–12 × 2–4 mm, lateral or excentric, concolorous with pileus.

Hyphae of cortical layer of pileus 2–6 µm broad, slightly thick-walled, parallel in upper part, ascending and branched. Cheilocystidia 40.0–75.0 × 3.5–8.0 µm, irregularly flexuous and cylindric, sometimes branched. Pleurocystidia absent. Basidia 20–25 × 3–5 µm, with 4 sterigmata. Basidiospores 4.2–5.5 × 2.5 µm, amyloid, cyanophilous.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount between Tuman-gang (5) and Taehong-dan (6), alt. *ca* 1500 m, mixed forest, taiga, on stump of deciduous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 51966; shore of Samji-yon Lake (7), taiga with *Betula*, on fallen dead trunk of *Betula platyphylla*, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 51967; *ca* 5 km S of Samji-yon town (8), mixed taiga, on decayed stump of *Betula* sp., 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 51965; Myohyang-san Mts: Wonman Peak (31), alt. *ca* 1000 m, deciduous forest, on fallen dead trunk of deciduous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 51970; Taesong-san Mts: Chujak Mt. peak (35), deciduous forest, on stump of deciduous tree, 29 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51971; Suian-san Mts (48): near ruins of castle, deciduous forest, on dead fallen *Quercus* sp. branch, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51968; Kumgang-san Mts: below Onjong-ri Pass (54), alt. *ca* 400 m, deciduous forest, on stump of deciduous tree, 4 Oct.1984, *leg. W. Wojewoda*, KRAM-F 51969.

DISTRIBUTION IN ASIA. Armenia, Japan, Kazakhstan, Korea and Russia (e.g. Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 112); Azbukina *et al*. (1984: 42); Breitenbach & Kränzlin (1991: 310, Pl. 391); Gorbunova (1997: 16); Imazeki & Hongo (1975, **1**: 30, Pl. 11: 60); Jahn (1979: 190, Pl. 164); Melik-Khachatrian (1980: 269); Mukhin (1993: Tab. 1); Pilát (1934: 286); Syarzhanina (1994: 73); Vasilyeva (1973: 92); Watling & Turnbull (1998: 101, Figs 39–42).

Phyllotopsis nidulans (Pers.: Fr.) Singer

Beih. Bot. Zbl. (B) **56**: 143. 1936.

Agaricus nidulans Pers., Ic. Descr. Fung. **1**: 19, Pl. 6: 4. 1798. – *A. nidulans* Pers.: Fr., Syst. Mycol. **1**: 189. 1821. – *Crepidotus nidulans* (Pers.: Fr.) Quél., Enchir.

Fung. 108. 1886. – *Pleurotus nidulans* (Pers.: Fr.) P. Kumm, Führ. Pilzk. 105. 1871.

Basidiocarp pleurotoid, sessile. Pileus 20–50 mm in diam., conchate, rounded flabelliform, reniform to almost circular. Upper surface pale yellow, orange-yellow to pale ochraceous, hirsute to strigose. Margin at first involute. Hymenophore lamellate. Context fleshy, elastic, yellowish. Smell strong, pleasant or unpleasant. Lamellae narrow, salmon-yellow to rusty orange, crowded.

Pileipellis a thin, dense cutis covered with tomentum. Hyphae with clamps. Cheilocystidia 1–2 μm, filiform. Basidia with 4 sterigmata. Basidiospores 4.5–6.0 × 2.0–2.5 μm, subcylindric to allantoid, smooth, hyaline, non-amyloid. Sporeprint salmon-pink.

SPECIMENS EXAMINED. Myohyang-san Mts: below Wonsan Mt. peak (31), alt. *ca* 1000 m, coniferous forest zone with *Betula*, on fallen trunk of *Betula* sp., 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29205; Suian-san Mts (48), alt. *ca* 200 m, near ruins of castle, deciduous forest, on dead fallen *Quercus* sp. branch, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51968, KRAM-F 29205.

DISTRIBUTION IN ASIA. Japan, Korea and Russia (e.g. Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 112); Bas (1990: 24); Azbukina *et al*. (1984: 42); Cetto (1984: Pl. 1551); Enderle & Laux (1980: 42); Hansen & Knudsen (1992: 48); Hrouda (2001: 64, Fig. 7a); Imazeki & Hongo (1975, **2**: 16, Pl. 3: 21); J. E. Lange (1936: 69, Pl. 65D); Mukhin (1993: Tab. 1); Ryman & Holmĺsen (1984: 205); Syarzhanina (1994: 65); Vasilyeva (1973: 94).

Resupinatus striatulus (Pers.: Fr.) Murrill

Murrill *et al*., North American Flora **9**(4): 242.1915.

Agaricus striatulus Pers. Syn. Meth. Fung. **2**: 485. 1801. – *A. striatulus* Pers.: Fr., Syst. Mycol. **1**: 193. 1821. – *Pleurotus striatulus* (Pers.: Fr.) P. Kumm., Führ. Pilzk. 105. 1871. For further synonyms see Thorn & Barron (1986: 427).

Basidiocarps solitary or in groups. Pileus up to 1.0–1.5 mm in diam., orbicular, cupulate, brown,

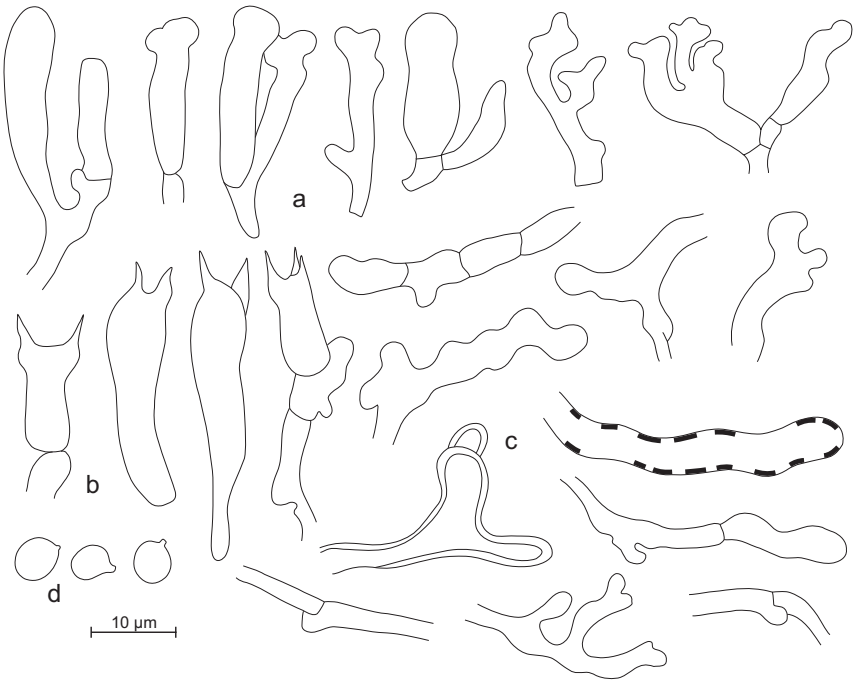


Fig. 102. *Resupinatus striatulus* (Pers.: Fr.) Murrill: a – cheilocystidia, b – basidia, c – hyphae of cortical layer of pileus, d – basidiospores (KRAM-F 28492).

cherry-brown, darkening on drying, finely pruinose. Margin paler, translucent-striate. Flesh thin, dark. Basal mycelium (at point of attachment) whitish. Lamellae concolourous with pileus or paler.

Hyphae of cortical layer of pileus 1.5–5.0 µm broad, cylindric, brownish, encrusted, with irregular nodules, gelatinous layer thin with tangled and ascendent, faintly brownish hyphae. Cheilocystidia 10.0–25.0 × 3.5–7.5 µm clavate-diverticulate. Basidia 18.0–30.0 × 4.5–7.5 µm, clavate, with 2 (or ?4) sterigmata. Basidiospores 4.7 × 3.9–4.7 µm globose to subglobose, smooth (?rugose), non-amyloid (Fig. 102).

SPECIMENS EXAMINED. Myohyang-san Mts: valley near Sangwon-am Monastery (19), mixed forest, on decayed wood, 13 July 1986, *leg. H. Komorowska*, KRAM-F 28492, 28523.

DISTRIBUTION. Widespread in Europe and North America.

NOTES. New to North Korea. This species may be confused with *R. applicatus* (Batsch: Fr.) Gray.

REFERENCES. Thorn & Barron (1986: 427, Fig. 28A–G).

Resupinatus trichotis (Pers.) Singer

Persoonia **2**: 48.1961.

Agaricus trichotis Pers., Mycol. Eur. **3:** 18. 1828. – *A. rhacodium* Berk. & M. A. Curtis, Centuries North American fungi. Ann. Mag. Nat. Hist. Ser. 3, **4** (22): 288. 1859. – *Pleurotus rhacodium* (Berk. & M. A. Curtis) Sacc., Syll. Fung. **5**: 380. 1887. – *P. applicatus* (Batsch: Fr.) P. Kumm., for. *rhacodium* Pilát, *Pleurotus* Fr., *in* Kavina & Pilát, Atl. Champ. Eur. **2**: 67. 1935. For further synonyms see Thorn and Barron (1986: 430).

Basidiocarps solitary or in groups. Pileus up to 10 mm across, cupulate or applanate, dorsally or laterally attached to substrate, grey with raised central disc of black, shaggy hairs, margin pruinose to glabrous, non-striate. Lamellae radiating from point of attachment, narrow, brownish grey to nearly black with white edges.

Hyphae of cortical layer of pileus 1.5–2.5 µm broad, cylindric, brown, gelatinous layer thick, hyphae with finger-like projections. Cheilocystidia 23–30 × 6–7 µm, clavate to ventricose with finger-like projections. Basidia 25–30 × 5–7 µm, clavate-cylindric, with 4 sterigmata. Basidiospores 4.2–5.5 µm, globose, non-amyloid, smooth.

SPECIMEN EXAMINED. Sokdamgukok village (47), forest, on fallen twig of deciduous tree or shrub, 7 July 1986, *leg. W. Wojewoda*, KRAM-F 53257.

DISTRIBUTION IN ASIA. Japan.

NOTES. Known also from Europe and America (Argentina, Brazil, Canada and United States). *Resupinatus trichotis* could, like *R. striatulus*, be regarded as one of the more striking variants of *R. applicatus*. Pilát (1935: 67) and Noordeloos (1995d: 167) were of this opinion, and treated it merely as a form of *R. applicatus*.

REFERENCES. Imazeki & Hongo (1975, **1**: 28, Pl. 10: 56, as *Resupinatus rhacodium*); Singer & Digilo (1952: 104, as *R. subrhacodium*); Thorn & Barron (1986: 430, Figs 29, 30A–B).

Rickenella fibula (Bull.: Fr.) Raithelh.

Metrodiana **4**: 67. 1973.

Agaricus fibula Bull., Herb. Fr. Pl. 186. 1783–1784. – *A. fibula* Bull.: Fr., Syst. Mycol. **1**: 163. 1821. – *Omphalina fibula* (Bull.:Fr.) Quél., Enchir. Fung. 46. 1886. – *Mycena fibula* (Bull.: Fr.) Kühner, Genre *Mycena*. 607. 1938. For further synonyms see Kuyper (1995b: 158).

Basidiocarps single, scattered, or gregarious. Pileus 2–10 mm in diam., plano-convex to applanate, with umbo or disc faintly depressed, hygrophanous, pale orange-yellow. Flesh thin, concolorous with pileus. Lamellae up to 2 mm broad, thick, crowded, decurved, whitish. Stipe 10.0–30.0 × 0.5–1.0 mm, central, cylindric, slightly tapering towards base, concolorous with pileus, finely pubescent overall, white-fibrilose towards base.

Hyphae of cortical layer of pileus 6–13 µm broad, cylindric, repent, with intracellular pigment. Pileocystidia 55–85 × 8–12 µm, subcylindric to subfusoid, hyaline, scattered. Cheilo-, pleuro- and caulocystidia similar to pileocystidia, 40.0–60.0 × 8.0–10.5 µm. Basidia 18–25 × 4–6 µm, with 4 sterigmata. Basidiospores 4.5–6.5 × 2.5–3.0 µm, narrowly elliptic, smooth, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: 5 km S of Samji-yon town (8), mixed taiga, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53015; valley of stream near Naegok (13), near Onsu-pyong, alt. *ca* 1000 m, mixed forest, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28444; near Naegok, alt. *ca* 800 m, in mixed forest, 27 June 1986, *leg. Z. Heinrich*, KRAM-F 27898; Myohyang-san Mts: valley near Sangwon-am Monastrey (19), mixed forest, 13 July 1986, *leg. H. Komorowska*, KRAM-F 28508; near Myohyang-san Hotel (20), mixed forest with *Pinus densiflora*, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 53016; shore of Soham-ho Lake (32), coniferous forest, 17 July 1986, *leg. H. Komorowska*, KRAM-F 28575, 28585; Wonsan town (50), Botanical Garden, 22 July 1986, *leg. Z. Heinrich*, KRAM-F 28063; Kumgang-san Mts: Onjong-ri village, near hotel (60), pine forest, 21 July 1986, *leg. H. Komorowska*, KRAM-F 28402; shore of Samil-po Lake (62), forest with *Pinus densiflora*, 3 July 1985, *leg. B. Zarzycka*, KRAM-F 53017; 19 July 1986, *leg. H. Komorowska*, KRAM-F 28400. – On trunks and stumps.

DISTRIBUTION IN ASIA. Japan and Russia (e.g. Far East: Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 44); Breitenbach & Kränzlin (1991: 316, Pl. 401); Imazeki & Hongo (1975, **2**: 15); Kuyper (1995b: 158, Fig. 163); Syarzhanina (1994: 98); Vasilyeva (1973: 146).

Tricholoma nauseosum (Blytt) Kytöv.

Karstenia **28**(2): 69. 1989.

Armillaria nauseosa Blytt., Vidensk. Selsk. Skrift **6**: 22. 1905. – *Armillaria matsutake* S. Ito & Imai, Bot. Mag. **39**: 326. 1925. – *Tricholoma matsutake* (S. Ito & Imai) Singer, Ann. Mycol. Berl. **41**: 77. 1943. – *T. caligatum* ss. auct., non *T. caligatum* (Viv.) Ricken ss. Kytövuori (1988: 66). For further synonyms see Kytövuori (1988: 69).

Pileus 100–150 mm in diam., convex to planoconvex, subumbonate. Upper surface weakly viscid when wet, radially fibrillose, with large appressed scales. Centre of pileus brown. Margin paler, inrolled when young. Flesh whitish. Smell strong, sweetish. Taste mild, pleasant. Lamellae broad, close, white. Stipe 60–150 × 10–20 mm, cylindric, curved, deeply radicating, weakly viscid, concolorous with pileus, solid. Flesh of stipe whitish.

Hyphae of pileipellis 6–20 μm wide, smooth, hyaline to brownish, thin-walled. Cystidia not seen. Basidia 30.0–45.0 × 6.0–8.5 μm, clavate, with 4 sterigmata. Basidiospores 5.0–7.5(–8.0) × 4.5–5.5 μm, broadly elliptic, smooth, hyaline, some with oil-drops.

SPECIMEN EXAMINED. Kumgang-san Mts: near Onjong-ri (60), alt. *ca* 50 m, mixed forest with *Pinus densiflora*, on ground, 21 July 1986, *leg. a Korean from Onjong-ri* (*unknown name*), KRAM-F 27990.

DISTRIBUTION IN ASIA. China, Japan and Korea.

NOTES. In Japan the species occurs mainly in forests of *Pinus densiflora*. In Europe it is rare and occurs e.g. under *Pinus sylvestris*. It is known from mountain areas of Europe (Austria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Italy, Norway, Slovakia, Sweden and Switzerland) and North Africa (Algeria: Atlas Mts, associated with *Cedrus atlantica*). In Japan and Korea it is traditionally a highly esteemed edible fungus.

REFERENCES. Anonymous (1978: 49; 1983a: 115); Imazeki & Hongo (1975, **1**: 26, Pl. 9: 46, as *Armillaria matsutake*); Kytövuori (1988: 69, Figs 2n, 7); Michael *et al*. (1987: 362, Pl. 204, as *Tricholoma caligatum*); Pilát (1959: Pls. 62–63, as *T. caligatum*); Wojewoda *et al*. (1993: 125, 128); Ying *et al*. (1983: 139, 202, Pl. 30: 3).

Tricholoma virgatum (Fr.: Fr.) P. Kumm.

Führ. Pilzk. **1**: 134. 1871.

Agaricus virgatus Fr., Observ. Mycol. **2**: 113. 1818. – *A. virgatus* Fr.: Fr., Syst. Mycol. **1**: 48. 1821. – *Gyrophila virgata* (Fr.: Fr.) Quél., Enchir. Fung. 14. 1886. For further synonyms see Noordeloos & Christensen (1999: 137).

Basidiocarp solitary. Pileus 45 mm in diam., convex, umbonate. Margin bent inwards, dark grey, ashen, radially filamentous, silvery sheen. Flesh thin, whitish-grey. Smell absent. Taste bitterish (also in exsiccates). Lamellae 5 mm broad, moderately crowded, adnexed, whitish, then darkening (brown in exsiccates), with crenate edges. Stipe 120 × 10 mm, cylindric, below bent, subcla-

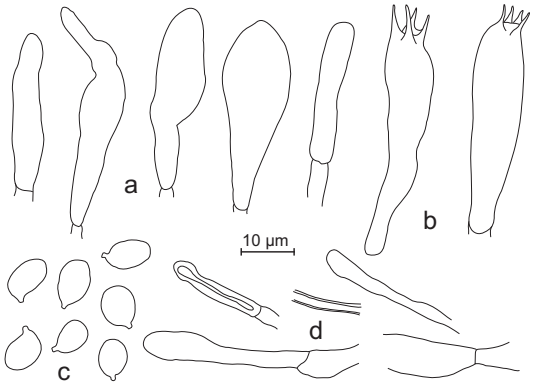


Fig. 103. *Tricholoma virgatum* (Fr.: Fr.) P. Kumm.: a – cheilocystidia, b – basidia, c – basidiospores, d – hyphae of cortical layer of pileus (KRAM-F 53351).

vate, whitish to finely greyish, longitudinally fibrillose.

Hyphae of cortical layer of pileus 2–4 µm broad, subgelified, cylindric, parallel, with brown pigment, some ascending in bundles. Hyphae of cortical layer of stipe 2–3 µm broad, cylindric, parallel. Clamps present. Caulocystidia 20–35 × 2–12 µm, clavate to subcylindric. Cheilocystidia 29.0–42.0 × 4.6–9.2 µm, cylindric, clavate or irregular. Basidia 34.7–41.6 × 6.2–8.5 µm, with 4 sterigmata. Basidiospores 7.7–8.4 × 3.9–4.8 µm (Fig. 103).

SPECIMEN EXAMINED. Paekdu-san Mts: ca 10 km S of Samji-yon town (8), mixed taiga, on ground, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53351.

DISTRIBUTION IN ASIA. Armenia, Georgia, Japan, Kazakhstan, Korea and Russia (e.g. Primorski Krai).

REFERENCES. Anonymous (1983a: 116); Azbukina *et al.* (1984: 48); Bon (1984: 118); Breitenbach & Kränzlin (1991: 344, Pl. 442); Bresadola (1927: Pl. 89); Imazeki & Hongo (1975, **1**: 27, Pl. 10: 53); Marchand (1986: 122); Melik-Khachatrian (1980: 189); Noordeloos & Christensen (1999: 137); Vasilyeva (1973: 121).

Tricholomopsis rutilans (Schaeff.: Fr.) Singer

Schw. Z. Pilzk. **17**: 56. 1939.

Agaricus rutilans Schaeff., Icon. Fung. 51. 1774. – *A. rutilans* Schaeff.: Fr., Syst. Mycol. **1**: 41. 1821. – *Tricholoma rutilans* (Schaeff.: Fr.) Quél., Champ. Jura Vosges 78. 1872. – *Cortinellus rutilans* (Schaeff.: Fr.) P. Karst., Ryssl., Finl., Skand. Halföns Hattsvamp. **1**: 24. 1879. Fur further synonyms see Boekhout & Noordeloos (1999: 151).

Basidiocarps solitary. Pileus 95 mm in diam., plano-convex, centre depressed, purplish-reddish brown, with numerous purplish red scales, forming solid mat toward centre. Margin inflexed, yellowish. Flesh thick, yellow. Lamellae up to 12 mm broad, adnate, close, yellowish, edges crenulate. Stipe 120 × 10 mm, cylindric, hollow, yellow at apex, below covered with numerous purplish red scales.

Hyphae of cortical layer of pileus 3.5–13.5 µm broad, cylindric, hyaline, repent to somewhat ascending, with purplish brown intracellular pigment. Hyphae of cortical layer of stipe 3.5–14.5 µm broad. Clamps present. Caulocystidia 40–80 × 8–15 µm, abundant. Cheilocystidia 65–

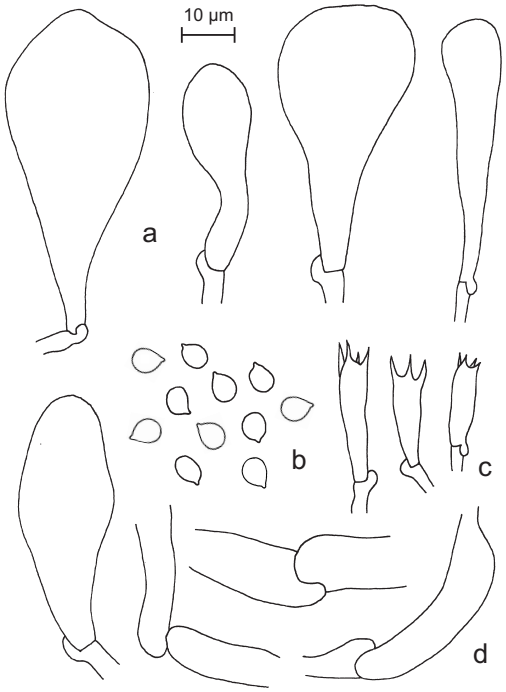


Fig. 104. *Tricholomopsis rutilans* (Schaeff.: Fr.) Singer: a – cheilocystidia, b – basidiospores, c – basidia, d – hyphae of cortical layer of pileus (KRAM-F 53275).

85 × 15–30 μm, some with brown, intracellular pigment. Pleurocystidia absent. Basidia 32–40 × 6–7 μm, Basidiospores 6.2–6.8 × 4.2–5.5 μm, ovoid to near globose (Fig. 104).

SPECIMEN EXAMINED. Kumgang-san Mts: near Onjong-ri village (60), alt. *ca* 100 m, the park, on trunk of ?coniferous tree, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53049.

DISTRIBUTION IN ASIA. Armenia, Georgia, Japan, Kazakhstan, Russia (e.g. North Altai, Primorski Krai and Sakhalin).

REFERENCES. Anonymous (1978: 53; 1983a: 116); Boekhout & Noordeloos (1999: 151); Bon (1984: 290); Breitenbach & Kränzlin (1991: 346, Pl. 445); Gorbunova (1997: 16); Horak (1968: 597); Imazeki & Hongo (1975, **1**: 21, Pl. 6: 35); Jahn (1979: 196, Pl. 171); Melik-Khachatrian (1980: 179); Syarzhanina (1994: 146); Vasilyeva (1973: 126).

Xeromphalina (‘*Xeromphalia*’) ***campanella*** (Batsch: Fr.) Kühner & Maire

Bull. Soc. Mycol. Fr. **50**: 18. 1934.

Agaricus campanellus Batsch, Elench. Fung. **1**: 74. 1783. – *A. campanellus* Batsch: Fr., Syst. Mycol. **1**: 166. 1821. – *Omphalia campanella* (Batsch) P. Kumm., Führ. Pilzk 107. 1871. – *Omphalina campanella* (Batsch) Quél., Enchir. Fung. 45. 1886. For further synonyms see Redhead (1988: 484).

Basidiocarps caespitosae. Pileus 3–20 mm across; campanulate with central depression; margin curved and striate; orange-brown, cinnamon-brown, smooth, hygrophanous. Lamellae adnate to decurrent, yellowish. Flesh thin, yellowish. Stipe 10.0–45.0 × 0.5–1.5 mm, firm and elastic, usually curved, yellow-brown in upper part, darker at base. Basal tomentum yellow-brown. Rhizomorphs present.

Hyphae of cortical layer of pileus 3–15 μm broad, cylindric, fusiform, branched; encrusted with yellow-brown pigment; parallel or irregularly arranged (trichoderm). Hyphae of cortical layer of the stipe 3–8 μm broad, ± thick-walled, parallel, ± encrusted. Cheilocystidia 30–55 × 8–13 μm fusiform or lageniform with obtuse apices. Clamps present. Pileocystidia 40.0–70.0 × 7.5–15.0 μm, clavate, lageniform, thin-walled, with or without encrustations. Caulocystidia of two types: (1) thin-walled 30–60 × 10–25 μm, pyriform, globose, inflated; (2) thick-walled (1–2 μm), 10–35 × 5–10 μm, solitary at base of stipe. Basidia 18.0–30.0 × 4.5–6.0 with 4 sterigmata. Basidiospores 6.0–7.5 × 3.0–3.5 μm.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 25 km NW of Samji-yon town (8), alt. *ca* 1700 m, taiga (*Larix*, *Picea*), 30 June 1986, *leg. H. Komorowska*, KRAM-F 28607; *ca* 10 km N of Samji-yon town (8), alt. *ca* 1400 m, taiga with *Larix* and *Picea*, 29 June 1986, *leg. W. Wojewoda*, KRAM-F 53230. – On decayed stumps.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan, Korea, Mongolia and Russia (e.g. North Altai and Far East: Primorski Krai).

REFERENCES. Anonymous (1983a: 116); Azbukina *et al*. (1984: 48); Breitenbach & Kränzlin (1991: 346, Pl. 446); Gorbunova (1997: 17); Imazeki & Hongo (1975, **1**: 41, Pl. 16: 91); Jahn (1979: 200, Pl. 176); Malençon & Bertault (1975: 342); Miller (1968: 162); Petrov & Belova (1999: 27); Redhead (1988: 484, Figs 3, 16–20, 92); Syarzhanina (1994: 196); Teng (1996: 445); Vasilyeva (1973: 153).

Xeromphalina campanelloides Redhead

Can. J. Bot. **66**: 488. 1988.

Basidiocarps gregarious. Pileus 3–10 mm in diam., convex with incurved margin, translucent-striate, yellow with dark umbo. Flesh thin. Smell not distinctive. Taste bitter. Lamellae narrow, adnate to arcuate, paler than pileus. Stipe 10.0–25.0 × 0.7–1.0 mm, tapered downwards and slightly curved, centrally fulvous to umber, lower portion dark brick to blackish. Basal mycelium cinnamon-coloured.

Hyphae of cortical layer of pileus 4–6 μm wide, smooth. Terminal hyphae up to 30 μm high, thin-walled, diverticulate or with cystidioform ends. Hyphae of cortical layer of stipe 4–5 μm broad, hyaline in apical region, smooth, thin-walled, with thickened reddish brown walls lower down. Cheilocystidia 24–30 × 3–4 μm, narrowly cylindric, with apex rounded or with 2–5 finger-like projections, hyaline, thin-walled. Basidia 25.0–28.0 × 5.0–5.5 μm, with 4 sterigmata. Basidiospores 4.5–5.0 × 3.0–4.8 μm, subglobose to

broadly elliptic, smooth, hyaline, thin-walled, amyloid.

SPECIMEN EXAMINED. Kaesong town (63), near Kaesong Hotel, forest park, 21 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53275.

DISTRIBUTION. North America (Canada and United States).

NOTES. New to North Korea.

REFERENCES. Redhead (1988: 488, Figs 2, 4, 7, 28–32, 94).

Auriculariales J. Schröt. 1887

Auriculariaceae Fr. 1838

Auricularia auricula-judae (Bull.: Fr.) Wettst.

Verh. Zool.-Bot. Ges. Wien. **35**: 554. 1885.

Tremella auricula-judae Bull., Herb. Fr. Tab. 427, Fig. 2. 1788. – *Exidia auricula-judae* (Bull.): Fr., Syst. Mycol. **2**(1): 221. 1822. – *Hirneola auricula-judae* (Bull.: Fr.) Berk., Outl. 289. 1860. – *Auricularia auricula* (L.) Underw., Mem. Torr. Bot. Club **12**: 15. 1902. For further synonyms see Donk (1966: 158), Dueñas (2002: 31), Kobayasi (1981: 48), and Lowy (1971: 19).

Basidiocarp 10–50 mm broad, cap-, shell- to ear-shaped, sessile to pseudostipitate. Consistency gelatinous, tough, elastic. Hymenophore even, veined, wrinkled, to slightly wrinkled-undulating, red-brown to olive-brown. Sterile surface finely pubescent, red grey.

Hairs of sterile surface of pileus 38.0–160.0 × 3.8–9.7 μm, cylindric, smooth, hyaline, thick-walled. Hyphae 1.4–7.7 μm wide, gelatinized, smooth, hyaline, thin-walled, branched, with clamps. Cystidia absent. Basidia 40–80 × 5–6 μm, cylindric, with 3 transverse septa and 4 (3 lateral) epibasidia (sterigmata). Basidiospores (8.7–)11.6–15.0 × 3.8–5.8 μm, cylindric, allantoid, smooth, hyaline, non-amyloid, some with oil-drops, germinating by repetition. Spore-print white (Fig. 105).

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga, on trunk of *Quercus mongolica*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53284; shore of Samji-yon Lake (7), coniferous taiga with *Abies nephrolepis*, *Larix olgensis*, *Picea ajanensis* and *P. koraiensis*, on dead fallen trunk of *Abies nephrolepis*, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 53285; *ca* 10 km S of Samji-yon town (8), alt. *ca* 1500 m, coniferous taiga, on dead fallen trunk of *Abies nephrolepis*, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53286; Myohyang-san Mts: near Pochyon Temple (16), on living trunk of *Robinia pseudacacia*, 9 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53287; near Habiro Temple, in mixed forest, on trunk of *Pinus densiflora*, 6 Aug. 1983, *leg. W. Wojewoda*, specimen not preserved; Pyongyang town: Central Botanical Garden (36), on living twigs of *Hibiscus syriacus*, 9 July 1986, *leg. W. Wojewoda*, KRAM-F 53289; Taedong-gang Pleasure Park (40), bank of Tedong-gang River, on stump of deciduous tree, 1 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53288; Ryongyak-san Mt. (42), alt. *ca* 250 m, mixed forest with *Castanea*, *Pinus densiflora* and *Quercus*, on dead hanging twigs of *Quercus*, 16 July 1986, *leg. W. Wojewoda*, KRAM-F 53290.

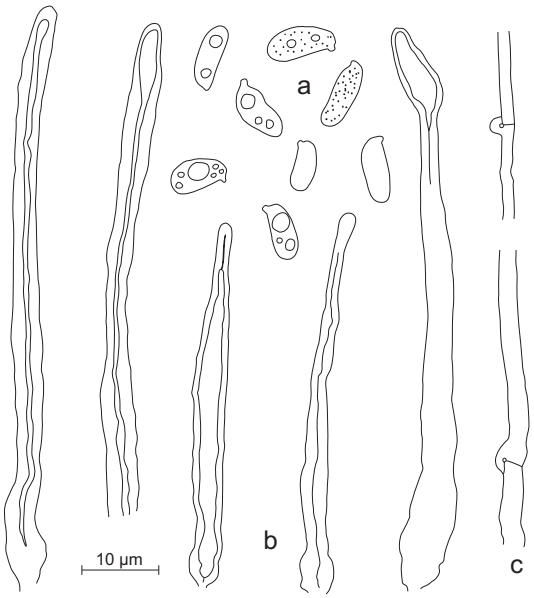


Fig. 105. *Auricularia auricula-judae* (Bull.: Fr.) Wettst.: a – basidiospores, b – hairs of sterile surface, c – hyphae (KRAM-F 53290).

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, Caucasus, China, Georgia, Iran, Japan, Korea, Pakistan and Russia (Siberia and Far East).

NOTES. Cosmopolitan species. Known also from Europe, North (Canada and United States) and South America and Africa. In North America

grows also on coniferous trees, e.g. *Abies*, *Chamaecyparis*, *Picea*, *Pinus*, *Pseutotsuga* and *Thuja*, in Russia on *Abies*.

REFERENCES. Breitenbach & Kränzlin (1986: 54, Pl. 7); Donk (1966: 158); Ginns & Lefebvre (1993: 25); Govorova (1997: 12); Hallenberg (1981: 499); Hansen & Knudsen (1997: 97); Imazeki & Hongo (1975, **2**: 172, Pl. 57: 337); Kobayasi (1981: 48, Figs 3, 8–10, 21C, 23A); Morris (1990: 326); Raitviir [1967: 34, Pl. II-III, on *Abies*, as *Auricularia auricula* (L.) Underw. for. *abietis* Raitv.]; Teng (1996: 265); Wojewoda (1977: 221, Figs 1L, 30, 82, Pls. XXI-XXIV; 1981: 184, Pls. LXIII-LXIV).

Boletales E.-J. Gilbert 1931

Boletaceae Chevall. 1826

Boletus edulis Bull.: Fr.

Syst. Mycol. **1**: 392. 1821.

B. edulis Bull., Hist. Champ. Fr. 322. 1791.

Pileus 60–100 mm in diam., dry, in wet weather slightly viscid, glabrous, convex when young, yellowish brown, light brown to dark brown. Flesh white, unchanging. Smell pleasant, fungous. Taste mild. Pores 2–3 per mm. Stipe 50–100 × 20–30 mm, cylindric or enlarged below, bulbous, delicately reticulate in upper part.

Hyphae of pileipellis 2.5–4.5 μm, without clamps. Cystidia 35.0–45.0 × 3.5–9.0 μm. Basidia 35–45 × 9–11 μm, with 4 sterigmata, without basal clamp. Basidiospores 11.0–17.0 × 4.5–5.5 μm, fusiform to fusiform-elliptic, light yellow, smooth, thick-walled, with oil-drops. Spore-print brownish-green or light olive-brown.

SPECIMEN EXAMINED. Kumgang-san Mts: Chanto Forest (61) near Onjong-ri village, in mixed wood with *Pinus* and *Quercus mongolica*, under *Pinus densiflora*, on ground, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53388.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Japan, Kazakhstan, Korea, Russia (Siberia and Primorski Krai) and Tadzhikistan.

NOTES. Cosmopolitan species.

REFERENCES. Alessio (1985: 102, Fig. 5, Pl. 8); Anonymous (1978: 9; 1983a: 122); Breitenbach & Kränzlin (1991: 54, Pl. 8); Hansen & Knudsen (1992: 57); Imazeki & Hongo (1975, **1**: 85, Pl. 38, Fig. 221); Melik-Khachatrian (1980: 439); Skirgiełło (1975: 64, Fig. 33A, Pls. 13: 6, 14); Syarzhanina (1994: 22); Teng (1996: 408).

Boletus impolitus Fr.

Epicr. Syst. Mycol. 421. 1838.

Pileus 120–150 mm in diam., hemispherical to convex-pulvinate. Upper surface dry, buff, pale ochre, cinnamon-brown to brown-yellow, at first finely tomentose, then fibrillose, flocculose to granulose-punctate, becoming rusty brown when touched. Flesh whitish, cream-coloured, pale lemon to light yellow, not changing when cut. Smell slight, somewhat carbolic. Taste pleasant, mild, slightly sweetish-farinaceous to slightly acid. Hymenophore at first lemon yellow, then ochraceous. Pores minute, almost circular to angular, pale pink, not changing color when touched. Stipe 100–130 × 15–50 mm, robust, subcylindric, ventricous to subbulbose, solid, at first granulose-punctate, then glabrous, pale yellowish, pale lemon to golden yellow. Veil absent.

Hyphae 3.5–8.0 μm wide, thin-walled, without clamps. Cheilocystidia and pleurocystidia 28–40 × 5–10 μm, fusiform, smooth, hyaline, yellow to brownish, thin-walled. Basidia 20–36 × 6–12 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 8.7–14.5 × 3.8–5.8 μm, fusiform-elliptic, smooth, thin-walled, yellowish to yellow brown, with oil-drops. Spore-print olive-brown.

SPECIMEN EXAMINED. Kumgang-san Mts: near Kuryong Falls (59), alt. *ca* 600 m, in mixed forest, under *Quercus mongolica*, on ground, 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53341.

DISTRIBUTION IN ASIA. Caucasus and Japan.

NOTES. New to North Korea. Cosmopolitan species, known e.g. from Europe, Africa, North America and Australia.

REFERENCES. Alessio (1985: 268, Pl. 39); Breitenbach & Kränzlin (1991: 56, Pl.11); Dermek & Pilát (1988: 81, Pl. 65); Hansen & Knudsen (1992: 661); Imazeki & Hongo (1975, **2**: 100); Phillips (1981: 197); Skirgiełło (1975: 81, Pl. 11: 1); Snell & Dick (1970: 82, Pls. 46 and 83: 9); Syarzhanina (1994: 22).

Boletus luridiformis Rostk.

in Sturm, Deutschlands Flora **3**: 105. 1844, ss. Hansen & Knudsen (1992: 60).

– var. ***luridiformis***

B. erythropus (Fr.: Fr.) Krombh., Consp. Fung. esc. 24. 1821 ss. Fries *et auct. plur*. – *B. luridus* Fr. var. *erythropus* (Fr.): Fr., Syst. Mycol. **1**: 391. 1821.

Pileus 50–100 mm in diam. Upper surface at first finely tomentose, then smooth and glabrous, somewhat viscid when moist, dark brown. Pores minute, circular-angular, yellowish when young, then orange-red. Flesh yellow, turning dark blue when cut. Smell slight. Taste pleasant, mild. Stipe 80–100 × 20–40 mm, cylindric to slightly clavate, solid, yellow, covered with a number of minute orange-red grains. Veil absent.

Hyphae without clamps. Cheilo- and pleurocystidia 20–50 × 5–8 µm, fusiform to clavate, smooth, hyaline to brownish, thin-walled. Basidia 25–40 × 8–13 µm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 9.7–14.5 × 4.8–6.7(–7.7) µm, fusiform-elliptic, smooth, thick-walled, yellowish, with oil-drops. Spore-print olive-brown (Fig. 106).

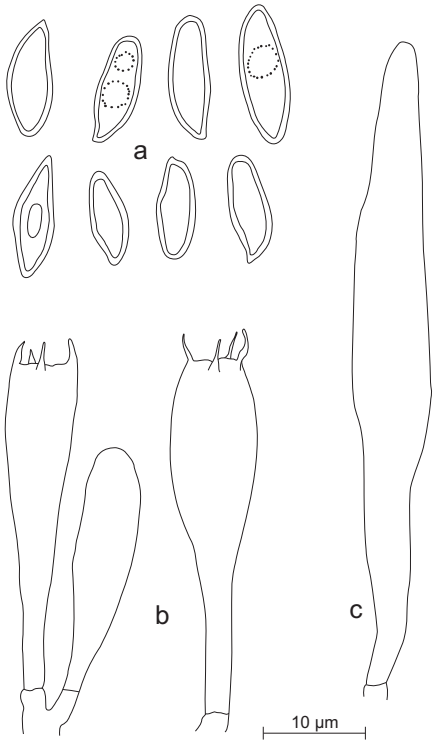


Fig. 106. *Boletus luridiformis* Rostk.: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 29197).

SPECIMENS EXAMINED. Wonsan town (50), Botanical Garden, under *Abies* and *Picea*, 20 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29197; under *Picea koraiensis*, 22.07.1986, *leg. W. Wojewoda*, KRAM-F 29196; Suiansan Mts (48): near ruins of castle, near Haeju city, deciduous forest, on dead fallen *Quercus* branch, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 51968; Kumgangsan Mts: near Onjong-ri village (60), alt. *ca* 100 m, pine forest, under *Pinus densiflora*, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29198. – On ground.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Japan, Kirghizia, Korea and Russia (Primorski Krai).

NOTES. Known also from Europe, Asia and North America.

REFERENCES. Alessio (1985: 179, Pl. 21); Anonymous (1983a: 122); Breitenbach & Kränzlin (1991: 54, Pl. 9); Dähncke & Dähncke (1980: 48); Doi (1991: 51); Engel *et al*. (1983: 90, Pl. 22); Hansen & Knudsen (1992: 60, Fig. 28); Imazeki & Hongo (1975, **1**: 86, Pl. 39: 224); Melik-Khachatrian (1980: 440); Phillips (1981: 200); Skirgiełło (1975: 79, Fig. 40, Pl. 19: 1–4); Teng (1996: 407); Vasilyeva (1973: 279; 1978: 122, Pl. 25).

Boletus reticulatus Schaeff.

Icon. Fung. **4**: 78, Pl. 108. 1774.

B. aestivalis Paulet. *ex* Fr., Epicr. Syst. Mycol. 422. 1838. – *B. edulis* Bull.: Fr. subsp. *reticulatus* (Schaeff.) Konrad & Maubl. 1926.

Pileus 60–120 mm in diam. Upper surface ochraceous yellow, pale brown, greyish brown to alutaceous, finely tomentose. Flesh white to yellow, firm, thick. Smell and taste pleasant. Hymenophore porose. Tubes yellow or greyish. Stipe 40–100 × 20–60 cm, cylindric or swollen at middle, concolorous or paler, above with fine reticulum on brown background.

Basidiospores 13.0–16.0 × 4.0–5.5 µm, oblong fusiform to oblong elliptic, smooth, yellow to olivaceous, with 1–3 oil-drops.

SPECIMENS EXAMINED. Myohyang-san Mts: Kuchung Falls (26), alt. *ca* 700 m, in mixed forest, under *Quercus* sp., 7 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29199; Kumgang-san Mts: near Onjong-ryong Pass (52), alt. *ca* 800 m, mixed forest, under *Quercus* sp., 16 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29200.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan and Georgia.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1991: 60, Pl. 17); Dähncke & Dähncke (1980: 60); Dermek & Pilát (1988: 77, Pls. 53–54); Engel *et al*. (1983: 33, Pl. 2); Hansen & Knudsen (1992: 57); Melik-Khachatrian (1980: 439); Michael *et al*. (1983a: 330, Pl. 154); Phillips (1981: 194).

Boletus rubellus Krombh.

Nat. Abb. Schw. **5**: 12. 1836.

B. versicolor Rostk. *in* Sturm, Deutschl. Fl., Pilze, **3:** Pl. 10. 1839. – *Xerocomus rubellus* (Krombh.) Quél., Fl. Mycol. Fr. 418. 1888.

Pileus 20–60 mm in diam., hemispherical, convex then plane, dry. Margin almost even. Upper surface pink to blood red, tomentose. Flesh yellow to golden yellow, slightly bluing. Smell and taste weak. Hymenophore porose. Tubes golden yellow to olivaceous yellow, becoming bluish or greenish when cut or broken. Stipe 25–50 × 5–15 mm, at larger part red or pink on yellowish ground, pruinose.

Basidiospores 11–13 × 4–5 μm, oblong elliptic to fusoid, smooth, brownish, with oil-drops. Spore-print olivaceous brown.

SPECIMEN EXAMINED. Wonsan town (50), Botanical Garden, on ground, under *Quercus* sp., 22 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29223.

DISTRIBUTION IN ASIA. China (e.g. Tibet), Japan, Kazakhstan, Korea and Russia (e.g. Primorski Krai).

NOTES. Known also from Europe, North Africa and North America.

REFERENCES. Anonymous (1983a: 123); Breitenbach & Kränzlin (1991: 88, Pl. 59); Dermek & Pilát (1988: 74, Pl. 44–45); Hansen & Knudsen (1992: 62, Fig. 36); Imazeki & Hongo (1975, **1**: 86, Pl. 38: 222); Michael *et al*. (1986: 192, Pl. 14); Skirgiełło (1975: 72, Fig. 36A, Pl. 11: 5); Syarzhanina (1994: 20); Vasilyeva (1973: 275; 1978: 120, Pl. 20); Ying *et al*. (1983: 104).

Boletus subtomentosus L.: Fr.

Syst. Mycol. **1**: 389. 1821.

B. subtomentosus L., Sp. Pl. 1178. 1753. – *Xerocomus subtomentosus* (L.: Fr.) Quél., Fl. Mycol. Fr. 418. 1888.

Pileus 30–80 mm in diam. Upper surface finely tomentose, olive-brown to olive-yellow. Flesh whitish to yellowish, not or only scarcely bluing when cut. Smell pleasant, slightly fruity. Taste mild, somewhat fungous. Pores relatively large, irregular, angular, gold-yellow. Stipe 50–80 × 10–15 mm, central, cylindric, solid, yellow to yellow-brownish, without veil.

Hyphae without clamps. Cheilo- and pleurocystidia 25–30 × 6–8 μm, fusiform, smooth, hyaline, thin-walled. Basidia 25–35 × 6–12 μm, subcylindric to clavate, with 4 sterigmata, without basal clamp. Basidiospores 9.0–14.0 × 3.5–5.0 μm, fusiform-ellipstic, smooth, olive-brownish, thin- to thick-walled. Spore-print brown with olive tint.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed taiga with *Abies*, *Betula*, *Larix*, *Pinus*, and *Picea*, 1 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29224; Wonsan town (50), Botanical Garden, on ground, under *Pinus* sp., 20 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29225.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Korea, Russia (e.g. Siberia and Primorski Krai).

REFERENCES. Allesio (1985: 276, Pl. 40); Anonymous (1983a: 124); Azbukina *et al*. (1984: 57); Breitenbach & Kränzlin (1991: 88, Pl. 60); Imazeki & Hongo (1975, **2**: 94, Pl. 28: 179); Melik-Khachatrian (1980: 435); Michael *et al*. (1983a: 322, Pl. 150); Skirgiełło (1975: 53, Fig. 30, Pls. 8: 1; 9); Snell & Dick (1970: 51, Pls. 26 and 79: 1); Syarzhanina (1994: 20); Teng (1996: 409); Vasilyeva (1973: 275; 1978: 121, Pl. 21); Ying *et al*. (1983: 107, Pl. 19: 17–19).

Phylloporus rhodoxanthus (Schwein.) Bres.

Fungi Trid. **2**: 95. 1900.

Agaricus rhodoxanthus Schwein., Schr. Naturf. Ges. Leipzig **1**: 83. 1822.

Pileus 30–60 mm in diam. Upper surface red-brown with olivaceous tinge, finely tomentose. Flesh whitish to lemon yellow. Smell indistinct. Taste mild. Hymenophore lamellate. Lamellae thick and waxy, lemon-yellow to golden yellow, broad, connected by coarse veins. Stipe 30–50 × 5–15 mm, central to excentric, cylindric, golden yellow at apex, below brownish, slightly pruinose, without veil.

Hyphae without clamps. Cheilocystidia and pleurocystidia present, 70–100 × 10–15 µm, fusiform to clavate. Basidia 28–40 × 6–8 µm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 10.0–12.0 × 3.5–5.0 µm, elliptic, greenish yellow, smooth, thin-walled, non-amyloid. Spore-print olivaceous ochre.

SPECIMENS EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest vith *Castanea* sp., *Pinus densiflora* and *Quercus mongolica*, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29227; Kumgang-san Mts: Chanto Forest (61), mixed forest, under *Pinus densiflora* and *Quercus mongolica*, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29226. – On ground.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (e.g. Far East).

NOTES. Known also from Europe and North America.

REFERENCES. Anonymous (1978: 1; 1983a: 123); Breitenbach & Kränzlin (1991: 74, Pl. 39); Hansen & Knudsen (1992: 66, Fig. 42); Imazeki & Hongo (1975, **2**: 93, Pl. 28: 178); Skirgiełło (1975: 105, Fig. 49); Teng (1996: 409); Vasilkov (1955: 30, Fig. 4); Ying *et al.* (1983: 111).

Coniophoraceae Ulbr. 1928

Coniophora arida (Fr.) P. Karst.

Not. Säll. Fauna Flora Fenn. Forh. **9**: 370. 1868.

Thelephora arida Fr., Elench. Fung. **1**: 197. 1828. For further synonyms see Ginns (1982: 21).

Basidiocarp corticioid, resupinate, membranous, thin. Hymenophore smooth to slightly granulose or verrucose, olivaceous brown. Margin finely filamentous. Consistency soft.

Hyphal system monomitic. Hyphae 2–5 µm wide, smooth, hyaline to yellowish, thin-walled, without clamps. Cystidia absent. Basidia 40–75 × 6–9 µm, clavate or urniform, with 4 sterigmata, without basal clamp. Basidiospores 8.0–12.5 × 5.5–9.5 µm, smooth, olivaceous, thick-walled, non-amyloid (Fig. 107).

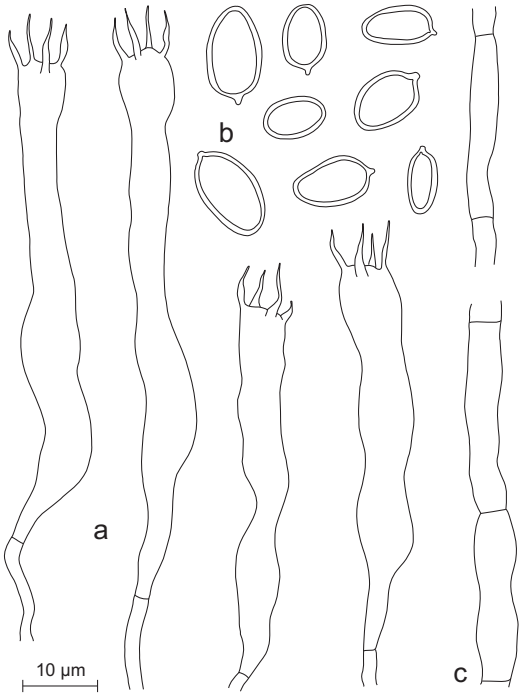


Fig. 107. *Coniophora arida* (Fr.) P. Karst.: a – basidia, b – basidiospores, c – hyphae (KRAM-F 29173).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, taiga, on decayed stump, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29173; Kumgang-san Mts: Chanto Forest (61), alt. *ca* 50 m, on decayed trunk, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29004.

DISTRIBUTION IN ASIA. India (e.g. Himalayas), Japan, Kazakhstan, Mongolia, Nepal and Russia (e.g. Kamchatka and Siberia).

NOTES. New to North Korea. It is a species of the north temperate and south temperate zones (also known from Europe, Africa, North America and Australia).

REFERENCES. Bondartseva & Parmasto (1986: 153, Fig. 41a); Breitenbach & Kränzlin (1986: 206, Pl. 236);

Ginns (1982: 21, Figs 1A, 5B, 6B); Hansen & Knudsen (1997: 289, Fig. 594); Jülich (1982: 450, Pl. 3); Mukhin (1993: Tab. 1); Rattan (1977: 83, Fig. F, p. 85).

Coniophora olivacea (Pers.: Fr.) P. Karst.

Bidr. Känn. Finl. Nat. Folk **37**: 162. 1882.

Thelephora olivacea (Pers.): Fr., Mycol. Eur. **1**: 143. 1822. For further synonyms see Ginns (1982: 39).

Basidiocarp corticioid, resupinate, membranous, thin. Hymenophore smooth, verrucose to sligthtly tuberculate, olivaceous brown. Margin fimbriate, sometimes with fine rhizomorphs.

Hyphal system monomitic. Hyphae 2–7 μm wide, smooth, hyaline to brown, thin- to thick-walled, without clamps. Cystidia 90.0–175.0 × 5.8–13.0 μm, numerous, cylindric, septate, thick-walled, yellowish to dark brown, somewhat encrusted. Basidia 25.0–40.0 × 6.0–6.5 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 6.7–10.5 × 3.8–5.8 μm, smooth, olivaceous, elliptic to ovoid, thick-walled, non-amyloid (Fig. 108).

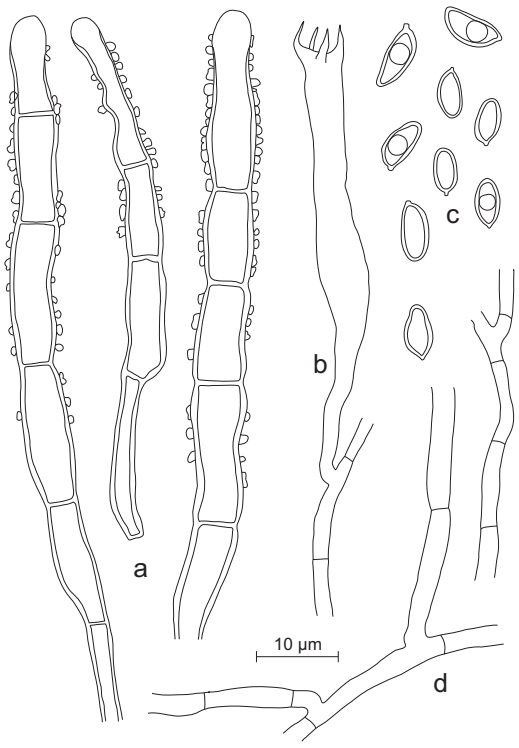


Fig. 108. *Coniophora olivacea* (Pers.: Fr.) P. Karst.: a – cystidia, b – basidia, c – basidiospores, d – hyphae (KRAM-F 29097).

SPECIMENS EXAMINED. Paekdu-san Mts: between Paekdu-san Mt. peak (1) and Samji-yon town (8), alt. *ca* 1850 m, taiga with *Larix*, *Abies*, *Picea*, on fallen dead trunk of ?*Picea*, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29097; *ca* 10 km S of Samji-yon town (8), alt. *ca* 1300 m, taiga with *Larix*, *Abies*, and *Picea*, on stumps and fallen, dead, rotten trunks of coniferous tree, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30305, 52780 (together with *Amphinema byssoides*); *ca* 10 km S of Samji-yon town, alt. *ca* 1300 m, taiga, on dead decayed trunk of coniferous tree, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30306 (together with *Tylospora fibrillosa*).

DISTRIBUTION IN ASIA. Japan, Kazakhstan, Russia (e.g. Kamchatka and Siberia).

NOTES. New to North Korea. It is a circumboreal species, known also from Europe, North and South America, South Africa and New Zealand.

REFERENCES. Bondartseva & Parmasto (1986: 157, Fig. 42); Breitenbach & Kränzlin (1986: 206, Pl. 237); Cunningham (1963: 244, Fig. 141); Ginns (1982: 39, Figs 2U–X, 3E–F, H, 18–19); Hansen & Knudsen (1997: 289, Fig. 596); Mukhin (1993: Tab. 1); Pilát (1936: 394, Fig. 9).

Pseudomerulius aureus (Fr.) Jülich

Persoonia **10**: 330. 1979.

Merulius aureus Fr., Elench. Fung. **1**: 62. 1828.

Basidiocarp resupinate or effuso-reflexed. Hymenophore merulioid, radially folded-wrinkled or semiporose with angular pores, yellow-orange.

Hyphal system monomitic. Hyphae 1.5–3.0 μm, smooth, hyaline, thin-walled, some with clamps. Cystidia absent. Basidia 16.5–23.0 × 3.5–4.5 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 3.5–4.5 × 1.5–2.0 μm, cylindric to suballantoid, smooth, thin-walled, yellowish, non-amyloid (Fig. 109).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 400 m, in mixed

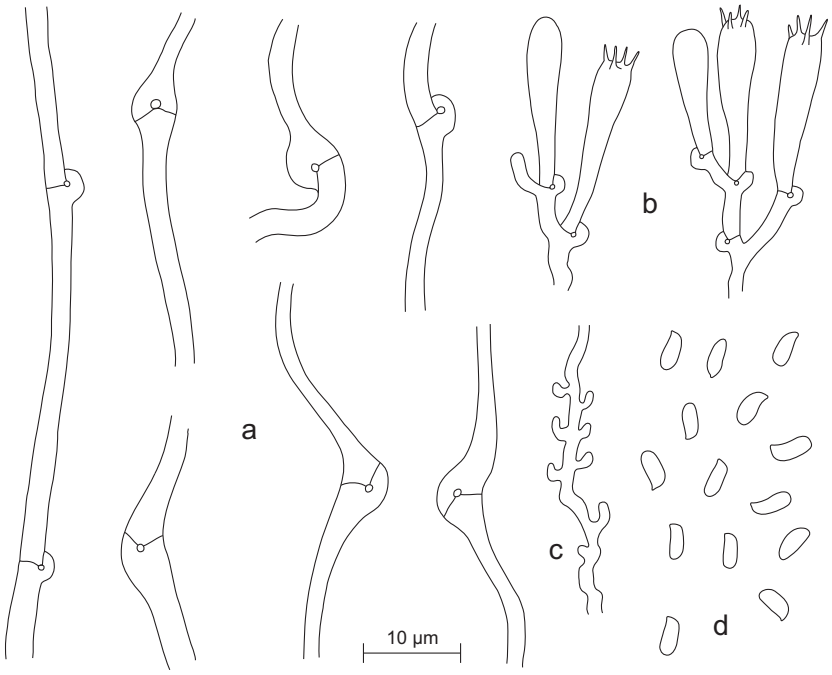


Fig. 109. *Pseudomerulius aureus* (Fr.) Jülich: a – hyphae, b – basidia, c – hyphae with ring-structures and conidioid prosesses, d – basidiospores (KRAM-F 29011).

forest (*Pinus densiflora* and *Quercus mongolica*), on fallen dead trunk of *Pinus densiflora*, 5 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29011; below Wonman Mt. (31), alt. *ca* 900 m, in coniferous forest with *Picea* and *Thuja koraiensis*, on fallen dead trunk of coniferous tree, 17 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28944.

DISTRIBUTION IN ASIA. China, India, Japan, Kazakhstan and Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Azbukina *et al*. (1984: 33); Bondartseva & Parmasto (1986: 170, Fig. 49); Breitenbach & Kränzlin (1986: 210, Pl. 243); Eriksson *et al*. (1981: 1219, Figs 625–626); Ginns & Lefebvre (1993: 132); Hansen & Knudsen (1997: 292, Fig. 602); Imazeki & Hongo (1975, **2**: 124, Pl. 40: 243); Maekawa & Zang (1995: 92); Mukhin (1993: Tab. 1); Sharma (2000: 118); Shvartsman (1964: 282); Teng (1996: 63).

Gomphidiaceae Maire *ex* Jülich 1982

Gomphidius maculatus (Scop.: Fr.) Fr.

Epicr. Syst. Mycol. 319. 1838.

Agaricus maculatus Scop., Fl. Carniol. **2**: 448. 1772. – *A. maculatus* Scop.: Fr., Syst. Mycol. **1**: 315. 1821.

Pileus 20–45 mm in diam., campanulate, umbonate to depressed, then plane. Upper surface glutinous, whitish, pinkish to reddish brown, with brownish tint, covered with blackish spots, finally almost black. Margin striate. Flesh soft, whitish to pinkish. Taste weak. Smell absent. Hymenophore lamellate. Lamellae thick, in young specimens whitish, white-cinereous, then greyish, olivaceous to reddish, blackish when cut. Stipe 40–70 × 5–10 mm, whitish, yellow at base, covered with red brown scales, blackening when touched, floccose, slightly viscid.

Cystidia 10–125 × 15–18 µm, cylindric to fusoid, obtuse. Basidiospores 15.0–22.0 × 5.5–8.0 µm, subfusoid, elliptic to cylindric-fusoid,

smooth, olivaceous to pale brown, smooth, with oil-drops.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 30 km NE of Paedu-san Mt. peak (1), alt. *ca* 1500 m, in taiga with *Larix*, on ground under *L. olgensis*, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52988.

DISTRIBUTION IN ASIA. Japan and Russia (e.g. Primorski Krai).

NOTES. New to North Korea. Holarctic species.

REFERENCES. Dermek & Pilát (1988: 93. Pl. 109); Hansen & Knudsen (1992: 69, Fig. 47); Imazeki & Hongo (1975, **2**: 92); Michael *et al*. (1987: 452, Pl. 287); Skirgiełło (1975: 110); Vasilyeva (1973: 266; 1978: 128).

Gomphidius roseus (Fr.) Fr.

Epicr. Syst. Mycol. 319. 1838.

Agaricus (*Gomphus*) *lubricus* var. β *roseus* Fr., Syst. Mycol. **1**: 315. 1821.

Basidiocarp very young, hemispherical. Upper surface of pileus carmine-red. Hymenophore lamellate. Lamellae white. Stipe cylindric-conic, whitish.

Hyphae of pileipellis 2.5–6.0 μm wide, smooth, hyaline, thin-walled, without clamps. Cystidia 90.0–120.0 × 13.5–15.5, cylindric, thin-walled, some encrusted, abundant. Basidia 30.0–50.0 × 9.7–11.5 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores (9.7–)13.5–17.5 × (3.8–)4.8–6.7 μm, subfusoid to fusiform-elliptic, smooth, brown-yellow, thick-walled, some with oil-drops (Fig. 110).

SPECIMEN EXAMINED. Kumgang-san Mts: shore of Samil-po Lake (62), mixed forest with *Pinus densiflora* and *Quercus mongolica*, on ground, together with *Suillus bovinus*, under *Pinus densiflora*,19 July 1986, *leg. W. Wojewoda*, KRAM-F 53346. On lower part of stipe growing mycophilous fungus *Hypomyces chrysospermus* (see Ascomycetes, Hypocreaceae).

DISTRIBUTION IN ASIA. Armenia, China, Japan, Korea and Russia (e.g. Siberia and Far East).

NOTES. Known also from Europe, North America and Africa. This species often (always?) grows together with *Suillus bovinus* (L.: Fr.) Kuntze.

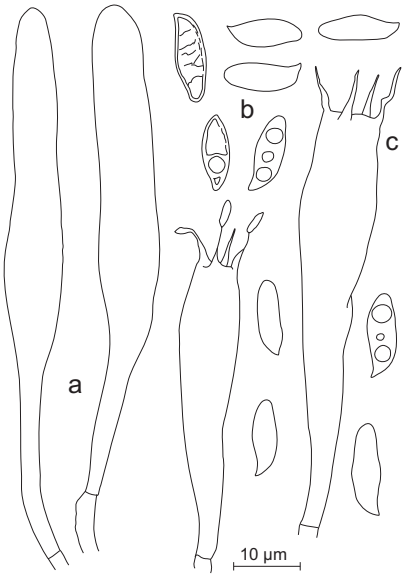


Fig. 110. *Gomphidius roseus* (Fr.) Fr.: a – cheilocystidia, b – basidiospores, c – basidia (KRAM-F 53346).

REFERENCES. Anonymous (1978: 16; 1983a: 122); Breitenbach & Kränzlin (1991: 98, Pl. 74); Dermek & Pilát (1988: 92, Pl. 108); Hansen & Knudsen (1992: 69, Fig. 48); Imazeki & Hongo (1975, **1**: 81, Pl. 36: 209); Melik-Khachatrian (1980: 425); Michael *et al*. (1987: 467, Pl. 289); Skirgiełło (1975: 109); Syarzhanina (1994: 38).

Gyroporaceae Locq. 1984

Gyroporus castaneus (Bull.: Fr.) Quél.

Enchir. Fung. 161. 1886.

Boletus castaneus Bull., Champ. Fr. Pl. 328. 1786. – *Boletus castaneus* Bull.: Fr., Syst. Mycol. **1**: 392. 1821.

Pileus 40–50 mm in diam., convex at first, then plane to depressed. Upper surface minutely velvety-tomentose, cinnamon brown to chestnut. Hymenophore porose, white, then yellowish, unchanging when bruised. Flesh white, uchanging when cut. Taste mild, pleasant. Smell indistinct. Stipe 40–60 × 5–10 mm, cylindric, hollow, fragile, concolorous with cap.

Cheilocystidia 25.0–40.0 × 6.5–9.7 μm, fusiform to clavate, smooth, thin-walled. Basidia 25.0–40.0 × 8.5–10.0 μm, with 4 sterigmata, with-

out basal clamp. Basidiospores 6.7–12.6(–17.4) × 4.8–5.8(–6.7) µm, oblong-elliptic to broadly ovoid, smooth, hyaline, light olivaceous to pale yellow, thin- to thick-walled, with oil-drops, non-amyloid. Spore-print white-cream to pale lemon yellow.

SPECIMEN EXAMINED. Myohyang-san: near Sangwon-am Monastery (19), mixed forest with *Pinus densiflora* and *Quercus mongolica*, on ground, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52227.

DISTRIBUTION IN ASIA. Caucasus, China, Japan, Korea and Russia (e.g. West Siberia and Far East).

NOTES. This species is known also from Europe, North America and Africa.

REFERENCES. Anonymous (1983a: 123); Breitenbach & Kränzlin (1991: 68, Pl. 29); Hansen & Knudsen (1992: 53, Fig. 14); Imazeki & Hongo (1975, **1**: 83, Pl. 37: 212); Morris (1990: 355); Skirgiełło (1975: 26, Fig. 18, Pl. 2); Snell & Dick (1970: 16), Pls. 7 and 74: 3); Syarzhanina (1994: 13); Teng (1996: 402); Vasilyeva (1973: 268).

Hygrophoropsidaceae Kühner 1980

Hygrophoropsis aurantiaca (Wulfen: Fr.) Maire

in Martin-Sans, Emplois. Champ. 99. 1929.

Agaricus aurantiacus Wulfen, *in* Jacq., Misc. Austr. **2**: 107. 1781. – *A. aurantiacus* (Wulfen): Fr., Syst. Mycol. **1**: 318. 1821.

Pileus 20–60 mm in diam., depressed, infundibuliform. Upper surface orange, orange-yellow, orange-ochraceous, to orange-brown. Flesh yellowish, soft. Margin involute. Lamellae orange to orange-red. Stipe orange 30–45 × 4–7 mm, ochraceous to red, sometimes eccentric.

Basidiospores 5.0–7.5 × 2.0–4.5 µm, elliptic, smooth, hyaline, thin-walled, with a large central oil-drop. Spore-print white.

SPECIMEN EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100 m, forest with *Pinus densiflora*, on ground, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 29201.

DISTRIBUTION IN ASIA. Armenia, Korea, Mongolia and Russia (e.g. Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 122); Azbukina *et al.* (1984: 57); Breitenbach & Kränzlin (1991: 90, Pl. 61); Hansen & Knudsen (1992: 53, Fig. 16); J. E. Lange (1940: 84, Pl. 196C); Melik-Khachatrian (1980: 423); Petrov & Belova (1999: 27); Vasilyeva (1973: 106, Fig. 21A).

Paxillaceae Lotsy 1907

Paxillus involutus (Batsch: Fr.) Fr.

Epicr. Syst. Mycol. 317. 1838.

Agaricus involutus Batsch, Elench. Fung., Cont. **1**: 39, Pl. 13, Fig. 61. 1786. – *A. involutus* Batsch.: Fr., Syst. Mycol. **1**: 271. 1821.

Pileus up 40–50 mm in diam., at first convex, then plane. Upper surface smooth, tuberculate to tomentose, with dark fibrils, ochraceous, olive-brown to rust brown. Margin strongly involute. Flesh light yellow to brownish yellow, turning brown when cut. Smell aromatic. Taste mild, fungous. Lamellae narrow, ochraceous yellow to olive-ochraceous, sometimes forked and anastomosing, decurrent as small tooth. Stipe 50–60 × 5–10 mm, cylindric, grey-yellow to ochraceous brown, smooth, longitudinally fibrillose.

Pileipellis of irregular hyphae without clamps. Cheilo- and pleurocystidia 35.0–80.0 × 7.5–14.0 µm, fusiform, with brown contents. Basidia 28–45 × 8–10 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 6.7–9.7(–11.5) × 4.2–6.7, elliptic-ovoid, smooth, yellowish, thin- to thick-walled, non-amyloid. Spore-print rust-brown.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, mixed taiga, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52986, 52987; Nampo (44), park, among grass, under *Juniperus* sp. and *Robinia pseudoacacia*, 25 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29228, 29229, 29230. – On ground.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Korea, Russia (e.g. North of Altai, Siberia and Primorski Krai) and Tadzhikistan.

REFERENCES. Anonymous (1983a: 122); Azbukina *et al.* (1984: 57); Breitenbach & Kränzlin (1991: 92, Pl. 64); Gorbunova (1997: 16); Hansen & Knudsen (1992: 54, Fig. 19); Imazeki & Hongo (1975, **1**: 81, Pl. 36:

208); Melik-Khachatrian (1980: 422); Park *et al*. (1986: 248, Pls. I: 6; II: 6); Skirgiełło (1975: 101, Fig. 47, Pl. 30: 2); Syarzhanina (1994: 34); Teng (1996: 409, Fig. 290); Vasilyeva (1973: 265; 1978: 128, Pl. 44); Ying *et al*. (1983: 110).

Paxillus panuoides (Fr.: Fr.) Fr.

Epicr. Syst. Mycol. 318. 1838.

Agaricus panuoides Fr., Obs. **2**: 228. 1818. – *A. panuoides* Fr.: Fr., Syst. Mycol. **1**: 273. 1821. – *Tapinella panuoides* (Fr.: Fr.) Gilbert, Les Bolets. 67. 1931. – *Crepidotus panuoides* (Fr.: Fr.) Pilát, Atl. Champ. Eur. **6**: 18. 1948.

Basidiocarp pileate, sessile, without stipe. Pileus 15–50 mm broad. Upper surface finely velutinous-tomentose, ochraceous brown, petaloid to conchate, subimbricate. Margin involute. Flesh cream to light yellow. Smell indistinct, pleasant. Taste mild. Hymenophore lamellate. Lamellae yellow to cinnamon brown, broad, decurrent.

Hyphae 3.0–5.8 μm wide, smooth, hyaline, thin-walled, with clamps. Cystidia absent. Basidia 20–40 × 5–8 μm, clavate, with 4 sterigmata and a basal clamp. Basidiospores 3.8–5.8 × 3.0–3.8 μm, broadly elliptic, ovoid to subglobose, smooth, pale yellow, thin-walled, with oil-drops, non-amyloid (Fig. 111).

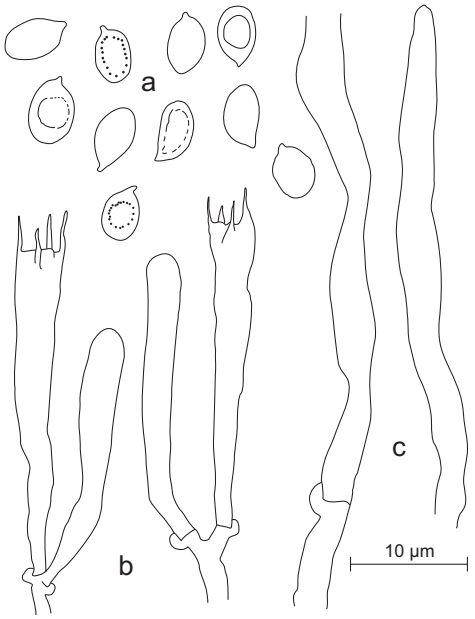


Fig. 111. *Paxillus panuoides* (Fr.: Fr.) Fr.: a – basidiospores, b – basidia, c – hyphae (KRAM-F 53339).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, mixed taiga, on fallen, rotten trunk, 3 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 52987, 53339.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan, Korea, and Russia (e.g. Siberia and Far East).

REFERENCES. Anonymous (1983a: 122); Azbukina *et al*. (1984: 57); Breitenbach & Kränzlin (1991: 94, Pl. 68); Hansen & Knudsen (1992: 55); Imazeki & Hongo (1975, **1**: 81, Pl. 36: 207); Jahn (1979: 230, Pl. 206); Mukhin (1993: Tab. 1); Pilát (1948: 17, Fig. 1); Skirgiełło (1975: 103, Fig. 48B); Syarzhanina (1994: 34); Teng (1996: 409); Vasilyeva (1973: 265); Wen & Sun (1999: 368).

Rhizopogonaceae Gämann & C. W. Dodge 1928

Rhizopogon roseolus (Corda) Th. M. Fries

Svensk Bot. Tidskr. **3**: 288. 1909.

Splanchnomyces roseolus Corda, *in* Sturm, Deutschl. Fl., III, Abt. **3**: 3, Pl. 2. 1837. – *Rhizopogon rubescens* (Tul. & Tul.) Tul, Gi. Bot. Ital. **2**: 58. 1844. For further synonyms see Pilát (1958: 130).

Basidiocarp 20–30 mm in diam., globose to tuberiform. Peridium 120–350 μm thick, at first whitish, then yellowish, turning pink when cut. Gleba in form subglobose to to labyrinthiform cavities, at first whitish, later yellowish to ferruginous brown.

Hyphae of peridium 2.5–8.0 μm wide, hyaline to brown-yellow, thin-walled. Basidiospores 7.5–9.5 × 3.0–4.0 μm, cylindric, elliptic to cylindric-fusoid, smooth, hyaline to pale lemon yellow, thin-walled, non-amyloid, with 1–2 oil-drops.

SPECIMEN EXAMINED. Kumgang-san Mts: shore of Samil-po Lake (62), mixed forest with *Pinus densiflora* and *Quercus mongolica*, under ground, under *Pinus densiflora*, 19 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29236.

DISTRIBUTION IN ASIA. Caucasus, India, Japan, Korea and Russia (e.g. Far East: Primorski Krai).

NOTES. Cosmopolitan species, known also from Europe, North and South America, South Africa, Tasmania, New Zealand and Australia.

REFERENCES. Anonymous (1983a: 126); Cunningham (1944: 44, Pl. XXXIII: 2); Hansen & Knudsen (1992: 68); Imazeki & Hongo (1975, **2**: 166, Pl. 55: 324); Pilát (1958a: 130, Fig. 31A, 33–34); Sosin (1973: 39, Fig. 9); Vasilyeva (1978: 177, Pl. 199).

Sclerodermataceae Corda 1842

Astraeus hygrometricus (Pers.) Morgan

J. Cincinnati Soc. Natur. Hist. **12**: 20. 1889.

Geastrum hygrometricum Pers., Syn. Meth. Fung. 135. 1801. For further synonyms see Bottomley (1948: 603).

Unexpanded basidiocarp globose. Exoperidium three-layered, split below the middle into 7–11 equal acute rays which are expanded when wet, strongly involute when dry. Fleshy layer thick, adnate, umber, rimose in mature specimens. Endoperidium 10–25 mm in diam., sessile, depressed globose or globose, greyish brown, finely pubescent, and somewhat areolate. Gleba umber.

Capillitium 4–6 µm wide, often encrusted with granules, subhyaline, thick-walled, branched. Basidiospores 7–10 µm in diam., globose, areolate, verrucose, brown, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: valley near Sangwon-am Monastery (19), alt. *ca* 300–500 m, mixed forest, 13 July 1986, *leg*. *H. Komorowska*, KRAM-F 28511; valley of stream between Sangwon-am Monastery and Hyangsan-gang Stream Valley (19–20), alt. *ca* 300 m, mixed forest, under ground, 5 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 27832; Hyangsan-gang Stream Valley (20), *ca* 10–15 E of Hyang-san, alt. *ca* 100–150 m, mixed forest with *Pinus densiflora* and *Quercus mongolica*, 12 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28937; Kuchung Falls (26), alt. *ca* 500 m, mixed forest, 6 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 27821; near Habiro Temple (27), alt. *ca* 200 m, mixed forest, 7 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 27830; 10 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28936; Soham-ho Lake (32), *ca* 30 km N of Pyongyang, *Pinus densiflora* forest, 17 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28938; Ryongak-san Mt. (42), alt. *ca* 280 m, *Pinus densiflora* forest, 16 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28939; alt. *ca* 200 m, 16 July 1986, *leg*. *H.Komorowska*, KRAM-F 28326; 16 July 1986, *leg Z. Heinrich*, KRAM-F 27977; mixed forest with *Castanea*, *Quercus and Pinus densiflora*, 10 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 27849; Suian-san Mts (48): young mixed forest with *Pinus densiflora*, on ground, 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 25475, 27850; mixed forest with *Pinus densiflora* and *Castanea* sp., 5 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28935; Wonsan town (50), Botanical Garden, 22 July 1986, *leg*. *H. Komorowska*, KRAM-F 28562; *leg*. *Z. Heinrich*, KRAM-F 28064; Kumgang-san Mts: Okryu-dong Valley (59), alt. *ca* 500 m, 20 July 1986, *leg*. *Z. Heinrich*, KRAM-F 28020; near Onjong-ri village, bank of Nam-gang River, near hotel (60), pine forest, 20 July 1986, *leg*. *Z. Heinrich*, KRAM-F 28049; 21 July 1986, *leg*. *H.Komorowska*, KRAM-F 28396; shore of Samil-po Lake (62), forest with *Pinus densiflora* and *Quercus mongolica*, 19 July 1986, *leg*. *H. Komorowska*, KRAM-F 28355; Pagyon Ravine (65), forest, 26 July 1986, *leg*. *H. Komorowska*, KRAM-F 28268. – On ground or under ground.

DISTRIBUTION IN ASIA. Afghanistan, Azerbaijan, China, Georgia, India, Iran, Israel, Japan, Kazakhstan, Kirghizia, Korea, Pakistan, Russia (e.g. West Siberia and Far East) and Thailand.

NOTES. Known also from Europe, North America and Australia.

REFERENCES. Anonymous (1978: 180; 1983a: 128); Bottomley (1948: 603, Pl. LX); Cunningham (1944: 178, Pls. XXVII: 6–7; XXXVI: 39); Eckblad (1970: 130; 1976: 68); Imazeki & Hongo (1975, **1**: 123, Pl. 58: 319); L. Lange (1974: 40); Michael *et al*. (1983a: 370, Pl. 184); Shvartsman & Filimonova (1970: 194, Fig. 70); Sosin (1973: 61, Fig. 25); Pilát [1958a: 627, Figs 233–235, also as var. *koreanus* V. J. Stanek, *in* Pilát (1958a: 819)]; Teng (1996: 509, Fig. 343b); Wojewoda *et al*. (1993: 128); Ying *et al*. (1983: 168).

Scleroderma areolatum Ehrenb.

Sylvae Mycol. Berol. 15 & 27. 1818.

S. lycoperdoides Schwein., Schrift. Naturforsch. Gesellsch Leipzig **1**: 61. 1822.

Basidiocarp 20–35 mm in diam., globose to pyriform. Pericium thin, simple, leathery, appressed-squamulosae, with brownish scales on yellowish ground. Gleba whitish at first, then brown to black. Stipe 10–15 mm long, cream to

yellowish, with remains of mycelium, almost completely buried in ground.

Hyphae of gleba 2.5–8.0 μm wide, brown, smooth, thick-walled, without clamps. Basidiospores (including spines) 10.8–15.6(–16.8) μm in diam., globose, brown, thin-walled. Spines up to 2 μm long, sharp. Reticulum absent.

SPECIMENS EXAMINED. Paekdu-san Mts: between Potae-gu (11) and Poso-ri (12), alt. *ca* 1200 m, mixed taiga, 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28141; Wonsan town (50), Botanical Garden, under *Quercus*, 20 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27859. – On ground.

DISTRIBUTION IN ASIA. India, Japan and Kazakhstan.

NOTES. New to North Korea. Known also from Europe, North America and South America.

REFERENCES. Breitenbach & Kränzlin (1986: Pl. 504); Demoulin (1968: 20; 1969: 27, Fig. 2: 5); Guzmán (1970: 282, Figs 40–41, 70–72, 101–102, 132–133, 171–172).

Scleroderma fuscum (Corda) Ed. Fischer

in Engler & Prantl, Die Natürl. Pflansenf. I, Abt., **1**: 336. 1899.

Phlyctrospora fuscum Corda, *in* Sturm, Deutschl. Pl. 51, Pl. 16, Figs 1–5. 1841.

Basidiocarp 20–35 × 30 mm in diam., globose or subglobose. Peridium brownish, thick, with squamules. Gleba at first whitish, then dark greyish.

Basidiospores including spines 10.8–15.6 (–16.8) μm in diam., echinulate, reticulate, with hyaline cells.

SPECIMEN EXAMINED. Wonsan town (50), Botanical Garden, semihypogean in ground, 22 July 1986, *leg. H. Komorowska*, KRAM-F 285572.

DISTRIBUTION. Reported e.g. from Africa, Europe (France, former Estonia, Czechoslovakia, Hungary, Italy and Russia), South America (Argentina, Uruguay) and North America (e.g. Jamaica).

NOTES. New to North Korea.

REFERENCES. Guzmán (1970: 346, Figs 58–60, 121–123, 151); Jülich (1984: 507); Pilát (1958a: 572, Fig. 204: 8–9); Rudnicka-Jezierska (1991: 97); Sosin (1973: 56).

Scleroderma verrucosum (Bull.): Pers.

Syn. Meth. Fung. 154. 1801.

Lycoperdon verrucosum Bull., Hist. Champ. Fr. **1**: 157. 1791.

Basidiocarp 15–40 mm in diam., globose. Peridium up to 1.5 mm thick, yellowish at first, then yellowish-brown, covered with brown squamules on yellowish ground. Gleba whitish at first, then olivaceous, greyish brown to black. Stipe 10–20 mm long, with remains of mycelium.

Hyphae without clamps. Basidiospores (including spines) 7.2–12.0(–13.8) μm in diam., dark brown, echinulate, spines 1.0–1.5 μm long. Reticulum absent.

SPECIMENS EXAMINED. Myohyang-san Mts: valley below Sangwon-am Monastery (19), alt. *ca* 400 m, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27829; Ryongak-san Mt. (42), alt. *ca* 250 m, forest with *Castanea*, *Pinus densiflora* and *Quercus*, 3 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 28469; 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27857; Suian-san Mts (48): forest with *Pinus densiflora* and *Quercus* sp., 5 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 28128; 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27858; 5 July 1986, *leg. Z. Heinrich*, 28127; Kumgang-san Mts: Okryu-dong Valley, below Kuryong Falls, on Okryu Stream, (59), alt. *ca* 300 m, 14 Aug.1983, *leg. W. Wojewoda*, KRAM-F 27856; 5 July 1985, *leg. B. Zarzycka*, KRAM-F 27798, 7806; between Onjong Range and Onjong-ri (60), *ca* 8 km of Onjong-ri, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27827; park in Onjong-ri (60), in grass, under deciduous trees, 15 Aug.1983, *leg. W. Wojewoda*, KRAM-F 27824; shore of Samil-po Lake, (62), on ground, 13 Aug.1983, *leg. W. Wojewoda*, KRAM-F 27820; 19 July 1986, *leg. H. Komorowska*, KRAM-F 28349; near tomb of King Kongmin (64), 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28116; Pagyon Ravine (65), 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28197. – In mixed forests, sometimes in parks, on ground.

DISTRIBUTION IN ASIA. Armenia, China (e.g. Tibet), India, Iran, Kazakhstan, Korea, Malaysia, Nepal, Pakistan, Philippines, Russia (e.g. Far East), Sri Lanka and Turkmenia.

NOTES. Known also from Europe, Africa and Australia.

REFERENCES. Anonymous (1983a: 128); Azbukina *et al.* (1984: 60); Demoulin (1968: 19; 1969: 26, Fig. 2: 4);

Eckblad (1976: 69); Ecklblad & Ellingsen (1984: 19); Guzmán (1970: 276, Figs 67–69, 131, 167–169); Pilát (1958a: 567, Figs 204–205); Rudnicka-Jezierska (1991: 96, Fig. 23: 5); Shvartsman & Filimonova (1970: 191, Fig. 68); Sosin (1973: 54, Fig. 17); Ying *et al.* (1983: 167).

Strobilomycetaceae J.-E. Gilbert 1931

Strobilomyces strobilaceus (Scop.: Fr.) Berk.

Dec. Fung. 32–33, Hook. J. Bot. **3**: 77. 1851.

S. floccopus (Vahl: Fr.) P. Karst., Bidr. Finl. Nat. Folk **37**: 16. 1882. – *Boletus strobilaceus* Scop., Ann. Hist. Nat. **IV**: 148. 1770. – *B. strobilaceus* Scop.: Fr., Elench. Fung. **1**: 127. 1828.

Pileus 50–100 mm in diam., at first hemispheric, then convex. Upper surface squamose, with pyramidal, greyish, brown-black to blackish floccose scales. Flesh whitish, brownish-pink when cut, then turning blackish. Smell somewhat earthy. Taste mild. Hymenophore poroid. Pores 7–8 per mm, rounded-angular, at first whitish, then grey-brownish, browning to blackening when cut. Stipe 50–100 × 5–15 mm, cylindric, floccose-fibrillose, grey-brown, solid, with whitish veil. Flesh grey-brownish, reddening to blackening when cut.

Hyphae without clamps. Cheilo- and pleurocystida 40–75 × 15–20 µm, clavate-fusiform, with brown pigments. Basidia 40–55 × 10–20 µm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 8.0–11.5 × 8.0–10.5 µm, subglobose, reticulate-verrucose, brown-yellow. Spore-print black with purple tint.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest (*Pinus densiflora*, *Quercus*), 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29202; near Myohyang-san Hotel (20), alt. *ca* 100–200 m, mixed forest, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29203; Kumgang-san Mts: Myongyong-dae Ravine near Myongyong-dae Rock (58), alt. *ca* 1000 m, mixed forest, 17 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29204. – On ground.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (e.g. Primorski Krai).

NOTES. Known also from Europe and North America.

REFERENCES. Anonymous (1978: 14; 1983a: 124); Breitenbach & Kränzlin (1991: 50, Pl. 2); Imazeki & Hongo (1975, **1**: 89, Pl. 40: 228); L. Lange (1974: 25); Skirgiełło (1975: 97, Fig. 45, Pl. 29: 4); Teng (1996: 399, Fig. 288); Vasilyeva (1973: 284; 1978: 127, Pl. 40); Ying *et al*. (1983: 110).

Tylopilus plumbeoviolaceus (Snell) Snell & Dick

Mycologia **33**: 32–33. 1941.

Boletus plumbeoviolaceus Snell, Mycologia **28**: 465. 1936.

Pileus 30–100 mm in diam., dry, violaceous when young, then dull violaceous-purplish-grey to violaceous-brown, dry. Flesh white, unchanging. Smell insignificant. Taste acrid, bitter. Hymenophore adnate to slightly decurrent, white at first, then becoming rosy. Stipe 50–100 × 10–40 mm, even or very slightly reticulate, white, violaceous to brownish.

Basidiospores 8.0–11.0 × 3.0–4.5 µm, subelliptic to fusiform, hyaline. Spore-print vinaceous when fresh, almost cinnamon when old.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53340; near Myohyang-san Hotel (20), alt. *ca* 150 m, 4 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29326; Kumgang-san Mts: near Onjong-ryong Pass (54), alt. *ca* 800 m, 16 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29327. – Mixed forests with *Quercus*, on ground, under *Q. mongolica*.

DISTRIBUTION IN ASIA. Korea and Russia (e.g. Primorski Krai).

NOTES. New to North Korea. Known also from North America: Canada and United States.

REFERENCES. Anonymous (1983a: 124); Snell & Dick (1970: 91, Pls. 56 and 85: 3); Vasilyeva (1973: 282); Wojewoda *et al*. (1993: 125).

Suillaceae (Singer) Besl & Bresinsky 1997

Boletinus asiaticus Singer

Rev. Mycol. **3**: 164, Pl. 5: 3. 1938.

Pileus 40–80 mm in diam., hemispherical, purplish, vinous-red or lilaceous-blood-red with age, dry, floccose in centre. Flesh yellowish, unchang-

ing. Smell absent. Taste mild. Tubes irregular, decurrent, at first yellow, later olivaceous-yellow. Pores up to 3–4 mm in diam., elongated, angular, lemon-yellowish, not changing. Stipe 45–80 × 10–15 mm, hollow, above annulus under pileus yellowish, below vinous-red, yellowish blood-red, fibrillose to squamate, at base thicker and smooth. Veil red, dry.

Cystidia 50–80 × 9–13 μm, fusiform, hyaline. Basidia 30–40 × 6–7 μm, with 4 sterigmata. Basidiospores (5.8–)7.7–11.6 × (2.9-)3.8–4.8(-5.8) μm, fusoid-elliptic, thin-walled, with 1–2 oil-drops. Spore-print buff-brown (Fig. 112).

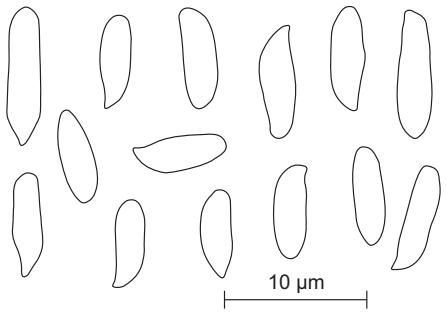


Fig. 112. *Boletinus asiaticus* Singer: basidiospores (KRAM-F 29191).

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 20–30 km SE of Paekdu-san Mt. peak (1), alt. *ca* 2000 m, 3 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29190; on shore of Samji-yon lake (7), alt. *ca* 1400 m, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 27065, 53343; *ca* 15 km N of Samji-yon town (8), 4 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29191. – Taiga with *Larix*, on ground, under *L. olgensis*.

DISTRIBUTION IN ASIA. Korea, Mongolia and Russia (North Altai and Primorski Krai).

NOTES. New to North Korea. In Europe this East Asiatic species hitherto has been found only in Finland (introduced from Asia?). In Asiatic mountains up to 2200 m.

REFERENCES. Dermek & Pilát (1988: 64, Pl. 15a–c); Gorbunova (1997: 16); Moser (1983: 59); Petrov & Belova (1999: 26); Skirgiełło (1975: 30); Vasilkov (1955: 20); Vasilyeva (1973: 269; 1978: 115, Pl. 3); Wojewoda *et al*. (1993: 125, 127).

Boletinus cavipes (Klotzsch) Kalchbr.

Enum. **2**: 287. 1867.

Boletus cavipes Klotzsch, *in* Fr. 1835.

Pileus 40–100 mm in diam., convex when young, then plane and depressed. Upper surface squamulose-tomentose. Flesh yellowish, not bluing when cut. Smell and taste mild, pleasant, fungous. Hymenophore porose, yellowish. Stipe 45–70 × 5–15 mm, cylindric, thickened toward base, hollow, of the same colour or somewhat lighter than the pileus. Veil present, whitish, yellowish to brown.

Hyphae with clamps. Cheilo- and pleurocystidia 38.0–70.0 × 5.5–10.0 μm, cylindric-clavate, smooth, hyaline to yellowish. Basidia 20–28 × 5–7 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 7.0–9.0 × 3.0–3.5 μm, elliptic-fusoid, smooth, hyaline to yellowish, thin-walled, with oil-drops, non-amyloid. Spore-print yellow-olive to yellow-brown.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 30 km SE of Paekdu-san Mt. peak (1), 3 Sept.1983, *leg*. *W. Wojewoda*, KRAM-F 29192; *ca* 15 km N of Samji-yon town (8), alt. *ca* 1500 m, 4 Sept.1983, *leg*. *W. Wojewoda*, KRAM-F 29193. – Taiga with *Larix*, on ground, under *L. olgensis*.

DISTRIBUTION IN ASIA. China, Japan, Korea, Mongolia and Russia (Primorski Krai).

NOTES. Known from the temperate Northern Hemisphere, e.g. from Europe and North America, most often in mountains.

REFERENCES. Allesio (1985: 424, Pl. 71); Anonymous (1983a: 122); Breitenbach & Kränzlin (1991: 50. Pl. 3); Dermek & Pilát (1988: 63, Pl. 14); Imazeki & Hongo (1975, **1**: 88, Pl. 39: 226); Petrov & Belova (1999: 26); Skirgiełło (1975: 28, Fig. 19, Pl. 3: 2–4); Snell & Dick (1970: 20, Pls. 9 and 74: 7); Teng (1996: 401); Vasilyeva (1973: 270; 1978: 116, Pl. 6).

Boletinus paluster (Peck) Peck

Bull. N. Y. State Mus. **2**(8): 78. 1889.

Boletus paluster Peck, Ann. Rep. N. Y. State Cab. Nat. Hist. **23**: 132. 1873.

Pileus 50–100 mm in diam., convex to plane or slightly depressed, sometimes with small umbo.

Upper surface dry, floccose-tomentose, pale pinkish purple to reddish purple. Flesh yellowish white to yellow, under pellicle reddish, unchanging. Smell and taste farinaceous. Hymenophore decurrent, lamellate-poroid, whitish yellow, pale yellow to ochraceous. Tubes yellowish, up to 4 mm long. Pores very large, 1–2 mm in radial dimension, angular. Stipe short and slender, 40–50 × 5–10 mm, under pileus reticulate to poroid, at first minutely squamulose, later glabrous, solid, under pileus yellowish, below pale purplish.

Basidiospores 6.7–9.7 × 2.5–3.8 µm, cylindric-elliptic, elliptic to subelliptic, smooth, subhyaline, thin-walled. Spore-print light to deep reddish purple at first, then pinkish brown.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, taiga, on ground, under *Abies*, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29194, 53342.

DISTRIBUTION IN ASIA. Japan and Russia (e.g. Primorski Krai).

NOTES. New to North Korea. This species is known also from North America (Canada and United States). Edible mushroom.

REFERENCES. Imazeki & Hongo (1975, **1**: 88, Pl. 39: 227, as *Boletinus pictus*, according to Vasilyeva 1973); Snell & Dick (1970: 21, Pls. 9 and 74: 8); Vasilyeva (1973: 270, Fig. 62B; 1978: 115, Pl. 4).

Boletinus pictus (Peck) Peck

Bull. N. Y. State Mus. **2**(8): 77. 1889.

Boletus pictus Peck, Ann. Rep. N. Y. State Cab. Nat. Hist. **23**: 128. 1873.

Pileus 40–80 mm in diam., convex to expanded, dry, covered with dense vinous-red tomentum whitch breaks up into floccose squamules on ± yellow ground. Flesh creamy yellow, changing slowly to pinkish or reddish when bruised. Smell fungous or slightly acid. Hymenophore sublamellate, pale yellow, later yellowish brown, adnate, somewhat decurrent. Tubes yellow, slightly decurrent, angular, radially arranged. Stipe 30–70 × 5–10 mm, central, solid, with vinous-red tomentum on ± yellow ground, as pileus. Veil white, persistent as a flocculent roll on apex of stipe.

Basidiospores 8–10 × 3–4 µm, elliptic to subfusoid, smooth, yellowish. Spore-print olive to yellowish brown.

SPECIMENS EXAMINED. Paekdu-san Mts: ca 5 km S of Samji-yon (8), alt. *ca* 1500 m, taiga with *Abies*, *Larix* and *Picea*, on ground, 5 Sept. 1983, *leg. W. Wojewoda*, specimens not preserved.

DISTRIBUTION IN ASIA. China (Tibet), Korea and Russia (e.g. Primorski Krai).

REFERENCES. Anonymous (1978: 2; 1983a: 122); Azbukina *et al*. (1984: 57); Dermek & Pilát (1988: 64, Pl. 15h–l); Snell & Dick (1970: 23, Pls. 11 and 75: 2); Teng (1996: 401); Vasilyeva (1973: 270, Fig. 62A; 1978: 116, Pl. 6); Wojewoda *et al*. (1993: 127); Ying *et al*. (1983: 103).

Boletinus spectabilis (Peck) Murrill

Mycologia **1**: 6. 1909.

Boletus spectabilis Peck, Ann. Rep. N. Y. State Cab. Nat. Hist. **23**: 128. 1873.

Pileus 50–100 mm in diam., convex to plane, subumbonate. Upper surface at first covered with bright red to purplish-red tomentum, later with greyish squamules, viscid. Margin deep red. Flesh of pileus yellowish, unchanging. Smell mild, sometimes farinaceous. Taste slightly farinaceous. Hymenophore adnate, at first yellow, then ochraceous to ferruginous, concealed by reddish membrane. Young tube yellowish, up to 3 mm long. Stipe 50–80 × 10–15 mm, solid (not empty), above annulus yellow, below purplish, somewhat tomentose-fibrillose like the pileus, solid. Flesh of stipe yellow. Veil tomentose, dark reddish orange.

Basidiospores (8.7–)9.7–13.5 × 3.8–5.8 µm, elliptic to subfusoid, smooth, yellowish, thin-walled, with oil-drops. Spore-print brown to purplish-brown.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake, near Samji-yon Hotel (7), 3. Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53344; *ca* 15 km N of Samji-yon town (8), alt. *ca* 1500 m, taiga with *Larix*, on ground, under *Abies* and *Larix olgensis*, 3 Sept.1983, *leg. W. Wojewoda*, KRAM-F 29195.

DISTRIBUTION IN ASIA. Russia (e.g. Primorski Krai).

NOTES. New to North Korea. Known also from North America.

REFERENCES. Snell & Dick (1970: 22, Pls. 10 and 75: 1); Vasilyeva (1973: 270, Fig. 62W; 1978: 114, Pl. 2).

Suillus aeruginascens (Opat.) Snell

in Slipp & Snell, Lloydia **7**: 25. 1944.

Boletus aeruginascens Opat., Comm. Hist.-nat. fam. Bolet. *in* Wiegmann's Archiv Naturgesch. **2**: 1–34. 1836. – *Suillus laricinus* (Berk.) Kuntze, Revis. Gen. Plant. **3**: 535. 1898. – *S. viscidus* (L.) Roussel ss. Fries.

Pileus 30–90 mm in diam., subumbonate. Upper surface lemon yellow, gold-brown, reddish grey to brownish red, viscid, fibrillose-tomentose to fibrillose-squamulose. Flesh whitish to lemon yellow. Hymenophore adnate to subdecurrent, greyish white, greyish to greyish brown. Pores narrow. Stipe 50–80 × 5–15 mm, at first white, then yellow, yellowish grey to yellowish brown, reticulate, floccose to tomentose-punctate. Ring with veil remnants, grey.

Hyphae of pileipellis 2.0–5.5 μm wide. Clamps absent. Cheilo- and pleurocystidia 25.0–50.0 × 4.0–7.5 μm, subcylindric to clavate, smooth or with faint brown encrustation, hyaline. Basidia 18.0–30.0 × 6.5–8.5 μm, cylindric-clavate, with 4 sterigmata. Basidiospores 7.7–12.5 × 3.5–5.5 μm, elliptic to subfusoid, smooth, thin-walled, pale olivaceous, with oil-drops. Spore-print olive-brown, greyish brown to ferruginous-brown.

SPECIMENS EXAMINED. Paekdu-san Mts: near Mupo (4), bank of Tuman-gang River (5), alt. *ca* 1400 m, taiga with *Larix olgensis*, 4 Sept.1983, *leg*. *W. Wojewoda*, KRAM-F 29222; shore of Samji-yon Lake (7), taiga with *Larix olgensis*, 1 Sept.1983, *leg*. *W. Wojewoda*, KRAM-F 29220; *ca* 15 km N of Samji-yon town (8), alt. *ca* 1500 m, taiga, under *Larix olgensis*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29221. – On ground.

DISTRIBUTION IN ASIA. Japan, Kazakhstan, Korea and Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. Known also from Europe and North America.

REFERENCES. Allesio (1985: 339, Pl. 53); Anonymous (1983a: 123); Breitenbach & Kränzlin (1991: 84, Pl. 53); Gorbunova (1997: 16); Imazeki & Hongo (1975, **1**: 83, Pl. 37: 215); Skirgiełło (1975: 37, Fig. 22, Pl. 3: 6–8); Snell & Dick (1970: 27, Pls 13 & 75: 7); Syarzhanina (1994: 14); Vasilyeva (1973: 272; 1978: 119, Pl. 16).

Suillus bovinus (L.: Fr.) Kuntze

Rev. Gen. Plant. **3**(2): 535. 1898.

Boletus bovinus L., Sp. Pl.: 1177. 1753. – *B. bovinus* L.: Fr., Syst. Mycol. **1**: 388. 1821.

Pileus 30–80 mm in diam., nearly plane, even, viscid, yellow, orange-brown, cinnamon to rusty orange. Flesh whitish, pale yellow to yellow-brown. Taste mild. Tubes decurrent, grey- olivaceous. Pores angular. Stipe 30–60 × 5–10 mm, subcylindric, solid, even, yellow, light brown-yellowish to brownish, smooth.

Cheilo- and pleurocystidia 30–50 × 6–12 μm, cylindric-clavate to fusiform, hyaline to yellow. Basidia 20.0–33.0 × 7.0–9.5 μm, cylindric-clavate, with 4 sterigmata, without basal clamp. Basidiospores 8.0–10.0 × 3.0–4.5 μm, elliptic to elliptic-fusoid, smooth, yellowish to olivaceous with oil-drops.

SPECIMENS EXAMINED. Shore of Soham-ho Lake (32), 14 Sept.1984, *leg*. *W. Wojewoda*, specimens not preserved; Taesong-san Mts: near Chujak Mt. peak (35), 10 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 29210; Suian-san Mts: (48), 5 Sept.1982, *leg*. *K. Zarzycki*, KRAM-F 29206; Kumgang-san Mts: near Onjong-ri village (60), 10 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29208; shore of Samil-po Lake (62), rocks, 15 Sept.1982, *leg*. *K. Zarzycki*, KRAM-F 29209; 19 July 1986, *leg*. *Z. Heinrich*, KRAM-F 28006; *leg*. *W. Wojewoda*, KRAM-F 27989; 29207. – Mixed forests with *Pinus densiflora* and *Quercus mongolica*, on ground, under *Pinus densiflora*. Sometimes accreting with *Gomphidius roseus*.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Korea and Russia (e.g. Siberia and Primorski Krai).

NOTES. Known also from Europe.

REFERENCES. Allesio (1985: 393, Pl. 65); Anonymous (1978: 3; 1983a: 123); Breitenbach & Kränzlin

(1991: 76, Pl. 42); Hansen & Knudsen (1992: 70, Fig. 50); Imazeki & Hongo (1975, **1**: 84, Pl. 37: 216); Melik-Khachatrian (1980: 429); Skirgiełło (1975: 47, Fig. 27A, Pl. 5: 1–4); Syarzhanina (1994: 15); Teng (1996: 405); Vasilyeva (1973: 32; 1978: 118, Pl. 14); Wen & Sun (1999: 368).

Suillus granulatus (L.: Fr.) Kuntze

Rev. Gen. Plant. **3**(2): 535. 1898.

Boletus granulatus L., Sp. Pl.: 1177. 1753. – *B. granulatus* L.: Fr., Syst. Mycol. **1**: 3987. 1821.

Pileus 40–80 mm in diam. Upper surface red-brown to yellow-brown, lubricous-viscid. Flesh whitish to yellowish. Smell pleasant. Taste mild. Hymenophore porose, cream-coloured to light yellow or olive-yellow, with fine milk-white droplets. Stipe 30–80 × 6–15 mm, cylindric, cream-coloured to light yellow, with fine milky droplets toward apex, without annulus.

Hyphae without clamps. Cheilocystidia 40–55 × 8–10 μm, clavate, smooth, hyaline, thin-walled. Basidia 18.0–28.0 × 4.5–6.0 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 7–10 × 3–4 μm, elliptic to fusoid, smooth, yellow-brown, thin- to thick-walled. Spore-print orange-brown with olivaceous tinge.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29212; near Kuchung Falls (26), alt. *ca* 700 m, 7 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29211; shore of Soham-ho Lake, (32), *ca* 30 km N of Pyongyang, 14 Sept. 1984, *leg. W. Wojewoda*, specimens not preserved; shore of Sijung-ho Lake (52), on sandy soil, 20 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29214; near tomb of King Kongmin (64), 26 July 1986, leg. *Z. Heinrich*, KRAM-F 28113; *leg. W. Wojewoda*, KRAM-F 29213. – Coniferous and mixed forests, e.g. with *Pinus densiflora* and *Quercus mongolica*, on ground, under *Pinus densiflora*.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Korea, Philippines and Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. Known also from Europe, Africa and North America.

REFERENCES. Allesio (1985: 365, Pl. 59); Anonymous (1978: 4; 1983a: 123); Breitenbach & Kränzlin (1991: 78, Pl. 45); Gorbunova (1997: 16); Imazeki & Hongo (1975, **1**: 83, Pl. 37: 214); Melik-Khachatrian (1980: 430); Morris (1990: 357); Skirgiełło (1975: 42, Fig. 23B); Snell & Dick (1970: 39, Pls. 20 and 77: 2); Syarzhanina (1994: 16); Teng (1996: 404); Vasilyeva (1973: 272; 1978: 118, Pl. 12); Wen & Sun (1999: 368).

Suillus grevillei (Klotzsch: Fr.) Singer

Farlowia **2**: 259. 1945.

Boletus elegans Schum., Enum. Plant. **2**: 374. 1803. – *B. grevillei* Klotzsch, Linnaea **7**: 198. 1832. – *B. grevillei* Klotsch: Fr., Syst. Mycol. 1821. – *Suillus elegans* (Schum.) Snell, *in* Slipp & Snell, Lloydia **7**: 27.1944. – *S. flavus* (With.) Singer, Farlowia 2: 250. 1945.

Pileus 30–80 mm in diam., hemispherical, convex to plane. Upper surface smooth, lemon chrome, lemon yellow, apricot to orange-brown, viscid. Flesh whitish, lemon to yellowish. Smell pleasant like *Boletus edulis*. Taste mild. Tubes decurrent, lemon, rust when cut. Hymenophore lemon to sulfur yellow, then olive-yellow. Pores small. Stipe cylindric, 50–80 × 10–15 mm, lemon above the whitish ring, below cinnamon to rust.

Hyphae of pileipellis 2–5 μm, wide. Clamps absent. Cheilo- and pleurocystidia 25–40 × 4–6 μm, subcylindric, thin-walled, hyaline or with light yellow contents. Basidia 18.0–22.0 × 4.5–6.7 μm, cylindric-clavate, with 4 sterigmata. Basidiospores 7.5–11.6 × 2.9–3.8 μm, elliptic, smooth, pale green-yellow, thin- to thick-walled, some with oil-drops. Spore-print olive-brown (Fig. 113).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), taiga with *Larix olgensis*, 1–3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29216–29217; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1300 m, taiga with *Larix olgensis*, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29215. – On ground, under *Larix olgensis*.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan, Korea and Russia (e.g. North of Altai, Siberia and Primorski Krai).

NOTES. Known also from Europe, northern Africa and North America.

REFERENCES. Allesio (1985: 329–343, 606–607); Anonymous (1978: 5; 1983a: 123); Breitenbach & Kränzlin (1991: 80, Pl. 46); Dähncke & Dähncke (1980: 30); Gorbunova (1997; 16); Hansen & Knudsen

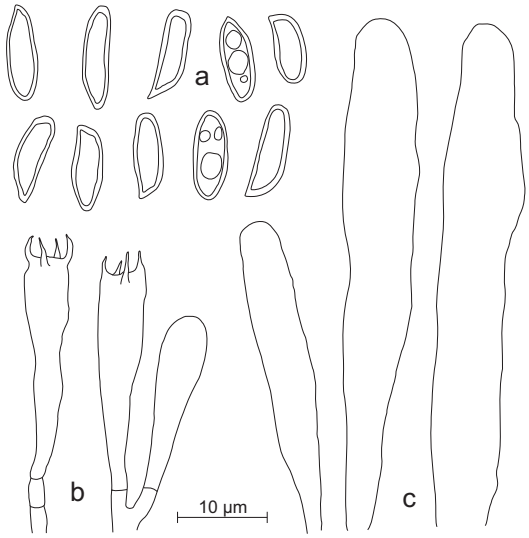


Fig. 113. *Suillus grevillei* (Klotzsch: Fr.) Singer: a – basidiospores, b – basidia, c – cheilocystidia (KRAM-F 29216).

(1992: 70, Fig. 53); Imazeki & Hongo (1975, **2**: 93, Pl. 28: 177); Skirgiełło (1975: Fig. 20, Pl. 4); Snell & Dick (1970: 29, Pls 14 and 75, Fig. 9); Syarzhanina (1994: 16); Teng (1996: 405); Vasilyeva (1973: 273; 1978: 119, Pl. 15).

Suillus luteus (L.: Fr.) Gray

Nat. Arr. Brit. Pl. **1**: 646. 1821.

Boletus luteus L., Sp. Pl. 1177. 1753. – *B. luteus* L.: Fr., Syst. Mycol. **1**: 386. 1821.

Pileus 40–90 mm in diam., convex to pulvinate. Upper surface ochraceous-tawny, purplish chestnut, to yellowish brown, glabrous, very viscid. Flesh in pileus white to lemon, unchangeable, in stipe base vinaceous. Tubes adnate. Pores round to subangular, 1–2 per mm. Stipe 50–80 × 10–15 mm, cylindric, ± glandular-dotted, yellow, becoming brownish. Ring membranaceous.

Hyphae of pileipellis 2.0–5.5 µm wide. Clamps absent. Cheilo- and pleurocystidia 25.0–40.0 × 4.0–5.5 µm, subcylindric, smooth, thin-walled, hyaline or with yellowish contents. Basidia 18.0–22.0 × 4.5–6.0 µm, cylindric-clavate, with 4 sterigmata, without basal clamp. Basidiospores 6.5–9.0 × 3.0–3.5 µm, oblong-subfusoid to elliptic-fusiform, smooth, yellowish, with 1–3 oil-drops.

SPECIMENS EXAMINED. Taesong-san Mts: Chujak Mt. peak (35), 29 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29218; Kumgang-san Mts: shore of Samil-po Lake, (62), 19 July 1986, *leg. W. Wojewoda*, KRAM-F 29219. – Mixed forests with *Pinus densiflora* and *Quercus mongolica*, on ground, under *Pinus densiflora*.

DISTRIBUTION IN ASIA. Armenia, China, Japan, Kazakhstan, Korea, Mongolia and Russia (e.g. North Altai, Siberia and Primorski Krai).

NOTES. Circumpolar species, known also from Europe and North America.

REFERENCES. Anonymous (1978: 6; 1983a: 123); Breitenbach & Kränzlin (1991: 80, Pl. 47); Gorbunova (1997: 16); Hansen & Knudsen (1992: 70, Fig. 54); Imazeki & Hongo (1975, **1**: 83, Pl. 37: 213); Melik- Khachatrian (1980: 431); Petrov & Belova (1999: 26); Skirgiełło (1975: 40, Fig. 23A, Pl. 5: 5–9); Snell & Dick (1970: 35, Pls, 17 and 76: 7); Syarzhanina (1994: 16); Teng (1996: 404); Vasilyeva (1973: 273; 1978: 118, Pl. 11).

Cantharellales Gäum. 1926
according to Kirk *et al*. 2001
or Botryobasidiales Jülich 1982

Botryobasidiaceae (Parmasto) Jülich 1982

Botryobasidium candicans J. Erikss.

Svensk Bot. Tidskr. **52**: 6. 1958.

Acladium capitatum Link, Ges. Naturforsch. Freunde Magz. **3**: 42. 1809 (anamorph). – *Haplotrichum capitatum* (Pers.) Link 1824 (anamorph). – *Monilia candicans* Sacc., Nuev. Giorn. Bot. Ital. **8**: 195. 1876 (anamorph). – *Oidium candicans* (Sacc.) Linder, Lloydia **5**(2): 183. 1942 (anamorph).

Basidiocarp corticioid, resupinate, attached loosely to substrate, very thin. Hymenophore farinose-furfuraceous, reticulate, hypochnoid to porous-reticulate, cream-yellowish, greyish white to ochraceous. Consistency soft, fibrous.

Hyphal system monomitic. All hyphae without clamps. Basal hyphae up to 9.6 µm wide, smooth, hyaline, thick-walled. Hymenial hyphae thinner and narrower. Cystidia absent. Basidia 10–20 × 6–8 µm, short, cylindric, clavate or suburniform, with 6 sterigmata, without basal clamp. Spores 6.6–9.6 × 3.6–4.8 µm, obliquely fusiform or na-

vicular (pip-shaped), distinctly biapiculate, smooth, hyaline, thin-walled, non-amyloid. Conidiophores and conidia absent.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 15 km SE of Paekdu-san Mt. peak (1), slightly below upper forest line, alt. *ca* 1900 m, taiga with *Larix olgensis*, on fallen dead trunk of *Larix olgensis*, 30 June 1986, *leg. W. Wojewoda*, KRAM-F 29088; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest on stump, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30347; deciduous forest, alt. *ca* 550 m, on fallen decayed trunk, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 28998; Kumgang-san Mts: near Onjong-ri village (60), alt. *ca* 150 m, mixed forest, on decayed stump of *Pinus densiflora*, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30315.

DISTRIBUTION IN ASIA. China, India, Iran and Japan.

NOTES. New to North Korea. Known also from Europe and North America (United States) and South America (Argentina).

REFERENCES. Breitenbach & Kränzlin (1986: 90–91, Pl. 62); Domański (1988: 126); Eriksson & Ryvarden (1973: 157, Figs 63, 65); Ginns & Lefebvre (1993: 28); Hallenberg (1981; 482); Hansen & Knudsen (1997: 120); Jülich (1984: 230); Jülich & Stalpers (1980: 58); G. Langer (1994: 96, Figs 44–48); Maekawa (1993: 40); Maekawa & Zang (1995: 88), Rattan (1977: 209, Fig. M-O, p. 208).

Botryobasidium conspersum J. Erikss.

Symb. Bot. Ups. **16**(1): 133.1958 (teleomorph).

Acladium conspersum Link, Mag. Ges. Naturforsch. Freunde z. Berlin **3**: 11–12. 1809 (anamorph). – *Haplotrichum conspersum* (Link) Hol.-Jech., Česká Mykol. **30**(1): 4. 1976 (anamorph).

Telomorph absent. Anamorph corticioid, resupinate, appressed loosely to substrate, thin, hypochnoid, ochraceous or yellowish when dry.

Hyphal system monomitic. Hyphae 2–10 µm, smooth, hyaline, without clamps. Conidiophores 160.0–240.0 × 7.2 µm, hypha-like, cylindric, septate, unbranched, hyaline or subhyaline. Conidiogeneous teeth 1.8–2.5 µm wide. Conidia 13.2–23.0(–24.0) × (6.6–)7.8–14.4 µm, elliptic, yellowish, thin-walled.

SPECIMENS EXAMINED. Suian-san Mts (48): alt. *ca* 200 m, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30316; Kumgang-san Mts: over Onjong-ri village (60), Onjong-gang Stream Valley, *ca* 100 m, mixed forest, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 29075. – Mixed forests, on decayed stumps.

DISTRIBUTION IN ASIA. China, Iran and Japan.

NOTES. New to North Korea. Known also e.g. from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 94–95, Pl. 68); Domański (1988: 128, Pl. 247: 4–5); Eriksson & Ryvarden (1973: 159, Figs 66–67); Ginns & Lefebvre (1993: 28); Hallenberg (1981; 482); Hansen & Knudsen (1997: 120); Holubova-Jechova (1976: 4; 1980: 128); Jülich (1984: 230); Jülich & Stalpers (1980: 59); G. Langer (1994: 109, Figs 52–55); Maekawa (1993: 40); Maekawa & Zang (1995: 89).

Botryobasidium laeve (J. Erikss.) Parmasto

Eesti NSV Tead. Akad., Toimet Biol., Seer., **14**: 220. 1965.

B. pruinatum var. *laeve* J. Erikss., Svensk Bot. Tidskr. **52**: 10. 1958.

Basidiocarp corticioid, resupinate, attached loosely to substrate, very thin. Hymenophore smooth, finely reticulate, hypochnoid to floccose, greyish white, with cream-coloured tint. Consistency cottony, soft.

Hyphal system monomitic. All hyphae without clamps. Basal hyphae 14.4–18.0 µm wide, smooth, hyaline or yellowish, thin- or thick-walled. Hymenial hyphae more narrow, 5–6 µm wide, hyaline, smooth. Cystidia absent. Basidia 10–25 × 6–8 µm, cylindric, clavate or suburniform, with 6 sterigmata. Spores 5.0–7.0 × 3.0–3.5 µm, oval-elliptic, smooth, hyaline, with somewhat thickened wall, with distinct apiculus, non-amyloid. Conidia not seen.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on stump, 13 July 1986, *leg. Z. Heinrich*, KRAM-F 27944; near Kumgang Falls (17), alt. *ca* 300 m, deciduous forest with *Pinus densiflora*, on fallen twigs, 13 July 1986, *leg. Z. Heinrich*, KRAM-F 29037.

DISTRIBUTION IN ASIA. Iran, Russia (West Siberia, Primorski Krai and Sachalin) and Taiwan.

NOTES. New to North Korea. Known also from Europe, Africa and North America (United States).

REFERENCES. Breitenbach & Kränzlin (1986: 90–91, Pl. 63); Domański (1988: 123); Eriksson & Ryvarden (1973: 165, Fig. 69); Hallenberg (1978: 50; 1981: 482); Hansen & Knudsen (1997: 119, Fig. 138); Jülich (1984: 229); Jülich & Stalpers (1980: 57); G. Langer (1994: 176, Figs 97–102); Mukhin (1993: Tab. 1).

Botryobasidium medium J. Erikss.

Symb. Bot. Ups. **16**(1): 54. 1958.

Basidiocarp corticioid, resupinate, appressed closely to substrate, thin. Hymenophore smooth, farinose, light grey to light ochre. Consistency cottony, soft.

Hyphal system monomitic. Basal hyphae up to 11 μm, smooth, hyaline, with thickened wall, some with clamps. Hymenial hyphae thinner, with clamps. Cystidia absent. Basidia 17.0–20.0 × 7.5–10.0 μm, cylindric to clavate, with 6 strigmata. Spores 8.4–12.0 × 4.8–6.6 μm, broadly navicular (pip-shaped), smooth, hyaline, thin-walled, with droplets, non-amyloid. Anamorph absent.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), in coniferous taiga, on dead decayed trunk of coniferous tree, 3 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30312; Kumgang-san Mts: Myoggyong-dae Ravine (58), alt. *ca* 800 m, mixed forest, on fallen, dead, decayed trunk, 17 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 30319.

DISTRIBUTION IN ASIA. Japan.

NOTES. New to North Korea. Known also e.g. from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 92–93, Pl. 64); Domański (1988: 119); Eriksson & Ryvarden (1973: 167, Fig. 70); Ginns & Lefebvre (1993: 29); Hansen & Knudsen (1997: 119, Fig. 139); G. Langer (1994: 201, Figs 114–120); Maekawa (1993: 40).

Botryobasidium pruinatum (Bres.) J. Erikss.

Svensk Bot. Tidskr. **52**: 9. 1958.

Corticium pruinatum Bres., Ann. Mycol. **1**(2): 99. 1903.

Basidiocarp corticioid, resupinate, attached loosely to substrate, thin. Hymenophore smooth, finely reticulate to arachnoid, white to cream-coloured. Consistency cottony, soft.

Hyphal system monomitic. All hyphae without clamps. Basal hyphae 6–8 μm, finely verrucose, light brownish, thick-walled, hymenial narrow and thin-walled. Cystidia absent. Basidia 18–20 × 6–8, cylindric, somewhat constricted, with 6 sterigmata, without basal clamp. Spores 4.8–6.0 × 3.0–3.6 μm, elliptic or ovoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on decayed stump, 13 Aug. 1986, *leg*. *W. Wojewoda*, KRAM-F 30313.

DISTRIBUTION IN ASIA. China, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also e.g. from Europe and North America (Canada and United States). This species has been described by Bresadola (1903), from material collected in Poland by Polish mycologist Bogumir Eichler.

REFERENCES. Breitenbach & Kränzlin (1986: 92, 93, Pl. 66); Bresadola (1903: 99); Eriksson & Ryvarden (1973: 171, Fig. 72, Pl. 14B–C); Domański (1988: 124); Ginns & Lefebvre (1993: 29); Hansen & Knudsen (1997: 119, Fig. 140); Jülich (1984: 229); Jülich & Stalpers (1980: 57); G. Langer (1994: 242, Figs 143–145); Maekawa (1993: 40); Maekawa & Zang (1995: 89); Mukhin (1993: Tab. 1).

Botryobasidium subcoronatum (Höhn. & Litsch.) Donk

Meded. Ned. Mycol. Vereen. **18–20**: 117. 1931.

Corticium subcoronatum Höhn. & Litsch., Sitz.-Ber. K. Ak. Wiss. Wien, Math.-nat. Kl. **116**: 822. 1907. – *Pellicularia subcoronata* (Höhn. & Litsch.) D. P. Rogers, Farlowia **1**: 104. 1943.

Basidiocarp corticioid, resupinate, appressed lightly to substrate, thin. Hymenophore smooth,

dull, tomentose, whitish when young, cream-color to yellow-ochre when older. Consistency cottony, soft.

Hyphal system monomitic. Hyphae with clamps. Basal hyphae up to 10.8 µm wide, thick-walled, subhymenial and hymenial thinner, smooth, hyaline, thin-walled. Cystidia absent. Basidia 15–25 × 6–10 µm, cylindric, with 6 sterigmata and basal clamp. Spores 6.0–10.8(–12.0) × 2.5–4.8 µm, navicular or elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, taiga, on fallen decayed trunk, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30320; Myohyang-san Mts: near Myohyang-san Hotel (20), mixed forest, on decayed stump, 4 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 27967; Suian-san Mts (48): near ruins of castle, alt. *ca* 200 m, in mixed forest, on decayed stump, 6 July 1986, *leg*. *W. Wojewoda*, KRAM-F 30314; near hospital, deciduous forest, on decayed fallen trunk, 6 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28999.

DISTRIBUTION IN ASIA. China, Iran, Israel, Japan, Russia (Siberia) and Taiwan.

NOTES. New to North Korea. This species has a world wide distribution. It is known from Europe, North America (Canada and United States), South America (Argentina, Brasil, Costa Rica), Africa (Kenya, Madagascar, Malawi, Tanzania) and New Zealand.

REFERENCES. Breitenbach & Kränzlin (1986: 94–95, Pl. 67); Cunningham (1963: 40, Fig. 5); Domański (1988: 122); Eriksson & Ryvarden (1973: 173, Fig. 73); Ginns & Lefebvre (1993: 30); Hallenberg (1978: 50, 1981: 482); Jülich & Stalpers (1980: 56); G. Langer (1994: 276, Figs 166–168); Maekawa (1993: 41); Maekawa *et al*. (2002: 84); Maekawa & Zang (1995: 89); Mukhin (1993: Tab. 1).

Botryohypochnus isabellinus (Fr.) J. Erikss.

Svensk Bit. Tidskr. **52**: 2. 1958.

Thelephora isabellina Fr., Epicr. Syst. Mycol. 544. 1838. – *Botryobasidium isabellinum* (Fr.) D. P. Rogers, Univ. Iowa Stud. Nat. Hist. **17**(1): 11. 1935.

Basidiocarp corticioid, resupinate, attached loosely to substrate, thin, tomentose-membranous. Consistency soft, cottony. Hymenophore cottony, tomentose, light to ochre-yellow.

Hyphal system monomitic. All hyphae without clamps. Basal hyphae up to 12 µm, yellowish, smooth, thick-walled, with right-angled branches. Hyphae of subhymenium 6–8 µm wide, smooth, thin-walled, hyaline, short-celled. Cystidia absent. Basidia 15–20 × 8–10 µm, short subcylindric, with 4 sterigmata, without basal clamp. Basidiospores 7–9 µm (excluding spines), globose, spinose, slightly yellowish, slightly thick-walled, non-amyloid, with distinct apiculus. Spines 1.0–2.5 µm, cylindric or slenderly conic.

SPECIMENS EXAMINED. Kumgang-san Mts: Okryu-dong Valley (59), alt. *ca* 700 m, deciduous forest, on deciduous tree, 14 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 28851; below Kuryong Falls, alt. *ca* 500 m, mixed forest, on fallen decayed trunk of deciduous tree, together with *Basidiodendron caesiocinereum* (Höhn. & Litsch.) Bourd. & Galz., 14 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29038.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Nepal and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe, Africa (Kenya and Tanzania), and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 94–95, PL. 69); Domański (1988: 130, PL. 122: 1); Eriksson & Ryvarden (1973: 179, Fig, 76); Ginns & Lefebvre (1993: 30); Hallenberg (1978: 50; 1981: 482); Jülich (1982: 449, Pl. 2; 1984: 232); Jülich & Stalpers (1980: 61); G. Langer (1994: 165, Figs 91–94); Maekawa (1993: 41); Maekawa *et al*. (2002: 85); Maekawa & Zang (1995: 89); Mukhin (1993: Tab. 1); Rattan (1977: 205, Fig. E-F, p. 208).

Cantharellaceae J. Schröt. 1888

Cantharellus cibarius Fr.

Syst. Mycol. **1**: 318. 1821.

Basidiocarp consisting of pileus and stipe. Pileus 10–60 mm in diam., convex, infundibuliform, egg yellow. Margin lobed. Stipe 20–60 × 5–8 mm, cylindric, hollow, yellow, smooth. Lamellae decurrent, fold-like, thick, distant, branched, anasto-

mosing, yellowish. Flesh soft, thin, yellowish. Smell fruity, pleasant. Taste mild.

Hyphal system monomitic. Hyphae 2–4 μm wide, with clamps. Cystidia absent. Basidia 55.0–85.0 × 5.5–8.0 μm, slenderly clavate, with 2 sterigmata and basal clamp. Basidiospores 7.5–8.0 × 4.5–6.0 μm, elliptic to oval, thin-walled, hyaline, smooth, with drops and granular contents, non-amyloid. Spore-print yellowish-orange.

SPECIMENS EXAMINED. Ryongak-san Mt (42), alt. *ca* 250 m, mixed forest with *Quercus mongolica* and *Pinus densiflora*, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29172; Kumgang-san Mts: Myonggyong-dae Ravine (58), alt. *ca* 700 m, mixed forest, on ground, 17 Aug.1983, *leg. W. Wojewoda*, KRAM-F 52933; shore of Samil-po Lake (62), mixed forest with *Pinus densiflora* and *Quercus mongolica* 13 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29171; mixed forest, 19 July 1986, *leg. H. Komorowska*, KRAM-F 28357; Pagyon Ravine (65), alt. *ca* 300 m, deciduous forest, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28206. – On ground.

DISTRIBUTION IN ASIA. China (Tibet), Japan, Korea, Mongolia and Russia (Primorski Krai).

REFERENCES. Anonymous (1978: 136; 1983a: 101); Azbukina *et al*. (1984: 40); Breitenbach & Kränzlin (1986: 370–371, P. 481); Corner (1966: 38); Domański (1978: 36, Pl. XCIV: 1–2); Imazeki & Hongo (1975, **1**: 104, Pl. 47: 270); Petrov & Belova (1999: 26); Teng (1996: 309, Fig. 262); Vasilyeva (1978: 180, Pl. 206); Zhao *et al*. (1983: 75, 80, Pl. 16: 3–4).

Craterellus cornucopioides (L.: Fr.) Pers.

Mycol. Eur. **2**: 5. 1825.

Peziza cornucopioides L., Sp. Pl. 1181. 1753. – *Cantharellus cornucopioides* (L.): Fr., Syst. Mycol. **1**: 320. 1821.

Basidiocarp 25–30 × 2–5 mm, hollow to base of stipe, funnel- to trumpet-shaped. Inner surface of funnel black to black-brown or grey-brown. Hymenophore grey to grey-black, sometimes with brownish tint, pruinose, wrinkled-veined, rarely smooth. Flesh 1–2 mm thick. Smell pleasantly aromatic. Taste mild.

Hyphal system monomitic. Hyphae of hymenium 3.0–4.5 μm wide, tramal hyphae up to 19.5 μm wide, hyaline to yellowish, thin-walled, without clamps. Cystidia absent. Basidia 60.0–87.0 × 7.7–8.7 μm, slenderly clavate, with 2(–1) sterigmata, without basal clamp. Basidospores 10.6–15.5 × 6.7–9.7 μm, broadly elliptic, some thick-walled, hyaline, smooth, with drops and granular contents, non-amyloid (Fig. 114).

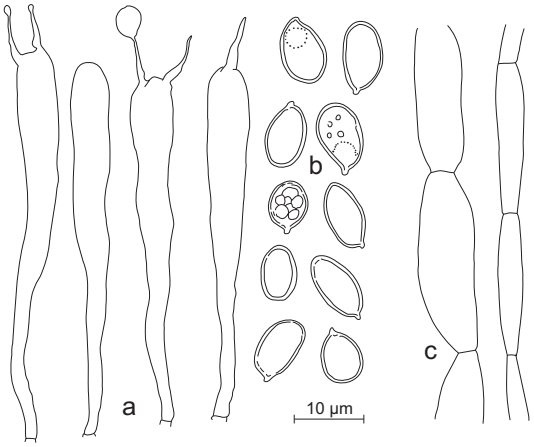


Fig. 114. *Craterellus cornucopioides* (L.: Fr.) Pers.: a – basidia, b – basidiospores, c – hyphae (KRAM-F 53128).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), near Samji-yon Hotel, taiga, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53128; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 550 m, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29174; Ryongak-san Mt. (42), alt. *ca* 200 m, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28943. – Mixed forests, on ground, gregarious and clustered, sometimes in large colonies.

DISTRIBUTION IN ASIA. China (Tibet), Japan, Korea and Russia (Primorski Krai).

REFERENCES. Anonymous (1978: 139; 1983a: 101); Breitenbach & Kränzlin (1986: 374–375, Pl. 487); Corner (1966: 93); Domański (1978: 171, Pl. XCVIII: 2–3); Imazeki & Hongo (1975, **1**: 104, Pl. 47: 271); Teng (1996: 308, Fig. 261); Vasilyeva (1978: 179, Pl. 205); Zhao *et al*. (1983: 77, 80, Pl. 16: 5–6).

Clavulinaceae (Donk) Donk 1970

Clavulina coralloides (L.: Fr.) J. Schröt.

in Cohn, Krypt. Fl. Schles. Pilze. 443. 1888.

Clavaria coralloides L., Sp. Pl. ed. 1. 1182. 1753. – *C. coralloides* L.: Fr., Syst. Mycol. 1: 467. 1821. – *C. cris-*

tata (Holmsk.: Fr.) J. Schröt., *in* Cohn, Krypt. Fl. Schles. Pilze. 442. 1888.

Basidiocarp 30–40 mm high, clavarioid, white to cream-coloured at first, then ochraceous, branched. Ends of branches subdividing many times into small points and teeth. Flesh white, soft, fragile. Taste mild. Smell indistinct. Hymenophore smooth to rugose.

Hyphal system monomitic. Hyphae 2.0–11.6 µm wide, thin-walled, hyaline, with clamps, constricted at some septa. Cystidia absent. Basidia 30.0–45.0 × 6.7–7.7 µm, cylindric-clavate, with 1–2 sterigmata and basal clamps. Basidiospores 7.7–11.6 × 5.8–9.7 µm, broadly elliptic, subglobose to globose, smooth, hyaline to pale yellowish, thin-walled, non-amyloid, with apiculus and a large oil-drop (Fig. 115).

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, mixed taiga, on ground, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53226.

DISTRIBUTION IN ASIA. North Caucasus, China, Georgia, India, Japan, Kazakhstan, Korea and Russia (Primorski Krai and Sakhalin).

NOTES. Cosmopolitan species.

REFERENCES. Anonymous (1983a: 98); Breitenbach & Kränzlin (1986: 352: Pl. 456); Corner (1950: 312, Figs 124–130); Domański (1984: 156, 166, Pl, CXCIV); Hansen & Knudsen (1997: 255, Fig. 519); Imazeki & Hongo (1975, **2**: 114, Pl. 36: 214, Fig. 214); Michael *et al*. (1986: 362, Pl. 176); Parmasto (1965: 80, Figs 55–59); Pilát (1958b: 212, Figs 21–23, Pls. XLIIIb, XLIVa-b); Shvartsman (1964: 99, Figs 26–28); Teng (1996: 303); Vasudeva (1962: 163).

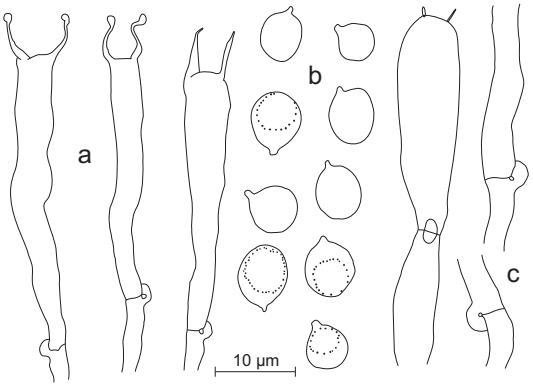


Fig. 115. *Clavulina coralloides* (L.: Fr.) J. Schröt.: a – basidia, b – basidiospores, c – hyphae (KRAM-F 53226).

Hydnaceae Chevall. 1826

Hydnum rufescens Fr.

Syst. Mycol. **1**: 401. 1821.

H. repandum var. *rufescens* (Fr.) Barla, Champ. Nice. 130, Pl. XXXIX, Fig. 10–12. 1859.

Basidiocarp divided into pileus and stipe. Pileus 30 mm in diam., orange. Hymenophore hydnoid, covered with subulate, yellowish orange spines up to 4 mm long. Stipe 40 × 5 mm, central, cylindric, pale orange.

Hyphal system monomitic. Hyphae 5–15 µm wide, smooth, hyaline, thin-walled, with clamps. Cystidia absent. Basidia 30.0–40.0 × 5.5–8.0 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 6–8 × 5–7 µm, broadly elliptic to subglobose, smooth, thin-walled, with a big oil-drop.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 150 m, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29175; Kumgang-san Mts: near Onjong-ri village (60), 4 July 1985, *leg. B. Zarzycka*, KRAM-F 29176. – Mixed forests, on ground.

DISTRIBUTION IN ASIA. India and Mongolia.

NOTES. New to North Korea.

REFERENCES. Dähncke & Dähncke (1980: 607); Domański (1975: 81, Pl. LXIV: 2); Hansen & Knudsen (1997: 264); Maas Geesteranus (1975: 28, Pl. 9); Nikolaeva (1961: 305, Figs 233–234, Pl. LXXVI); Petrov & Belova (1999: 26); Phillips (1981: 242); Ryman & HolmÍsen (1984: 107); Vasudeva (1962: 172).

Ceratobasidiales Jülich 1982

Ceratobasidiaceae G. W. Martin 1948

Scotomyces subviolaceus (Peck) Jülich

Persoonia **10**(3): 334. 1979.

Hypochnus subviolaceus Peck, Ann. Rep. State Bot. **1893**: 25. 1894. – *Ceratobasidium atratum* (Bres.) Rogers, Lloydia **4**: 262. 1941. – *Oliveonia subviolacea* (Peck) M. J. Larsen, Mycologia Mem. **4**: 128. 1974. –

Hydrabasidium subviolaceum (Peck) J. Erikss. & Ryvarden *in* J. Erikss. *et al*., Corticiaceae North Eur. **5**: 897, Figs 451–452. 1978.

Basidiocarp 0.2–0.8 mm thick, resupinate, bound loosely to substrate. Hymenophore farinose, dull, slightly uneven, dark grey-violet, soft.

Hyphal system monomitic. Hyphae 5–7 μm, hyaline or brownish, smooth, thin- or thick-walled, with clamps, non-amyloid. Cystidia absent. Basidia 15–25 × 7–8 μm, cylindric-clavate, with 4 sterigmata, up to 15 μm long. Spores 6.0–8.0 × 4.5–6.0 μm, subglobose, smooth, hyaline, thin-walled, with drops or granular contents, forming secondary spores.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on strongly decayed trunk of unidentified tree, 6 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29006.

DISTRIBUTION IN ASIA. Brunei and India.

NOTES. New to North Korea. Known also from Europe, South America (Brazil and Panama), North America (Canada and United States), Africa (Kenya) and New Zealand. According to Roberts' (1999) taxonomy of the genus *Scotomyces – incertae sedis*.

REFERENCES. Breitenbach & Kränzlin (1986: 78–79, Pl. 43); Domański (1988: 303, Pl. 238: 9–10); Ginns & Lefebvre (1993: 108); Hansen & Knudsen (1997: 113, Fig. 93, 123); Jülich (1984: 452); Jülich & Stalpers (1980: 160); Martin (1952: 12); Roberts (1999: 184, Fig. 94); Wojewoda (2002d: 99).

Dacrymycetales Henn. 1898

Dacrymycetaceae J. Schröt. 1888

Calocera cornea (Batsch: Fr.) Fr.

Stirp. Agri. Fems. **5**: 67. 1827.

Clavaria cornea Batsch, Elench. Fung. **1**: 139. 1783. – *Calocera cornea* (Batsch): Fr., Syst. Mycol. **1**: 486. 1821. For further synonyms see McNabb (1965a: 41).

Basidiocarp seldom more than 15 mm high and 0.5–1.0 mm wide; scattered or densely gregarious to almost caespitose, yellow to orange yellow, firm gelatinous, terete, varying in shape from simple-cylindric or lanceolate to occasionally forked near apex or more rarely palmate.

Hyphal system monomitic. Hyphae without clamps. Young basidia clavate, becoming 1-septate, slightly allantoid to elliptic, smooth, hyaline, thin-walled, non-amyloid. Basidiospores 5.5–10.8 × 3.6–5.5 μm, becoming 1-septate, slightly allantoid to elliptic, smooth, hyaline, thin-walled, non-amyloid (Fig. 116).

SPECIMENS EXAMINED. Myohyang-san Mts.: near Sangwon-am Monastery (19), alt. *ca* 600 m, on decayed stump, 5 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29305; near Myohyang-san Hotel (20), 4 Aug. 1983,

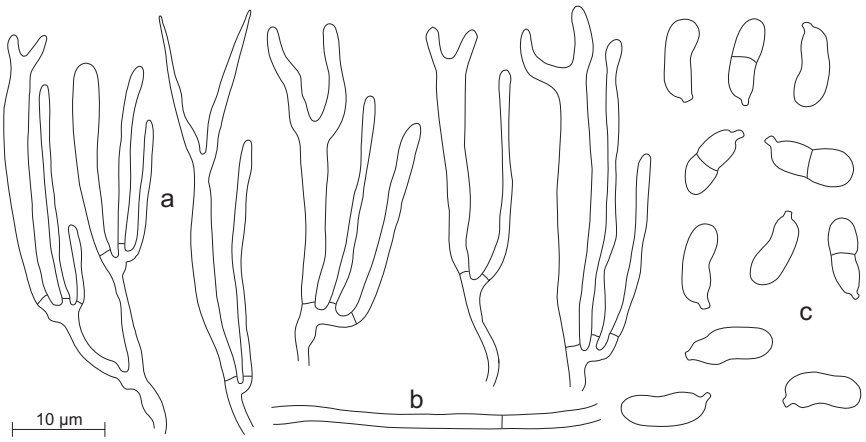


Fig. 116. *Calocera cornea* (Batsch: Fr.) Fr.: a – basidia, b – hyphae, c – basidiospores (KRAM-F 29055).

leg. *W. Wojewoda*, KRAM-F 28876; on fallen twig of deciduous tree (together with *Hyphoderma setigerum*), 12 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29055; on fallen twig of deciduous tree, 11 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28874; Kumgang-san Mts: near Onjong-ryong Pass (54), on fallen twig of deciduous tree, 16 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 28873; near Manmulsang Rocks (55), alt. *ca* 1000 m, on fallen decayed trunk, 17 Aug. 1982, *leg*. *W. Wojewoda*, KRAM-F 28879; near Onjong-ri village (60), alt. *ca* 100 m, on fallen trunk of deciduous tree, 15 Aug. 1983, *leg*. *W. Wojewoda*, KRAM, F28875; near Kuryong Falls (57), alt. *ca* 700 m, on fallen twigs of deciduous tree, 20 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28872. – Mixed and deciduous forests.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Iran, Indonesia, Japan, South Korea, Russia (Siberia and Far East) and Sri Lanka.

NOTES. New to North Korea. Cosmopolitan species, known also from Europe, Africa, North and South America, New Zealand and Australia.

REFERENCES. Azbukina *et al*. (1984: 31); Breitenbach & Kränzlin (1986: 50–51, Pl. 1); Ginns & Lefebvre (1993: 33); Govorova (1997: 11); Hallenberg (1981: 500); Jahn (1979: 66, Pl. 32); Lowy (1971: 120); McNabb (1965a: 41, Figs 1g, 2c); Park & Cho (1985: 102, Fig. 1, 105); Pilát (1936: 421); Raitviir (1967: 96, Fig. 83); Reid (1974: 438, Fig. 1A–B); Teng (1996: 271); Zang & Zong (1983: 64).

Calocera viscosa (Pers.: Fr.) Fr.

Stirp. Agric. Femsj. 67. 1827.

Clavaria viscosa Pers., Neues Mag. Bot. **1**: 117. 1794. – *C. viscosa* Pers.: Fr., Syst. Mycol. **1**: 485. 1821. For further synonyms see McNabb (1965a: 39).

Basidiocarp up to 70(–100) mm high, consisting of short, stout, white, tomentose base which almost immediately branches dichotomously, deep golden yellow or orange yellow, firm-gelatinous.

Hyphae 2.5–5.0 μm in diam., thick-walled, encrusted or not, hyaline, without clamps. Cystidia absent. Young basidia clavate, becoming furcate, up to 36.6 × 4.8 μm. Basidiospores 8.4–12.0 × 3.6–4.8(–5.4) μm, elliptic to slightly allantoid, becoming 1-septate at maturity, hyaline, smooth, thin-walled. Conidia globose. Spore-print white (Fig. 117).

SPECIMENS EXAMINED. Paekdu-san Mts: E slope of Paekdu-san Mt., between peak of Paekdu-san Mt. (1) and Sinmuson village (2), *ca* 20 km NE of Samji-yon town (8), alt. *ca* 1900 m, slightly below upper forest line, taiga with *Larix olgensis*, on stump of coniferous

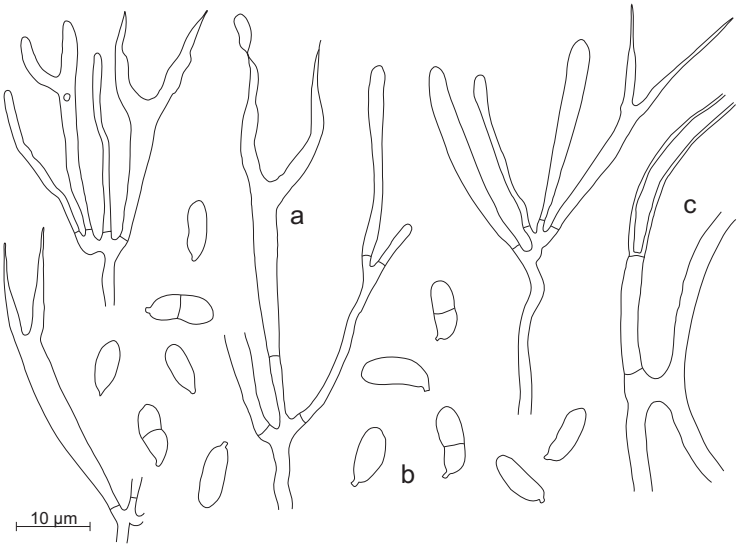


Fig. 117. *Calocera viscosa* (Pers.: Fr.) Fr.: a – basidia, b – basidiospores, c – hyphae (KRAM-F 28858).

tree, 30 June1986, *leg. W. Wojewoda.*, KRAM-F 28858; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, coniferous forest, on stump of *Pinus densiflora*, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28877; mixed forest, on decayed stump of *Pinus densiflora*,13 July 1986, *leg. W. Wojewoda*, KRAM-F 29329; Kumgang-san Mts: near Manmulsang Rocks peak (55), alt. *ca* 1000 m, mixed forest, on stump of coniferous tree (?*Pinus densiflora*), 17. Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28859; Okryu-dong Valley below Kuryong Falls (59), bank of Okryu-dong Stream, alt. *ca* 300 m, 5 July 1985, *leg. B. Zarzycka*, KRAM-F 27784; near Kuryong Falls, alt. *ca* 700 m, mixed forest, on stump of *Pinus densiflora*, 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28860; mixed forest with *Juniperus chinensis*, *Quercus* sp., and *Pinus densiflora*, on stump of coniferous tree, 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29304.

DISTRIBUTION IN ASIA. China (e.g. Tibet), Japan, Korea, Pakistan and Russia (e.g. Far East).

NOTES. Known also from Europe, North and South America, New Zealand and Australia.

REFERENCES. Anonymous (1983a: 130); Azbukina *et al.* (1984: 31); Breitenbach & Kränzlin (1986: 50–51, Pl.2); Ginns & Lefebvre (1993: 34); Govorova (1997: 11); Imazeki & Hongo (1975, **1**: 132, Pl. 61: 349); Jahn (1979: 66, Pl. 31); McNabb (1965a: 39); Raitviir (1967: 96, Fig. 84); Reid (1974: 446, Fig. 3A–D); Shvartsman (1964: 84, Fig. 21); Teng (1996: 272, Fig. 239); Zang & Zong (1983: 64, 69, Pl. 14: 10).

Dacrymyces capitatus Schwein.

Trans. Amer. Phil. Soc., Ser. II, **4**: 186. 1832.

D. ellisii Coker, J. Elisha Mitschell Sci. Soc. **35**: 167. 1920. For further synonyms see McNabb (1973: 487).

Basidiocarp 2–6 mm diam., to 5 mm high, firm-gelatinous, orange-yellow to brownish orange when fresh, drying brown, brownish-red or dull wine-red, at first pustulate, turbinate, stoutly cylindric or piston shaped, then globose, depressed globose, applanate or concave, sessile, substipitate or short stipitate.

Hyphal system monomitic. Internal hyphae thin-walled, typically roughened, occasionally smooth, septate, without clamp-connections. Young basidia cylindric-subclavate, with basal septa, becoming bifurcate. Basidiospores curved-cylindric, thin-walled, becoming 3–4 septate at maturity, orange in mass. Germination by hyaline, globose to spherical conidia and/or germ tubes.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 30 km SE of Paekdu-san Mt. peak (1), taiga, on rotten stump of unidentified tree, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52593.

DISTRIBUTION IN ASIA. Russia (e.g. Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States) and New Zealand.

REFERENCES. Breitenbach & Kränzlin (1986: 50–51, Pl. 3); Ginns & Lefebvre (1993: 51); Govorova (1997: 11); McNabb (1973: 487, Fig. 3a–b); Raitviir (1967: 82); Reid (1974: 451, Fig. 3E–G).

Dacrymyces chrysospermus Berk. & M. A. Curtis

Grevillea **2**: 20. 1873.

D. palmatus (Schwein.) Bres. *in* Höhn., Ost. Bot. Z. **5**: 425. 1904 (*comb. nuda*). For further synonyms see Lowy (1971: 124, McNabb (1973: 495) and Reid (1974: 459).

Basidiocarp bright orange when fresh, drying orange-red to orange-brown, extremely variable in shape, pulvinate, flabellate or stoutly stipitate with a spatulate, cupulate, convoluted or patellate pileus, frequently erumpent in groups, often coalescing to form erect, cerebriform or complicated, sessile or stoutly stipitate masses up to 60 mm in extent. Stipe and base of pileus often bearing simple, cylindric or subclavate, externally roughened, septate, thick-walled hairs.

Hyphal system monomitic. Internal hyphae smooth or roughened, thin-walled, septate. Clamps absent. Hymenium amphigenous, composed of basidia and occasionally simple, cylindric dicaryophyses. Young basidia clavate or cylindric-subclavate, becoming furcate. Basidiospores 14.4–27.0 × 4.8–7.8(–8.4) µm, curved-cylindric, thin-walled, becoming 6- or 7-septate at maturity. Germination by hyaline oval conidia or by germ tubes.

SPECIMENS EXAMINED. Paekdu-san Mts: E slope of Paekdu-san Mt. (1), alt. *ca* 1900 m, slightly below upper forest line, taiga (scattered forest with *Larix ol-*

gensis), on fallen trunk of coniferous tree, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28890; *ca* 30 km SE of Paekdu-san Mt. peak, alt. *ca* 1800 m, taiga with *Larix olgensis*, on fallen trunk of coniferous tree, 3 Sept.1983, *leg. W. Wojewoda*, KRAM-F 28888; between Paekdu-san Mt. peak and Sinmusong village (2), alt. *ca* 1800 m, taiga with *P. ajanenesis* and *P. koraiensis* and *Abies nephrolepis*, on fallen dead trunk of coniferous tree, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29331; shore of Samji-yon Lake (7), near Samji-yon Hotel, *ca* 1400 m, taiga with *Larix olgensis*, *Abies nephrolepis*, *Sorbus* sp. and *Betula platyphylla*, on fallen trunk of coniferous tree, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28889; taiga with *Larix olgensis*, *Abies nephrolepis* and *Picea koraiensis*, on roots of *Picea koraiensis*, 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28891; between Sinmuson village and Samji-yon town (8), *ca* 30 km NE of Samji-yon town, alt. *ca* 1200 m, taiga, on stump, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28885; *ca* 15 km NE of Samji-yon town, *ca* 1200 m, taiga, on fallen trunk of coniferous tree, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28886; *ca* 5 km S of Samji-yon town, taiga, on fallen trunk of coniferous tree, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28887; *ca* 10 km NE of Samjiyon town, alt. *ca* 1500 m, taiga with *Larix* and *Picea*, on bark of *Larix olgensis* stump, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28461; Myohyang-san Mts: near Kuchung Falls (26), alt. *ca* 850 m, mixed forest, on fallen trunk of *Pinus densiflora*, 14 July 1986, *leg. H. Komorowska*, KRAM-F 28538; near Isonnam Falls (29), alt. *ca* 200 m, mixed forest, on wood, 13 July 1986, *leg. H. Komorowska*, KRAM-F 28490; on slope of Wonman Mt. (31), alt. *ca* 1000 m, in coniferous forest, on fallen trunk of coniferous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28883; Kumgang-san Mts: below Onjong-ryong Pass (54), alt. *ca* 800 m, in mixed forest, on decayed stump of coniferous tree, 16 Aug. 1983, *leg. W. Wojewoda* KRAM-F 29330.

DISTRIBUTION IN ASIA. China (e.g. Tibet), Japan and Russia (e.g. Siberia, North Altai and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States), South Africa and New Zealand.

REFERENCES. Azbukina *et al.* (1984: 32); Ginns & Lefebvre (1993: 51); Gorbunova (1997: 15); Govorova (1997: 11); Jahn (1979: 68, Pl. 34); Lowy (1971: 124); McNabb (1973: 495, Fig. 4a–b); Mukhin (1993: Tab. 1); Pilát (1934: 331); Raitviir (1967: 85, Fig. 68); Reid (1974: 459, Fig. 5C–D).

Dacrymyces minor Peck

Rep. N. Y. St. Mus. **30**: 49. 1878.

Individual basidiocarp 0.5–0.75 mm, pale yellowish ochraceous, pustulate, with smooth surface, gelatinous when fresh, drying yellow-brown.

Hyphal system monomitic. Hyphae up to 3 µm wide, smooth, hyaline, with somewhat thickened walls, gelatinized, without clamps. Dicaryophyses not common, hyaline, cylindric, simple. Basidia 20.0–40.0 × 3.0–4.5 µm, at first clavate, then bifurcate. Spores 10.0–15.0 × 3.5–5.0 µm, elongate-elliptic to slightly allantoid, smooth, thin-walled, with 3 usually thin septa.

SPECIMENS EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1200 m, taiga, on stump, 29 June 1986, *leg. W. Wojewoda*, KRAM-F 28884; Pyongyang town: Morangbong Hill (38), park, on dead, hanging twig of living *Syringa* sp., 15 July 1986, *leg. W. Wojewoda*, KRAM-F 28881; Kumgang-san Mts: near Manmulsang Rocks (55), alt. *ca* 1000 m, mixed forest, on fallen dead trunk of *Pinus densiflora*, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28882.

DISTRIBUTION IN ASIA. Iran, Korea and Russia (e.g. Far East).

NOTES. Known also from Europe and North America (Canada and United States) and New Zealand.

REFERENCES. Anonymous (1983a: 130); Ginns & Lefebvre (1993: 52); Govorova (1997: 11); Hallenberg (1981: 500); McNabb (1973: 485, Fig. 3e); Raitviir (1967: 83, Fig. 64); Reid (1974: 454, Fig. 4E–F).

Dacryopinax spathularia (Schwein.: Fr.) Martin

Lloydia **11**: 116. 1948.

Merulius spathularia Schwein., Syn. Fung. Carol., **2**: 834, Figs 1–3. 1822. – *Guepinia spathularia* (Schwein.): Fr., Elench. Fung. **2**: 32. 1828. – *G. fissa* Berk., Ann. Mag. Nat. Hist. Ser. 1, **10**: 383. 1843. – *Guepiniopsis spathularia* (Schwein.: Fr.) Pat., Essai Taxon. Hyménomyc. 30. 1900. For further synonyms see Lowy (1971: 129) and McNabb (1965: 161).

Basidiocarp to 8 mm high, consisting with petalloid, spatulate or palmate pileus and stipe. Consistency tough-gelatinous to cartilaginous. Stipe dull white, cream or pallid tan, slender and cylind-

ric at base, becoming flattened toward pileus, protracted basally into a tough, flattened root.

Hyphal system monomitic. Hyphae smooth, hyaline, thin- or thick-walled, septate, without clamps. Cortex covered with simple or sparingly branched, thick-walled hairs. Young basidia cylindric-subclavate, mature bifurcate. Spores 8.4–10.8 × 3.6–4.2(–4.8 μm), slightly curved-cylindric, smooth, hyaline, thin-walled, becoming 1-septate at maturity, non-amyloid (Fig. 118).

SPECIMENS EXAMINED. Paekdu-san Mts: hill near Taehong-dan (6), alt. *ca* 1600 m, mixed forest with *Abies nephrolepis*, *Betula platyphylla*, *Larixolgensis*, *Picea ajanensis*, *Pinus*, *Populus davidiana*, and *Quercus mongolica*, on fallen trunk of ?*Quercus*, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29328; Myohyang-san Mts: below Kuchung Falls (26), alt. *ca* 700 m, mixed forest with *Pinus densiflora* and *Quercus*, on fallen dead trunk of *Q. mongolica*, 7 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29260; shore of Soham-ho Lake (32), mixed forest with *Pinus densiflora* and *Quercus mongolica*, on wooden pole, 14 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29302; Changsu Mt. (33), mixed forest with *Pinus* and *Quercus mongolica*, on stump of *Pinus densiflora*, 29 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29303.

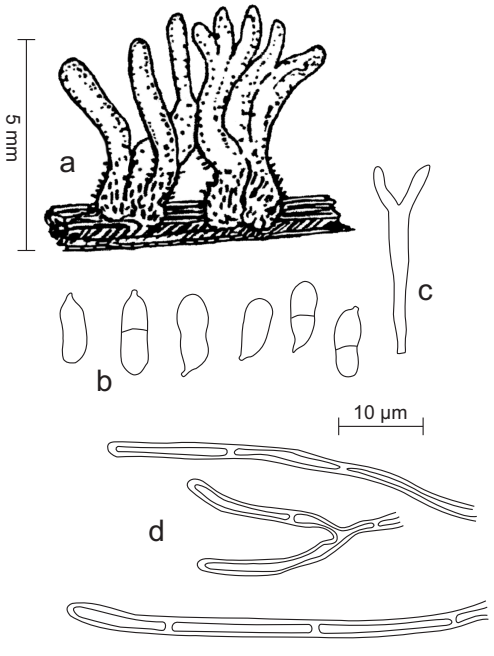


Fig. 118. *Dacryopinax spathularia* (Schwein.: Fr.) Martin: a – basidiocarps, b – basidiospores, c – basidium, d – hairs of stipe (KRAM-F 29302).

DISTRIBUTION IN ASIA. China, India, Japan, Korea, Malaysia, Philippines, Russia (e.g. Far East), Sri Lanka and Vietnam.

NOTES. Widely distributed in the tropics: America, Africa, Oceania and southern Asia. This species may be confused with *Tremella aurantiaca* and *T. mesenterica*.

REFERENCES. Anonymous (1983a: 130); Ginns & Lefebvre (1993: 54); Govorova (1997; 12); Hjortstam *et al*. (1990: 318); Lowy (1971: 129); Martin (1952: 39); McNabb (1965b: 63, Fig. 1b); Morris (1990: 326); Raitviir (1967: 95, Fig. 81); Teng (1996: 273, Fig. 241); Wojewoda *et al*. (1990: 59, Pl. without number: a-c, after p. 64; 1993: 125, 127); Zang (1985: 101); Zang & Zong (1983: 64, 69, Pl. 14: 8).

Guepiniopsis buccina (Pers.: Fr.) Kennedy

Mycologia **50**: 888, Fig. 35. 1958.

Peziza buccina Pers., Syn. Meth. Fung. **2**: 659. 1801. – *P. buccina* Pers.: Fr., Syst. Mycol. **2**: 129. 1822. – *Guepinia peziza* Tul., Annls Sci. Nat (Bot.), Ser. III, **19**: 224. 1853. – *G. merulina* (Pers.) Pat., Hyménomyc. Eur. 159. 1887. For further synonyms see Lowy (1971: 134) and McNabb (1965c: 161).

Basidiocarp 3–10 × 6–7 mm, pezizoid, irregularly cup-shaped, yellow when fresh, orange-yellow when dry, firm-gelatinous when fresh, with undulate margin, sessile or with short glabrous, often rooting stipe. Hymenophore smooth.

Hyphal system monomitic. Hyphae hyaline, gelatinized, somewhat roughened, without clamps. Cystidia and gloeocystidia absent. Dicaryophyses simple, narrow-cylindric, thin-walled, or very slightly clavate. Basidia 30.0–50.0 × 4.5–5.5 μm, first clavate, then bifurcate, with 2 sterigmata. Spores 10–14 × 4–7 μm, elliptic to subcylindric, smooth, hyaline, thin-walled, without septa or with 2–3 septa at maturity.

SPECIMEN EXAMINED. Myohyang-san Mts: near Habiro Temple (27), alt. *ca* 300 m, deciduous forest, on fallen twig of deciduous tree, 16 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28878.

DISTRIBUTION IN ASIA. China, India, Japan and Russia (e.g. Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada, United States and Mexico), South America (Argentina) and New Zealand.

REFERENCES. Ginns & Lefebvre (1993: 72); Govorova (1997: 12); Lowy (1971: 134, Fig. 35); McNabb (1965c: 161, Figs 1–2); Raitviir (1967: 91); Reid (1974: 484, Fig. 10); Teng (1996: 273); Vasudeva (1962: 32).

Hymenochaetales Oberw. 1977

Hymenochaetaceae Imazeki & Toki 1954

Coltricia perennis (L.: Fr.) Murrill

J. Mycol. **9**: 91. 1903.

Boletus perennis L., Sp. Pl. 1177. 1753. – *Polyporus perennis* (L.): Fr., Syst. Mycol. **1**: 350. 1821.

Basidiocarp irregularly infundibuliform, divided into pileus and stipe. Pileus 10–30 mm in diam., rounded, some fused to each other. Upper surface concentrically zonate, velutinous, yellow to rust brown. Margin thin, sharp. Hymenophore porose, ochraceous to grey-brown. Pores 2–4 per mm, rounded-angular. Stipe 10–30 × 2–5 mm, central, cylindric to compressed, tomentose, rust brown. Consistency corky, tough.

Hyphal system dimitic. Generative hyphae 2.0–12.5 µm, hyaline, smooth, thin- to thick-walled, without clamps. Skeletal hyphae 3.8–11.6 µm, thick-walled, smooth, yellowish to brown. Cystidia absent. Basidia 12–24 × 6–7 µm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 4.8–7.7(–8.7) × 3.8–5.8 µm, elliptic to ovoid, pale yellowish, smooth, thin- to thick-valled, some with oil-drops (Fig. 119).

SPECIMENS EXAMINED. Paekdu-san Mts: on Tumangang River (5), near Mupo, alt. *ca* 1400 m, taiga, under coniferous trees, 4 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 28093; Myohyang-san Mts: near Sangwonam Monastery (19), alt. *ca* 600 m, mixed forest with *Pinus densiflora* and *Quercus mongolica*, 5 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52935; Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest, under *Pinus densiflora*, 10 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52937; Kumgang-san Mts: near Onjong-ryong Pass (54), alt. *ca* 800 m, mixed forest, under coniferous trees, 16 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52936; Chanto Forest (61), alt. *ca* 100 m, pine wood, under *Pinus densiflora*, 19 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53225; shore of Samil-po Lake (62), alt. *ca* 100 m, forest with *Pinus densiflora*, 13 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52938; 19 July 1986, *leg*. *Z. Heinrich*, KRAM-F 28007; *leg*. *W. Wojewoda*, KRAM-F 52939. – Terrestrial, associated with *Pinus densiflora*.

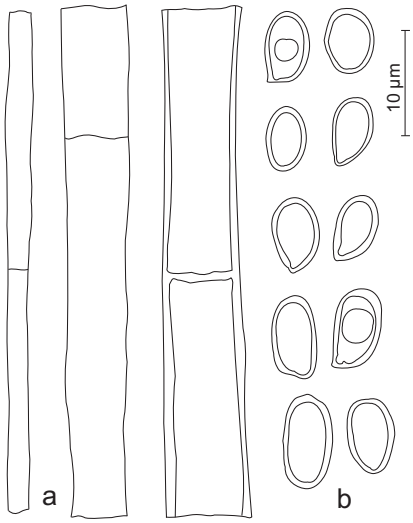


Fig. 119. *Coltricia perennis* (L.: Fr.) Murrill: a – hyphae, b – basidiospores (KRAM-F 52939).

DISTRIBUTION IN ASIA. China, India, Japan, Korea, Kazakhstan, Russia (e.g. Primorski Krai), Turkey and Vietnam.

NOTES. Cosmopolitan in the coniferous zone and rather common. By some authors this species is placed in the Phaeolaceae Jülich *emend*. Fiasson & Niemelä family. It has been proven that the species is not a saprobic or parasitic wood-rotting fungus but a mycorrhizal one.

REFERENCES. Anonymous (1978: 170; 1983a: 109); Azbukina *et al*. (1984: 35); Bondartsev (1953: 416, Pl. CLVI: 2); Bondartseva & Parmasto (1986: 54); Breitenbach & Kränzlin (1986: 248, Pl. 298); Domański (1975: 110); Fiasson & Niemelä (1984: 16); Hansen & Knudsen (1997: 331, Fig. 707); Hattori & Zang (1995: 103); Imazeki & Hongo (1975, **2**: 152, Pl. 51: 295); Kotlaba (1984: 54); Núñez & Ryvarden (2000: 54, Fig. 17C–D);

Ryvarden & Gilbertson (1993: 217, Fig. 102); Sharma (2000: 49); Shvartsman (1964: 463); Teng (1996: 349); Zhao *et al*. (1983: 82).

Fomitiporia punctata (P. Karst.) Murrill

Lloydia **10**: 254. 1948.

Phellinus punctatus (P. Karst.) Pilát, *in* Kavina & Pilát, Atlas hub Evropskych **3**: 530. 1936–1942. – *Polyporus punctatus* Fr., Hymenomyc. Eur. 572. 1874 (*nom. illeg*.). – *Poria punctata* Fr. *ex* P. Karst., Bidr. Känn. Finl. Nat. Folk **37**: 83. 1882 (*nomen novum*).

Basidiocarp resupinate. Hymenophore porose, cinnamon brown. Pores 5–7 per mm.

Hyphal system dimitic. Generative hyphae 2–3 μm wide, smooth, hyaline, thin-walled. Skeletal hyphae 3–5 μm, smooth, brown, thick-walled. All septa without clamps. Cystidia and setae absent. Cystidioles 20–30 × 4–5 μm, bottle-shaped, smooth, hyaline, thin-walled. Basidia 10–14 × 8–10 μm, short-clavate, with 4 sterigmata. Basidiospores 6–8 × 5–7 μm, broadly elliptic to subglobose, smooth, hyaline, somewhat thick-walled, with oil-drops or granular contents, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100 m, mixed forest, on branch of *Quercus mongolica*, 4 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29259.

DISTRIBUTION IN ASIA. China, Iran, Kazakhstan and Russia (West Siberia and Primorski Krai).

NOTES. New to North Korea. Known also from Europe, Africa, South America, North America and Australia. By some authors the genus *Fomitiporia* is placed in the Phellinaceae Jülich family.

REFERENCES. Azbukina *et al*. (1984: 37); Bondartseva & Parmasto (1986: 114, Figs 7, 11); Breitenbach & Kränzlin (1986: 262, Pl. 321); Dai (1999: 32, Fig. 10); Fiasson & Niemelä (1984: 24); Hallenberg (1981: 498); Mukhin (1993: Tab. 1); Ryvarden & Gilbertson (1994: 512, Fig. 264); Shvartsman (1964: 455, Fig. 198); Teng (1996: 323).

Hymenochaete cinnamomea (Pers.: Fr.) Bres.

Atti Imp. Regia Accad. Rovereto III, 3, **1**: 110. 1897.

Thelephora cinnamomea Pers., Mycol. Eur. **1**: 141. 1822. – *T. cinnamomea* Pers.: Fr., Elench. Fung. **1**: 201. 1828.

Basidiocarp corticioid, effused, adnate, resupinate. Hymenophore smooth, cinnamon-ochraceous.

Hyphal system monomitic. Hyphae 2.0–6.7 μm wide, smooth, thin- to thick-walled, brownish, without clamps. Cystidia absent. Setae 58.0–126.0 × 5.8–7.7 μm, subulate, thick-walled, with smooth tips, enclosed in subiculum and projecting in hymenium, dark brown, without encrustation. Basidia 10–25 × 3–5 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 4.5–7.0 × 2.0–2.5 μm, cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid (Fig. 120a).

SPECIMEN EXAMINED. Suian-san Mts (48), alt *ca* 200 m, deciduous forest, on dead fallen branch of deciduous tree, 6 July 1986, *leg*. *W. Wojewoda*, KRAM-F 52926.

DISTRIBUTION IN ASIA. Azerbaijan, China, Georgia, Iran and Russia (Siberia and Far East).

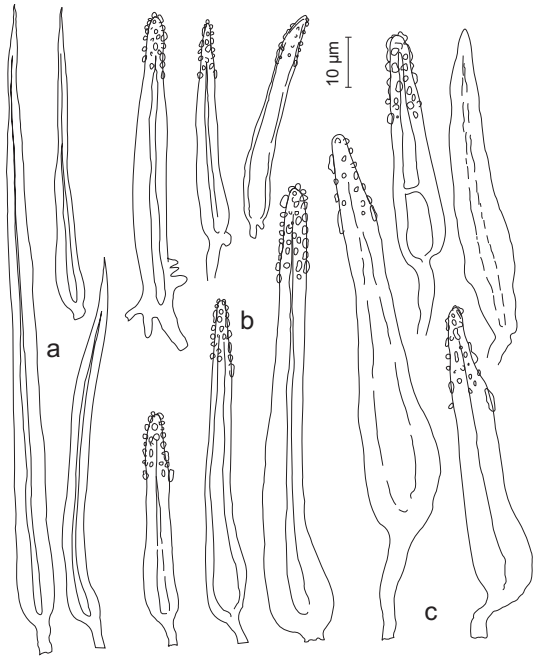


Fig. 120. Setae of: a – *Hymenochaete cinnamomea* (Pers.: Fr.) Bres. (KRAM-F 52926); b – *H. corrugata* (Fr.: Fr.) Lév. (KRAM-F 52931); c – *H. tabacina* (Sowerby.: Fr.) Lév. (KRAM-F 29242).

NOTES. New to North Korea. Known also from Europe, Africa, North America (Canada and United States) and New Zealand.

REFERENCES. Azbukina *et al.* (1984: 34); Bondartseva & Parmasto (1986: 39, Fig. 1a); Breitenbach & Kränzlin (1986: 244, Pl. 293); Cunningham (1963: 282, Fig. 166); Domański (1975: 139, Pl. LXXV); Ginns & Lefebvre (1993: 77); Hallenberg (1981: 497); Jahn (1971: 141, Fig. 29, Photo 40; 1979: 156, Pl. 130); Mukhin (1993: Tab. 1); Tellería (1990: 52); Teng (1996: 282).

Hymenochaete corrugata (Fr.: Fr.) Lév.

Ann. Sci. Nat. Bot. III, **5**: 152. 1846.

Thelephora corrgata Fr., Obs. Mycol. **1**: 154. 1815. – *T. corrugata* Fr.: Fr., Elench. Fung. **1**: 224. 1828.

Basidiocarp corticioid, effused, adnate, resupinate. Hymenophore irregularly tuberculate, grey-lilac to milky coffee, cracked.

Hyphal system monomitic. Hyphae 2.0–3.5 µm wide, smooth, thin- to thick-walled, hyaline to brownish, without clamps. Cystidia absent. Setae 38.0–87.0 × 7.7–15.5 µm, subulate, with obtuse, usually finely encrusted tips, thick-walled, dark brown, enclosed in subhymenium and projecting in hymenium. Basidia 8–14 × 2–4 µm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 3.5–5.0 × 1.0–1.5 µm, cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid (Fig. 120b).

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga, on fallen dead branches of deciduous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52928; shore of Samji-yon Lake (7), near Samji-yon Hotel, mixed taiga, on dead fallen twig of deciduous tree, 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52927; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on fallen dead trunk of deciduous tree, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52929; near Myohyang-san Hotel (20), in mixed forest, on fallen dead branches of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52930; near Habiro Temple (27), alt. *ca* 200 m, in deciduous forest, on fallen dead branches of deciduous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52931.

DISTRIBUTION IN ASIA. Azerbaijan, China, Georgia, Iran and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Known also from Europe, Central America, North America and ?New Zealand.

REFERENCES. Azbukina *et al*. (1984: 34); Bondartseva & Parmasto (1986: 32, Fig. 1b); Breitenbach & Kränzlin (1986: 244, Pl. 293); Cunningham (1963: 291, Fig. 175); Domański (1975: 139, Pl. LXXV); Ginns & Lefebvre (1993: 77); Hallenberg (1981: 497); Hansen & Knudsen (1997: 323, Fig. 709); Jahn (1971: 141, Fig. 29, Photo 40); Tellería (1990: 52); Teng (1996: 279).

Hymenochaete cruenta (Pers.: Fr.) Donk

Persoonia **1**(1): 51. 1959.

Thelephora cruenta Pers., Syn. Meth. Fung. 575. 1801. – *T. cruenta* Pers.: Fr., Syst. Mycol. **1**: 444. 1821. – *Hymenochaete mougeotii* (Fr.) Cooke, Grevillea **8**(48): 147. 1880.

Basidiocarps effused, resupinate, at first small, roughly orbicular, becoming confluent to form larger patches, leathery, up to 0.5 mm thick, with edge turned up 1–4 mm. Hymenophore bright red when young, becoming somewhat brownish red with age, slightly tuberculate.

Hyphal system monomitic. Hyphae 1–4 µm wide, hyaline, smooth, thin- to thick-walled, without clamps. Cystidia absent. Setae 35.0–100.0 × 5.5–10.0 µm, subulate, with obtuse, usually pale and finely encrusted tips, thick-walled, enclosed in subiculum and projecting in hymenium, dark brown. Basidia 8–14 × 2–4 µm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 3.5–5.0 × 1.0–1.5 µm, cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: Wonman Mt. peak (31), alt. *ca* 1200 m, in zone of coniferous trees, in coniferous forest with *Abies*, *Picea* and *Thuja*, on bark of fallen dead trunks of *Abies nephrolepis*, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29235.

DISTRIBUTION IN ASIA. China (Tibet), Georgia, Korea, Russia (Caucasus, Siberia and Far East), Turkey and Sri Lanka.

NOTES. New to North Korea. Known also from Europe, Asia and South America. Species mentioned under name *H. mougeotii* e.g. from India

and Nepal, growing e.g. on *Betula*, *Juglans*, *Pyrus*, *Quercus* and *Rhododendron*, is *H. sphaericola* Lloyd = *H. murashkinskyi* Pilát.

REFERENCES. Azbukina *et al*. (1984: 34); Bondartseva & Parmasto (1986: 35, Fig. 1g); Breitenbach & Kränzlin (1986: 246, Pl. 295); Dai (2000: 449); Domański (1975: 123); Imazeki & Hongo (1975, **2**: 162, Pl. 54: 316); Jahn (1971: 137, Fig. 24; 1979: 154, Pl. 127); Mukhin (1993: Tab. 1); Parmasto (2001: 308, Table 1, Figs 1–2); Pilát (1934: 326); Rattan (1977: 28, Figs H-K, p. 31); Tellería (1990: 52); Teng (1996: 280, only data on *Abies*!, as *H. mougeotii*); Wojewoda *et al*. (2002b: 69); Zhao *et al*. (1983: 66).

Hymenochaete tabacina (Sowerby: Fr.) Lév.

Ann. Sci. Nat. Bot., Ser. 3, **5**: 152. 1846.

Auricularia tabacina Sowerby, Brit. Fun., Pl. 25. 1797. – *Thelephora tabacina* (Sowerby) : Fr., Syst. Mycol. **1**: 437. 1821.

Basidiocarp resupinate, corticioid or semipileate, stereoid, often with reflexed, undulating, gold-yellow or ochraceous whitish margin, thin, coriaceous. Upper surface brown, zonate. Hymenophore irregularly verrucose-tomentose, greyish-brown, tobacco brown to rust brown.

Hyphal system monomitic. Hyphae 3–8 μm wide, thin- to thick-walled, smooth, hyaline or brownish, without clamps. Cystidia absent. Setae 58–100 × 17–21 μm, subulate, with obtuse, usually encrusted tips, some with septa, dark brown, thick-walled, enclosed in subiculum and projecting in hymenium. Basidia 15–20 × 3–4 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 5.0–6.0 × 1.5–2.0 μm, cylindric or suballantoid, smooth, hyaline, thin-walled, non-amyloid (Fig. 120c).

SPECIMENS EXAMINED. Paekdu-san Mts: near Chonbong Mt. (9), alt. *ca* 1400 m, mixed taiga, on fallen dead twig of deciduous tree, 31 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52932; Myohyang-san Mts: near Myohyang-san Hotel (30), alt. *ca* 100 m, mixed forest, on fallen dead branches of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53007; below Wonman Mt. (31), alt. *ca* 800 m, mixed forest, on fallen twigs of deciduous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29242.

DISTRIBUTION IN ASIA. China, India, Iran, Korea and Russia (e. g. Siberia and Far East).

NOTES. Known also from Europe, North America, perhaps also Australia and New Zealand.

REFERENCES. Anonymous (1983a: 101); Azbukina *et al*. (1984: 34); Bondartseva & Parmasto (1986: 39, Fig. 2b); Breitenbach & Kränzlin (1986: 246, Pl. 297); Cunningham (1963: 257, Fig. 146); Domański (1975: 120, Pl. LXXIV: 1); Ginns & Lefebvre (1993: 79); Hallenberg (1981: 497); Hansen & Knudsen (1997: 322, Fig. 712); Jahn (1979: 156, Pl. 128); Mukhin (1993: Tab. 1); Pilát (1934: 327; 1936: 412); Tellería (1990: 53); Teng (1996: 281); Vasudeva (1962: 44).

Inonotus hispidus (Bull.: Fr.) P. Karst.

Meddn. Soc. Fauna Fl. Fenn. **5**: 39. 1879.

Boletus hispidus Bull., Herb. Fr. Pl. 210. 1785. – *Polyporus hispidus* (Bull.): Fr., Syst. Mycol. **1**: 362. 1821. – *Xanthochrous hispidus* (Bull.: Fr.) Pat., Essai Taxon. Hyménomyc. 98. 1900.

Basidiocarp pileate, sessile. Upper surface tuberculate, hispid-tomentose, red-brown. Margin yellow-brown. Hymenophore poroid, ochraceous. Pores 2–3 per mm.

Hyphal system monomitic. All septa without clamps. Generative hyphae in subhymenium 2–4 μm wide, smooth, hyaline, thin-walled, other hyphae thin- to thick-walled, brownish. Cystidia absent. Setae 20–25 × 8–9 μm, subulate, smooth, brown, thick-walled. Basidia 25–30 × 6–9 μm, clavate, with 4 sterigmata. Basidiospores 7.2–10.0 × 6.0–8.0 μm, subglobose to ovoid, yellow or yellow-brown, thick-walled, smooth, non-amyloid (Fig. 121).

SPECIMENS EXAMINED. Myohyang-san Mts: on slope of Wonman Mt. (31), alt. *ca* 1000 m, mixed forest, on living trunk of *Quercus* sp., 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29309; alt. *ca* 800 m, deciduous forest, on trunk of deciduous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29310.

DISTRIBUTION IN ASIA. China (e.g. Tibet), Georgia, India, Iran, Japan, Kazakhstan, Kirghizia, Korea, Russia (Primorski Krai), Turkey, Turkmenia and Uzbekistan.

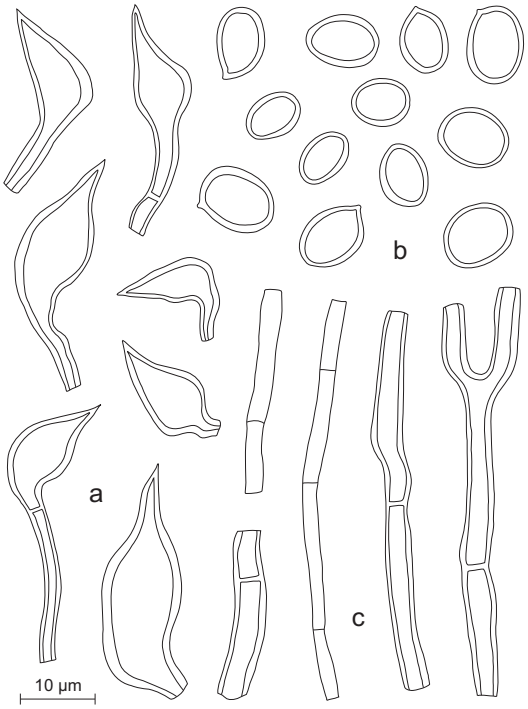


Fig. 121. *Inonotus hispidus* (Bull.: Fr.) P. Karst: a – setae, b – basidiospores, c – hyphae (KRAM-F 29309).

NOTES. Widely distributed in the Northern Hemisphere. Circumpolar in temperate forests. Known also from Europe, Africa (Canary Islands and Morocco), and North America. According to some authors the genus *Inonotus* is placed in the family of Inonotaceae Fiasson & Niemelä.

REFERENCES. Anonymous (1983a: 110); Azbukina *et al*. (1984: 36); Bondartsev (1953: 340, Fig. 99, Pls. XCV, XCVI: 3); Bondartseva & Parmasto (1986: 66, Fig. 7: 2); Breitenbach & Kränzlin (1986: Pl. 304); Dai & Niemelä (1997: 281); Domański (1975: 156, 162–163, Pls. LXXVI: 5; LXXVII: 9); Fiasson & Niemelä (1984: 23); Gilbertson (1976: 80, Fig. 8); Hallenberg (1981: 497); Imazeki & Hongo (1975, **2**: 158, Pl. 53: 305); Jahn (1979: 172, Pl. 146); Kotlaba (1976: 163; 1984: 48, Pl. 4: 10); Kreisel (1961: 31); Niemelä & Uotila (1977: 34); Núñez & Ryvarden (2000: 73); Piątek (2000: 35–40); Pilát (1940: 80); Ryvarden & Gilbertson (1993: 327, Fig. 155); Sharma (2000: 77); Shvartsman (1964: 398, Figs 173–175); Teng (1996: 351); Zhao *et al*. (1983: 99).

Inonotus radiatus (Sowerby: Fr.) P. Karst.

Bidr. Känned. Finl. Natur Folk **37**: 73. 1882.

Boletus radiatus Sowerby, Col. Figs. Engl. Fungi. Pl. 196. 1799. – *Polyporus radiatus* (Sowerby): Fr., Syst. Mycol. **1**: 369. 1821.

Basidiocarp pileate, sessile, imbricate. Upper surface tuberculate, tomentose or glabrous, rust brown. Hymenophore poroid, ochraceous. Pores 2–4 per mm.

Hyphal system monomitic. Hyphae 2–7 µm wide, smooth, hyaline to brownish, thin- to thick-walled. All septa without clamps. Cystidia absent. Setae 10–15 × 4–5 µm, subulate, hook-like, smooth, brown, thick-walled. Basidia 10–15 × 4–5 µm, cylindric-clavate, with 4 sterigmata. Basidiospores 4.0–5.5 × 3.5–4.5 µm, broadly elliptic, yellowish, thin- to thick-walled, smooth, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 30 km SE of Paekdu-san Mt. peak (1), alt. *ca* 1800 m, in taiga, on stump of *Betula* sp., 3 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29243; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1300 m, mixed taiga, on dead trunk of *Betula* sp., 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29249.

DISTRIBUTION IN ASIA. China, India, Japan, Kazakhstan, Korea and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Circumboreal in the Northern Hemisphere. Known also from Europe and North America.

REFERENCES. Azbukina *et al*. (1984: 35); Bondartseva & Parmasto (1986: 75); Breitenbach & Kränzlin (1986: 254, Pl. 307); Dai & Niemelä (1997: 282); Jahn (1979: 170, Pl. 144); Kotlaba (1984: 47); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2000: 82, Fig. 32); Pilát (1940: 81); Ryvarden & Gilbertson (1993: 337, Fig. 160); Sharma (2000: 78); Teng (1996: 347, Fig. 273).

Inonotus tomentosus (Fr.) Teng

Chung-kuo Ti Chen-chun. 761. 1964.

Coltricia tomentosa (Fr.) Murrill, Bull. Torrey Bot. Club **31**: 346, 1904. – *Onnia tomentosa* (Fr.) P. Karst., Krit. (fvers. Finl. Basidsv. 326. 1889. – *Polyporus tomentosus* Fr., Syst. Mycol. **1**: 351. 1821. – *Polystictus tomentosus* (Fr.) Fr., Nov. Symb. 55. 1851.

Basidiocarp divided into pileus and stipe. Pileus 15–105 mm in diam., infundibuliform. Upper surface tuberculate, with distinct zones, tomentose, cinnamon brown. Hymenophore porose, grey-brown. Pores 2–4 per mm. Stipe 20–40 × 5–15 mm, conic, tomentose, rust brown.

Hyphal system monomitic. Hyphae 2.0–4.8 μm wide, smooth, subhyaline, yellowish to brownish, thin- to thick-walled. All septa without clamps. Cystidia absent. Setae 20.0–65.0 × 7.7–13.5 μm, subulate, straight, smooth, yellowish, pale- to dark brown, thick-walled. Basidia 12–20 × 4–5 μm, clavate, with 4 sterigmata. Basidiospores 4.8–5.8 × 2.4–3.8 μm, elliptic to oval, smooth, hyaline, thin-walled, non-amyloid (Fig. 122).

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 10 km SE of Paekdu-san Mt. peak (1), near upper forest line, taiga with *Larix*, alt. *ca* 1900–2000 m, under *Larix olgensis* 1. Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29244; 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53127; shore of Samji-yon Lake (**7**), *ca* 1400 m, mixed taiga, under *L. olgensis*, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29245; under *Picea koraiensis*, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29247; *ca* 15 km NE of Samji-yon town (8), alt. *ca* 1600 m, taiga, under *Larix olgensis*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29246; *ca* 10 km S of Samji-yon town, alt. *ca* 1500 m, taiga, under *L. olgensis*, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53107; *ca* 25 km NE of Samji-yon town, alt. *ca* 1600 m, under *L. olgensis*, 30 June1986, *leg. W. Wojewoda*, KRAM-F 29248. – Terrestrial on roots of coniferous trees.

DISTRIBUTION IN ASIA. China, India, Japan, Kazakhstan, Mongolia and Russia (Siberia and Far East).

NOTES. New to North Korea. Circumpolar in boreal coniferous forests. Known also from Europe and North America. According to some authors this species is placed in the *Onnia* genus. According to Ryvarden & Gilbertson (1993) particularly common on *Picea*, rarely *Abies*, *Larix* and *Pinus*.

REFERENCES. Azbukina *et al*. (1984: 36); Bondartsev (1953: 420, Figs 102–103; Pl. CII: 4); Bondartseva & Parmasto (1986: 57); Breitenbach & Kränzlin (1986: 248, Pl. 299); Dai & Niemelä (1997: 282); Domański (1975: 167); Gilbertson (1976: 82, Fig. 11); Jahn (1979: 174, Pl. 149); Kotlaba (1984: 53); Núñez & Ryvarden (2000: 86, Fig. 34); Petrov & Belova (1999: 26); Ryvarden & Gilbertson (1993: 347, Fig. 165); Sharma (2000: 79); Teng (1996: 347); Zhao *et al*. (1983: 92).

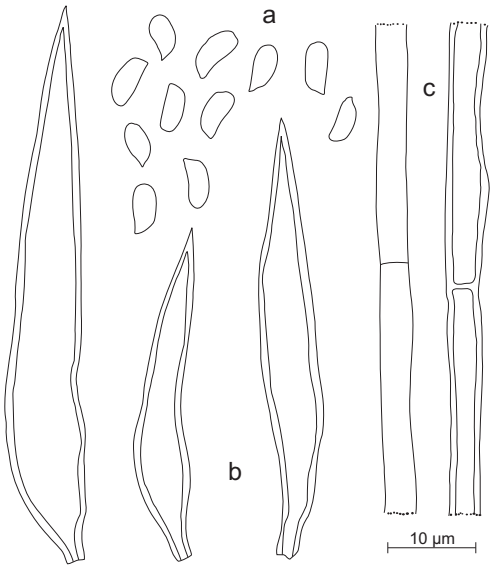


Fig. 122. *Inonotus tomentosus* (Fr.) Teng: a – basidiospores, b – setae, c – hyphae (KRAM-F 53107).

Inonotus triqueter (Fr.) P. Karst.

Ryssl. Finl. Skand. Halföns Hattsvamp. **2**: 73. 1882.

Onnia triquetra (Fr.) Imazeki, *in* Ito, Mycol. Fl. Japan **2** (4): 386. 1955. – *Polyporus triqueter* (Fr.) Fr., Hymenomyc. Eur. 565. 1874. – *Polystictus circinatus* var. *triqueter* (Fr.) Bres., Ann. Mycol. **1**: 75. 1903. – *Trametes triqueter* Fr., Summa Veget. Scand. 323. 1849.

Basidiocarp divided into pileus and stipe. Pileus. Upper surface tuberculate, some with concentric zones, finely tomentose, cinnamon or rust brown. Hymenophore porose, grey-brown. Pores 2–4 per mm. Stipe turbinate, excentric, tomentose, rust brown.

Hyphal system monomitic. Hyphae 2–6 μm wide, smooth, hyaline to brownish, thin- to thick-walled. All septa without clamps. Cystidia absent. Setae 60–75 × 10–18 μm, subulate, hook-like, some forked, smooth, red-brown, thick-walled. Basidia 14–18 × 4–5 μm, clavate, with 4 sterigmata. Basidiospores 5–7 × 3–4 μm, elliptic, smooth, yellowish, somewhat thick-walled, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on stump and roots of *Pinus densiflora*, 5 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29250; near Sogdamgukok village (47), mixed forest with *Pinus densiflora* and *Quercus mongolica*, on stump of *Pinus densiflora*, 7 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29251.

DISTRIBUTION IN ASIA. China, Japan and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Temperate Holarctic species. Known also from Europe and North America. According to some authors this species is placed in the *Onnia* genus.

REFERENCES. Azbukina *et al*. (1984: 36); Bondartsev (1953: 423, Pls. CXXV: 1–2; CXXVI: 1–2; CXXVII: 2); Bondartseva & Parmasto (1986: 58, Fig. 9); Breitenbach & Kränzlin (1986: 248, Pl. 300); Dai & Niemelä (1997: 282); Domański (1975: 168); Núnez & Ryvarden (2000: 88, Fig. 36); Teng (1996: 34); Zhao *et al*. (1983: 92).

Ochroporus laevigatus (P. Karst.) Fiasson & Niemelä

Karstenia **24**: 26. 1984.

Phellinus laevigatus (Fr. *ex* P. Karst.) Bourdot & Galzin, Hym. France. 624. 1928. – *Polyporus laevigatus* Fr., Hymenomyc. Eur. 571. 1874 (*nom. illeg.*), [non *P. laevigatus* (Pers.) Duby, Botanicum Gallicum **2**: 785. 1830]. – *Poria laevigata* Fr. *ex* P. Karst., Meddn. Soc. Fauna Fl. Fenn. **6**: 10. 1881.

Basidiocarp resupinate. Hymenophore porose, reddish brown. Pores 8–10 per mm.

Hyphal system dimitic. Generative hyphae 2–3 μm wide, smooth, hyaline, thin- to thick-walled. Skeletal hyphae 2–4 μm, smooth, brown, thick-walled. All septa without clamps. Cystidia absent. Setae 10–20 × 4–7 μm, subulate, ventricose, smooth, dark brown, thick-walled. Basidia 6–10 × 8–4(–6) μm, short-clavate, with 4 sterigmata. Basidiospores 4–5 × 3–4 μm, ovoid to subglobose, smooth, hyaline, thick-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), 28 June 1986, *leg*. *W. Wojewoda*, KRAM-F 29256; between Mubong (3) and Taehondan (6), 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29257. – Mixed taiga, on fallen trunk of *Betula platyphylla*.

DISTRIBUTION IN ASIA. China, India, Japan, Korea, Pakistan and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Circumpolar in the boreal zone. Known also from Europe, South America, North America, Australia and New Zealand.

REFERENCES. Bondartseva & Parmasto (1986: 103, Fig. 22); Breitenbach & Kränzlin (1986: 260, Pl. 317), Dai (1999: 47, Fig. 20, Photo X); Kotlaba (1984: 32); Mukhin (1993: Tab. 1); Niemelä (1972: 42, Figs 1–7); Núñez & Ryvarden (2000: 123, Fig. 51); Ryvarden & Gilbertson (1994: 495, Fig. 251); Sharma (2000: 106).

Ochroporus lundellii (Niemelä) Niemelä

in Fiasson & Niemelä, Karstenia **24**: 26. 1984.

Phellinus lundellii Niemelä, Ann. Bot. Fenn. **9**: 51, Figs 8–13. 1972.

Basidiocarp resupinate, with projecting pileate, smooth, somewhat concentrically zonate, brown-blackish edge. Hymenophore porose, brown, pores 5–6 per mm. Trama rust brown.

Hyphal system dimitic. Generative hyphae 2–4 μm wide, smooth, hyaline, thick-walled, without clamps. Skeletal hyphae 2.0–4.5 μm wide, smooth, brown, thick-walled. All septa without clamps. Cystidia absent. Setae 17.0–24.0 × 5.5–6.5 μm, subulate, smooth, brown, thick-walled. Basidia 10.0–12.0 × 4.5–6.0 μm, short, clavate, with 4 sterigmata, without basal clamp. Basidiospores 5.0–6.0 × 3.5–4.0 μm, broadly elliptic, smooth, hyaline, thick-walled, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon town (8), alt. *ca* 1400 m, taiga, on trunk of *Betula* sp., 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29258.

DISTRIBUTION IN ASIA. Caucasus and China.

NOTES. New to North Korea. Circumpolar, boreal-montane species known also from Europe and North America.

REFERENCES. Bondartseva & Parmasto (1986: 107, Fig. 23); Breitenbach & Kränzlin (1986: 260, Pl. 318); Dai (1999: 48, Fig. 21); Kotlaba (1984: 34); Núñez & Ryvarden (2000: 126, Fig. 54); Gilbertson & Ryvarden (1987: 584, Fig. 295).

Phellinus cfr. ***laricis*** (Jaczewski) Pilát

Bull. Soc. Mycol. Fr. **88**: 346. 1972.

Xanthochrous pini (Brot.: Fr.) Pat. f. *laricis* Jaczewski *in* Pilát, Bull. Soc. Mycol. Fr. **48**: 28. 1933. – *Phellinus chrysoloma* (Fr.) Donk, Proc. K. Ned. Akad. Wet. (C) **74**: 39. 1971, ss. lato.

Basidiocarp pileate, perenial. Pileus conchate, projecting 25–50 mm, 30–75 mm wide. Upper surface concentrically sulcate, with narrow zones, cracking, grayish black. Hymenophore porose, yellowish brown to rust-brown. Sterile margin up to 4 mm wide, brown. Pores 2–3 per mm, circular to ± sinuous. Context up to 5 mm thick, thinner than tube layer, cinnamon-brown, hard.

Hyphal system dimitic. All hyphae without clamps. Generative hyphae 1.5–4.0 μm wide, smooth, hyaline, thin-walled. Skeletal hyphae 2.5–4.5 μm, smooth, yellowish brown, thick-walled with wide lumen. Typical cystidia absent. Setae (17.4–)30.0–48.0 × (5.8–)7.2–10.8(–12.0) μm, subulate, smooth, dark brown, thick-walled. Basidia 10.0–20.0 × 4.0–5.8 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 3.8–5.8 × 3.8–4.8 μm, ovoid, subglobose to broadly elipsoid, smooth, hyaline, thin- or slightly thick-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: bank of Tuman-gang River (5), near Mupo (4), alt. *ca* 1200 m, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29311; shore of Samji-yon Lake (7), near Samji-yon Hotel, 1 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29312. – Taiga, on living trunk of *Larix olgensis*.

DISTRIBUTION IN ASIA. China, Mongolia and Russia.

NOTES. New to North Korea.

REFERENCES. Dai (1999: 99, Fig. 60); Fischer (2000: 43–48); Núñez & Ryvarden (2000: 103).

Porodaedalea pini (Brotero: Fr.) Murrill

Bull. Torrey Bot. Club **32**: 367. 1905.

Phellinus pini (Brotero: Fr.) Ames, Ann. Mycol. **11**: 246. 1913. – *Boletus pini* Brotero, Flora Lusitanica **2**: 468. 1804. – *Daedalea pini* (Brotero): Fr., Syst. Mycol. **1**: 336. 1821.

Basidiocarp polyporoid, pileate, sessile. Upper surface brown, zonate, hirsute. Hymenophore porose, brownish. Pores 1–3 per mm.

Hyphal system dimitic. Generative hyphae 2–4 μm wide, smooth, hyaline, thin-walled, without clamps. Skeletal hyphae 3–7 μm wide, smooth, brown, thick-walled. All septa without clamps. Cystidia absent. Setae 30.0–42.0(–78.0) × 9.6–15.6 μm, subulate, some ventricose, smooth, brown, thick-walled. Basidia 13.5–16.0 × 10.0–14.0 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 4.8–6.6 × 4.2–5.4 μm.

SPECIMENS EXAMINED. Myohyang-san Mts: on slope of Wonman Mt. (31), alt. *ca* 1000 m, coniferous trees zone with *Picea*, *Pinus*, *Abies*, and *Thuja*, on dead trunk of coniferous tree (?*Pinus*), 17 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29313; Kumgang-san Mts: near Onjong-ryong Pass (54), alt. *ca* 800 m, mixed forest with *Quercus*, *Pinus koraiensis*, *Picea*, *Pinus densiflora* and *Abies*, on trunk of coniferous tree, 16 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29314.

DISTRIBUTION IN ASIA. China (Tibet), India, Iraq, Japan, Kazakhstan, Mongolia, Pakistan, Russia (e.g. Siberia and Primorski Krai), Taiwan and Turkey.

NOTES. New to North Korea. Widespread in coniferous forest regions. Known also from Europe, North America and Africa.

REFERENCES. Azbukina *et al*. (1984: 37); Bondartseva & Parmasto (1986: 112, Fig. 27); Dai (1999: 101, Fig. 61); Fiasson & Niemelä (1984: 26); Kotlaba (1984: 40, Pl. 3); Larsen & Cobb-Poulle (1990: 104); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2000: 137, Fig. 61); Pilát (1936: 376); Rattan *et al*. (1978: 769, Fig. 2a–f); Ryvarden & Gilbertson (1994: 505, Fig. 259); Sharma (2000: 109); Shvartsman (1964: 436–437, Fig. 189); Teng (1996: 340); Zhao *et al*. (1983: 101).

Schizoporaceae Jülich 1982

Basidioradulum radula (Fr.: Fr.) Nobles

Mycologia **59**: 192. 1967.

Hydnum radula Fr., Obs. Mycol. **2**: 271. 1818. – *H. radula* Fr.: Fr., Syst. Mycol. **1**: 422. 1821. – *Radulum orbiculare* Grev.: Fr., Elench. Fung. **1**: 149. 1828. – *Hyphoderma radula* (Fr.: Fr.) Donk, Fungus **27**(1–4): 15. 1957.

Basidiocarp resupinate, orbicular, at first smooth and almost corticioid, then raduloid. Hymenophore with blunt teeth, 1–5 × 1–2 mm, cream-coloured, ochraceous to yellow. Margin distinctly bounded to slightly filamentous, whitish. Consistency ceraceous, soft.

Hyphal system monomitic. Hyphae 3–4 μm wide, thin- or some thick-walled, smooth, hyaline, with clamps. Cystidia (leptocystidia) 48–72 × 6–7 μm, subclavate or tubular, moniliform, hyaline, thin-walled, not projecting. Basidia 18.0–25.0 × 4.0–6,5 μm, cylindric-clavate, hyaline, thin-walled, with 4 sterigmata and basal clamp. Spores 8.4–12.0 × 3.0–3.6 μm, allantoid or subcylindric, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: near Naegok (13), alt. *ca* 1000 m, mixed forest, on fallen twigs and fallen, dead trunks, 27 June 1986, *leg*. *W. Wojewoda*, KRAM-F 28997, 29049.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan and Russia (e.g. West Siberia and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 134–135, Pl. 128); Domański (1988: 312); Eriksson & Ryvarden (1975: 519, Figs 239–241); Ginns & Lefebvre (1993: 27); Hansen & Knudsen (1997: 197); Jülich & Stalpers (1980: 54); Maekawa (1993: 13, Fig. 6; 1994: 41, Fig. 28); Maekawa *et al*. (2002: 84); Mukhin (1993: Tab. 1); Nikolaeva (1961: 81, Figs 24–25, Pl. IV: 1–2); Shvartsman (1964: 186).

Hyphodontia aspera (Fr.) J. Erikss.

Symb. Bot. Upsal. **16**(1): 104. 1958.

Grandinia aspera Fr., Hymenomyc. Eur. 627. 1874. – *Odontia aspera* (Fr.) Bourdot & Galzin, Hymenomyc. Fr. 627. 1928. – *Kneiffiella aspera* (Fr.) Jülich & Stalpers, Verh. Kon. Akad. Wetensch., Afd. Natuurk., Tweede Sect. **74**: 132. 1980.

Basidiocarp resupinate, corticioid, effuse, thin. Hymenophore with small, conic aculei with easily visible smooth surface between the aculei, cream-whitish to cream yellow.

Hyphal system monomitic. Hyphae 2–3 μm wide, hyaline, smooth, thin to slightly thickened walls, with clamps. Cystidia absent. Cystidial capitate hyphae frequent in hymenium. Basidia 15–19 × 4–5 μm, clavate to subcylindric or suburniform, with 4 sterigmata and basal clamp. Spores 4.2–6.6(–7.8) × 3.6–4.8(–6.0) μm, broadly elliptic, smooth, hyaline, thin-walled, with oil-drops, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: near Mupo (4), bank of Tuman-gang River (5), alt. *ca* 1300 m, 28 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28168; near Taehong-dan (6), alt. *ca* 1500 m, 4 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 27929; *ca* 5 km S of Samji-yon town (8), 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30400. – Taiga, on fallen, dead, decayed trunks of coniferous trees.

DISTRIBUTION IN ASIA. China, India (North Western Himalayas), Japan, Kazakhstan, Russia (e.g. Siberia) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1988: 352, Pl. 246: 3); Eriksson & Ryvarden (1976: 613, Figs 287–291); E. Langer (1994: 56, Figs 21–22); Lin & Chen (1990: 80, Fig. 9)l; Maekawa (1993: 12); Mukhin (1993: Tab. 1); Nikolaeva (1961: 116, Fig. 63, Pl. XVII); Pilát (1934: 299); Rattan (1977: 347, Figs M-O, p. 350); Shvartsman (1964: 191).

Hyphodontia crustosa (Pers.: Fr.) J. Erikss.

Symb. Bot. Upsal. **16**(1): 104. 1958.

Hydnum crustosum Pers., Syn. Meth. Fung. 561. 1801. – *H. crustosum* Pers.: Fr., Syst. Mycol. **1**: 419. 1821. – *Grandinia crustosa* (Pers.: Fr.) Fr., Epicr. Syst. Mycol. 528. 1838. – *Odontia crustosa* Quél., Fl. Mycol. Fr. 436. 1888.

Basidiocarp corticioid, resupinate, thin. Hymenophore verrucose or odontioid, with short teeth, white to cream coloured.

Hyphal system monomitic. Hyphae 2–3 μm, smooth, hyaline, thin-walled, with clamps at all septa. Cystidia absent, but in hymenium and in sterile aculeal apices are numerous subulate hyphal ends (cystidiols), 18–24 × 2–3 μm, sinuous, slightly projecting, with basal clamp. Basidia

18.0–26.0 × 4.0–5.5 μm, subclavate, subcylindric or suburniform, with 4 sterigmata and basal clamp. Spores 4.8–7.2 × 2.5–3.6(–4.2) μm, elliptic to subcylindric, smooth, thin-walled, mostly 1-guttulate, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts.: shore of Samji-yon Lake (7), near Samji-yon Hotel, on fallen twigs of deciduous tree or shrub, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30401; *ca* 5 km S of Samji-yon town (8), on fallen twigs, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30398; on fallen decayed trunk of tree, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30399; *ca* 10 km S of Samji-yon town, on fallen twig of deciduous tree or shrub, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30402; Chonbong Hill (9), near Rimyongsu (10), alt. *ca* 1460 m, on fallen decayed twig, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 29081; alt. *ca* 1400 m, on fallen dead twig, 31 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30698. – Coniferous and mixed taiga.

DISTRIBUTION IN ASIA. China, Iran, India, Japan, Nepal (North Western Himalayas), Russia (e.g. Siberia and Far East) and Taiwan.

NOTES. New to North Korea. Known also e.g. from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 102–103, Pl. 81); Domański (1988: 349, Pl. 246: 4); Eriksson & Ryvarden (1976: 633, Figs 302–304); Ginns & Lefebvre (1993: 87); Hallenberg (1978: 58; 1981: 485); E. Langer (1994: 82, Figs 35–38); Maekawa (1994: 75, Fig. 52); Mukhin (1993: Tab. 1); Nikolaeva (1961: 121, Figs 69–70, Pl. XX); Pilát (1934: 299; 1936: 397); Rattan (1977: 345, Figs G-I, p. 341); Wu (2002: 292).

Hyphodontia nespori (Bres.) J. Erikss. & Hjortstam

Corticiaceae North Europe **4**: 655, Fig. 317 & 318. 1976.

Odontia nespori Bres., Ann. Mycol. **18** (1–3): 43. 1920.

Basidiocarp corticioid, resupinate. Hymenophore grandinioid, verrucose, with very small, very dense, apically fimbriate, conic aculei, white to cream-coloured.

Hyphal system monomitic. Hyphae 2.0–3.5 μm, smooth, hyaline, thin- to thick-walled, with clamps at all septa. Cystidia absent, but in hymenium are numerous hyphal ends (cystidiols, cystidial organs), 35.0–60.0 × 3.0–4.5 μm, thin-walled, hyaline, in part with septa and clamps and encrusted with coarse crystals. Basidia 14.5–20.0 × 3.0–4.0 μm, subclavate or suburniform, with 4 sterigmata and basal clamp. Spores 3.6–6.0 × 2.0–2.5 μm, elliptic to subcylindric, smooth, thin-walled, mostly 1–2-guttulate, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: bank of Hyangsan-gang River, near Myohyang-san Hotel (20), alt. *ca* 100 m, mixed forest, on fallen, very decayed twig, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30403.

DISTRIBUTION IN ASIA. China, Iran, Japan and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (United States).

REFERENCES. Breitenbach & Kränzlin (1986: 104–105, Pl. 83); Domański (1988: 347); Ginns & Lefebvre (1993: 89); Hallenberg (1981: 485); Jülich & Stalpers (1980: 134); E. Langer (1994: 156, Figs 67–68); Maekawa (1993: 15; 1994: 79, Fig. 56); Maekawa *et al.* (2002: 88); Wu (1990: 98, Fig. 64a–f).

Hyphodontia pallidula (Bres.) J. Erikss.

Symb. Bot. Upsal. **16**(1): 104. 1958.

Gonadobotrys pallidula Bres., Ann. Mycol. **1**: 127. 1903.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Hymenophore at first porose then continuous, smooth to punctate or finely warted, and under the lens finely pilose with projecting cystidia, cream-coloured or pale ochraceous.

Hyphal system monomitic. Hyphae 2.0–3.5 μm, smooth, hyaline, thin-walled, with clamps at all septa. Cystidia (septocystidia) 80–100 × 4–5 μm, numerous, with slightly thickened walls, hyaline, with one or several clamps, often with constrictions, moniliform, apically obtuse or somewhat capitate; apical head sometimes with resinous encrustation. Basidia 9.5–16.0 × 3.0–4.5 μm, subclavate or subcylindric, with 4 sterigmata and basal clamp. Spores 3.6–4.5 × 2.0–2.5 μm, elliptic, ovoid to subglobose, smooth, thin-walled, mostly 1–2-guttulate, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Mubong (3) and Taehong-dan (6), alt. *ca* 1300–1500 m, in taiga with *Larix olgensis*, on stump of ?*Larix olgen-*

sis, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29060; Myohyang-san Mts: near Sangwon-am Monastery (19), *ca* 600 m, mixed forest, on decayed trunk, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28236, F 28136; on slope of Wonman Mt. (31), alt. *ca* 700 m, mixed forest, on decayed stump of tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29056.

DISTRIBUTION IN ASIA. China, India (North Western Himalayas), Japan, Russia (e.g. West Siberia) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States). The type of this species was described by Bresadola (1903) from specimens collected by Polish mycologist Bogumir Eichler.

REFERENCES. Breitenbach & Kränzlin (1986: 104–105, Pl. 84); Domański (1988: 335); Eriksson & Ryvarden (1976: 657, Fig. 319); Ginns & Lefebvre (1993: 89); E. Langer (1994: 174, Fig. 78); Maekawa (1994: 80, Fig. 57); Maekawa *et al*. (2002: 88); Mukhin (1993: Tab. 1); Rattan (1977: 344, Figs E-G, p. 356).

Hyphodontia paradoxa (Schrad.: Fr.) E. Langer & Vesterholt

Nordic J. Bot. **16**(2): 211. 1996.

Hydnum paradoxum Schrad., Spic. Fl. Germ. 179, Pl. 4, Fig. 1. 1974. – *H. paradoxum* Schrad.: Fr., Syst. Mycol. **1**: 424. 1821. – *Schizopora paradoxa* (Schrad.: Fr.) Donk, Persoonia **5**: 104. 1967.

Basidiocarp 1–3 mm thick, resupinate, at first whitish, then cream-white to yellowish. Hymenophore irpicoid to poroid. Pores 1–3 per mm, angular to irregularly denticulate.

Hyphal system dimitic. Encrusting crystals in dissepiments 1–3 µm broad, only present in terminal part of hyphae. Generative hyphae 2.5–3.0 µm wide, thin-to thick-walled, with clamps. Skeletal hyphae 3–5 µm wide, thick-walled. Cystidia (cystidioles) clavate, fusiform or ventricose, moniliform, capitate to hyphoid, with basal clamps. Cap of cystidia 4.2–7.2 µm in diam. Basidia 10.0–16.0 × 3.0–4.8 µm, cylindric-clavate, with 4 sterigmata and basal clamp. Basidiospores (4.2–)5.5–6.5 × 3.6–4.2 µm, broadly elliptic to oval, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), *ca* 30 km NE of Samjiyon, alt. *ca* 1500 m, mixed taiga, on fallen deciduous branches, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30707; Pyongyang town: Central Botanical Garden (36), on *Albizia* trunk, 9 July 1986, *leg. W. Wojewoda*, KRAM-F 30710; Myohyang-san Mts: near Myohyang Hotel (20) in Hyangsan-gang River Valley, alt. *ca* 150 m, mixed forest, on fallen deciduous twigs, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30708; near Unson Falls (23), alt. *ca* 600 m, deciduous forest, on decayed stump, 14 July 07.1986, *leg. W. Wojewoda*, KRAM-F 30709; Ryongak-san Mt. (42): alt. *ca* 250 m, mixed forest, on fallen deciduous branches, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30711; Suian-san Mts (48), *ca* 250 m, in deciduous forest, on decayed stump, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30712; Kumgang-san Mts: near Manmulsang Rocks (55), alt. *ca* 800 m, mixed forest, on dead, attached trunk of deciduous tree, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30715; Okryu-dong Stream Valley (59), near Kuryong Falls, alt. *ca* 600 m, mixed forest, on dead standing deciduous trunk, 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30713; alt. *ca* 650 m, mixed forest, on dead standing deciduous trunk, 5 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 30714; Onjong-gang Stream Valley near Onjong-ri village (60), mixed forest, on dead fallen deciduous branches, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 30716.

DISTRIBUTION IN ASIA. China, Indonesia (Sumatra), India, Iran, Japan, Korea, Russia (e.g. West Siberia and Far East) and Taiwan.

NOTES. New to North Korea. Common cosmopolitan species known from Asia, Europe, North America and East Africa.

REFERENCES. Breitenbach & Kränzlin (1986: 302, Pl. 380); Gilbertson & Ryvarden (1987: 707, Fig. 361); Hallenberg (1981: 495); Hansen & Knudsen (1997: 213, Fig. 394); E. Langer (1994: 180, Figs 80–83); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 450); Ryvarden & Johansen (1980: 551, Fig. 191); Ryvarden & Gilbertson (1994: 608, Fig. 323); Sharma (2000: 124); Suhirman & Núñez (1998: 277).

Hyphodontia radula (Pers.: Fr.) E. Langer & Vesterholt

Norw. J. Bot. **16**(2): 212.

Poria radula Pers., Obs. Mycol. **2**: 14. 1799. – *Polyporus radula* (Pers.) : Fr., Syst. Mycol. **1**: 383. 1821. –

Schizopora radula (Pers.: Fr.) Hallenberg, Mycotaxon **18**: 308. 1983.

Basidiocarp resupinate, adnate, effused. Hymenophore poroid, pore surface yellowish-cream. Pores 1–3 per mm, angular. Context white, thin.

Hyphal system monomitic. Hyphae 2.0–3.5 μm wide, thin- to thick-walled, hyaline, smooth, with clamps. Hyphal ends often covered with crystals. Encrusting crystals in dissepiments 0.5–1.5 μm broad. Cystidia moniliform, as bulbous or capitate hyphal ends in subhymenium and hymenium, head up to 6 μm in diam. Basidia 12–18 × 4–5 μm, suburniform, with 4 sterigmata and basal clamp. Basidiospores 4–5 × 3–4 μm, elliptic, hyaline, smooth, thin-walled, non-amyloid, often with an oil-drop.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), Hyang-san River Valley, alt. *ca* 150 m, mixed forest on fallen twigs of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30363; near Habiro Temple (27), alt. *ca* 200 m, deciduous forest, on fallen dead branch of deciduous tree, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 27936.

DISTRIBUTION IN ASIA. China, Japan, Russia (e.g. Far East), Taiwan and Turkey.

NOTES. New to North Korea. Species widespread in temperate zones, known from all continents (also from South America: Argentina) except Australia and New Zealand.

REFERENCES. E. Langer (1994: 198, Figs 92–93); Niemelä (1987: 365–370, Figs 1–3); Núñez & Ryvarden (2001: 451); Ryvarden & Gilbertson (1994: 609, Fig, 324).

Hyphodontia sambuci (Pers.) J. Eriksson

Symb. Bot. Upsal. **16**(1): 104. 1958.

Thelephora sambuci Pers., Mycol. Eur. **1**: 152. 1822. – *Lyomyces sambuci* (Pers.) P. Karst., Bidr. Känn. Finl. Nat. Folk **37**: 153. 1882. – *Rogersella sambuci* (Pers.) Liberta & Navas, Can. J. Bot. **56**: 1781. 1978. – *Hyphoderma sambuci* (Pers.) Jülich, Persoonia **8**(1): 80. 1984.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Hymenophore at first porose then continuous, smooth, slightly verrucose or tuberculate, white, cream-coloured or pale yellowish.

Hyphal system monomitic. Hyphae 3–5 μm wide, smooth or covered with crystals, hyaline, thin-walled, with clamps at all septa. Cystidia (leptocystidia, cystidial elements) 9.6–36.0 × 4.2 μm, cylindric, numerous, projecting, with slightly thickened walls, some covered with crystals, hyaline, with basal clamp, sometimes with constrictions (slightly moniliform), apically obtuse or somewhat capitate; apical head sometimes with resinous encrustation. Basidia 18.0–26.4 × 4.8–6.0 μm, subclavate, subcylindric or suburniform, with 4 sterigmata and basal clamp. Basidiospores 4.2–6.6(–7.2) × 3.9–4.2 μm, ovoid, smooth, thin-walled or slightly thick-walled, mostly 1–2-guttulate, non-amyloid (Fig. 123).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 550 m, deciduous forest, on fallen dead twig, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 30706; Kaesong town (63): near Korio Buddhist School, on living trunk of *Savina sinensis* = *Juniperus sinensis*, 26 July 1986, *leg. W. Wojewoda*, KRAM-F 30651.

DISTRIBUTION IN ASIA. China, Iran, Japan, Russia (e.g. West Siberia) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 142–143, Pl. 139); Domański (1988: 325); Eriksson & Ryvarden (1976: 575, Figs 267–268); Hallenberg (1981: 484); E. Langer (1994: 205, Figs 95–97), Lin & Chen (1990: 76, Fig. 6); Maekawa (1994: 83, Fig. 59); Maekawa *et al*. (2002: 88); Mukhin (1993: Tab. 1); Wu (1990: 104, Fig. 68a–d).

Hyphodontia spathulata (Schrad.: Fr.) Parmasto

Consp. Syst. Cortic. 123. 1968.

Hydnum spathulatum Schrad., Spic. Fl. German. 178. 1794. – *H. spathulatum* Schrad.: Fr., Syst. Mycol. **1**: 423. 1821. – *Odontia arguta* (Schrad.: Fr.) Quél. for. *spathulata* (Schrad.: Fr.) Wakefield, *in* Miller & Boyle, Univ. Iova Stud. Nat Hist. **18** (2): 38. 1943. – *Grandinia spathulata* (Schrad.: Fr.) Jülich, Int. J. Mycol. Lichen. **1**(1): 36. 1982.

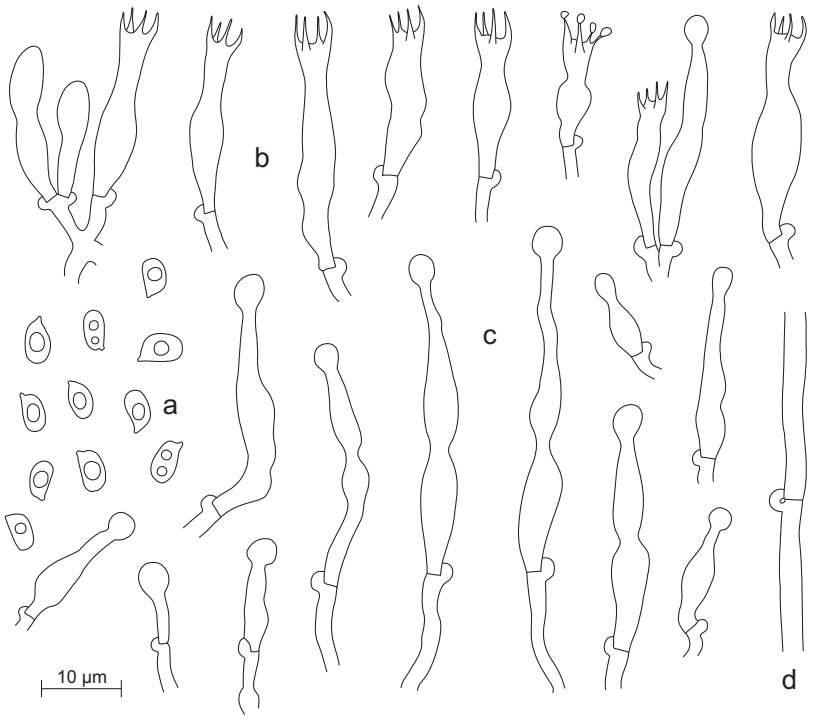


Fig. 123. *Hyphodontia sambuci* (Pers.) J. Erikss.: a – basidiospores, b – basidia, c – cystidia, d – hyphae (KRAM-F 30706).

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Hymenophore odontioid, cream-coloured to ochraceous. Aculei 1–2 mm long, dense, of varying shape, mostly flattened but also conic or subcylindric, apically fimbriate.

Hyphal system monomitic. Hyphae 2.5–3.5 µm, smooth, hyaline, somwewhat thick-walled, with clamps at all septa. Cystidia of two kinds: (1) numerous, sterile, capitate hyphal ends, 20–45 µm long, apically most often with resinous encrustation, (2) few gloeocystidia 20–30 µm, acute, with one or more constrictions and strongly stainable protoplasm. Basidia 10.0–18.0 × 4.5–5.0 µm, subclavate or subcylindric, with 4 sterigmata and basal clamp. Basidospores 4.5–5.0 × 3.5–4.5 µm, elliptic, smooth, thin-walled, mostly 1–3-guttulate, non-amyloid.

SPECIMEN EXAMINED. Kumgang-san Mts: Myonggyong-dae Ravine (58), alt. *ca* 800 m, mixed forest, on dead fallen decayed trunk, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 8392.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Nepal (North Western Himalayas), Russia (West Siberia) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1988: 352); Eriksson & Ryvarden (1976: 671, Figs 327–329a); Ginns & Lefebvre (1993: 90); Hallenberg (1981: 485); E. Langer (1994: 213, Figs 99–101); Maekawa (1994: 84, Fig. 60); Maekawa & Zang (1995: 91); Nikolaeva (1961: 113, Figs 59–60); Rattan (1977: 348, Figs D-G, p. 350).

Oxyporus populinus (Schum.: Fr.) Donk

Med. Bot. Mus. Univ. Utrecht **9**: 204. 1933.

Boletus populinus Schum., Enum. Plant. **2**: 384. 1803. – *Polyporus populinus* (Schum.): Fr., Syst. Mycol. **1**: 367. 1821. – *Rigidoporus populinus* (Schum.: Fr.) Pouzar.

Basidiocarp 30–50 mm broad, pileate. Upper surface smooth to tuberculate, tomentose to gla-

brous, overgrown with mosses and algae, cream-coloured to ochraceous. Margin sharp, white. Hymenophore porose, cream-coloured to ochraceous. Pores rounded-angular 5–7 per mm. Flesh cream-coloured, elastic, soft. Smell weak. Taste mild.

Hyphal system monomitic. Hyphae 1.5–2.5 μm wide, smooth, hyaline, thin- to thick-walled, without clamps. Cystidia 12.0–18.0 × 3.5–6.0 μm, fusoid, with crystals at apex, hyaline, thick-walled. Basidia 9.0–11.0 × 3.5–4.5 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 3.5–4.0 × 3.0–4.0 μm, globose or subglobose, smooth, hyaline, thin-walled, some with oil-drops, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed taiga, on fallen trunk of deciduous tree (*Prunus?*), 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28996; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 500 m, forest with *Quercus mongolica*, on trunk of deciduous tree, 8 June 1985, *leg. B. Zarzycka*, KRAM-F 27786.

DISTRIBUTION IN ASIA. China, India, Iran, Korea, Russia (Siberia and Far East) and Thailand.

NOTES. Temperate species known also from Europe and North America.

REFERENCES. Anonymous (1983a: 108); Azbukina *et al*. (1984: 36); Bondartsev (1953: Fig. 145, Pls. CIX: 2; CLXXXIII: 4); Breitenbach & Kränzlin (1986: 302, Pl. 379); Hallenberg (1981: 494); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 383, Fig. 384); Pilát (1940: 77); Ryvarden & Gilbertson (1994: 446, Figs 224–225); Sharma (2000: 96); Teng (1996: 332, as *Fomes populinus*).

Phallales E. Fisch. 1898

Geastraceae Corda 1842

Geastrum fimbriatum Fr.

Syst. Mycol. **3**: 16. 1829 (as *Geaster*).

G. sessile (Sow.) Pouzar, Folia Geobot. Phytotax. **6**: 93–97. 1971.

Basidiocarp 20–60 mm in diam. Exoperidium split into 6–8 rays. Endoperidium 10–20 mm in diam., globose, sessile, thin and papery. Peristome fibrillose.

Capillitium threads 4.5–6.6 μm wide. Basidiospores 2.5–3.6 μm in diam., globose, minutely verruculose, brownish.

SPECIMENS EXAMINED. Myohyang-san Mts: near Habiro Temple, (27), alt. *ca* 200 m, mixed forest, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28941; between Soham-ho Lake (32) and Pyongsong town, deciduous forest, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30580.

DISTRIBUTION IN ASIA. China, India, Kazakhstan, Kirghizia, Korea and Russia (e.g. North Altai, Siberia and Far East).

NOTES. Cosmopolitan species known also from Europe, South Africa, North America and Australia.

REFERENCES. Anonymous (1978: 177; 1983a: 127); Azbukina *et al*. (1984: 60); Breitenbach & Kränzlin (1986: 382, Pl. 501); Cunningham (1944: 176, Pls XXVII: 10, XXXVI: 36); Dörfelt (1985: 44, Fig. 35, 65–66 and coloured photo on cover); Gorbunova (1997: 19); Pilát (1958a: 412, Figs 132 and 136); Shvartsman & Filimonova (1970: 156, Fig. 53); Sosin (1973: 115, Fig. 66); Sunhede (1990: 180, Figs 68–76); Teng (1996: 509); Ying *et al*. (1983: 168).

Geastrum lageniforme Vittad.

Monogr. Lycoperd. 16–17. 1842.

Mature basidiocarp 40–50 mm in diam. Exoperidium 15–30 mm in diam., splitting into 6–8 rays. Upper surface of rays ochraceous yellow, then brownish. Endoperidium 10–20 mm in diam., globose, without stipe, ochraceous yellow to brownish. Gleba brownish with olivaceous tint.

Capillitium threads to 6.6 μm wide, simple to branched pale brownish. Basidiospores 3.0–4.8 μm in diam., globose, yellow-brown to brown, verruculose.

SPECIMENS EXAMINED. Between Soham-ho Lake (32) and Pyongsong town, *ca* 25 km N of Pyongyang, alt. *ca* 300 m, deciduous forest, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30581; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27847. – On ground.

DISTRIBUTION IN ASIA. Korea, Pakistan and Russia (e.g. Far East).

NOTES. Known also from Europe, North America and South Africa. *G. lageniforne* may be confused with other species of *Geastrum*, e.g. *G. saccatum* Fr. and *G. triplex* Jungh.

REFERENCES. Dörfelt (1985: 42, Fig. 40); Jülich (1984: 481); Pilát (1958a: 487, Figs 161a–b, as var. *koreanum* V. J. Staněk, *in* Pilát 1958a: 494); Sosin (1973: 106, Fig. 55); Sunhede (1990: 242, Figs 100–106).

Geastrum mirabile (Mont.) E. Fischer

Nat. Pflanzenfam. **7a**: 73. 1933.

Geaster mirabilis Mont., Ann. Sci. Nat., Ser. III, **4**: No. 595. 1855. For further synonyms see Bottomley (1948: 599).

Young basidiocarp 4–10 mm diam., globose to obovoid, cream to cream-buff. Exoperidium saccate, split star-like into 4–5 rays. Endoperium sessile, thin, membranaceous, brownish. Peristome even, silky, conic, marked with definite circular zone.

Capillitium threads 3–5 μm wide, subhyaline to brownish, thick-walled. Basidiospores 3–4 μm in diam., globose, minutely verrucose, brownish.

SPECIMEN EXAMINED. Suian-san Mts (48), alt. *ca* 200 m, young pine forest (*Pinus densiflora*), on ground, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 25476.

DISTRIBUTION IN ASIA. China, India, Japan, Korea and Sri Lanka.

NOTES. Known also from North and South America, Africa and Australia.

REFERENCES. Anonymous (1978: 178; 1983a: 127); Bottomley (1948: 598); Cunningham (1944: 171, Pls. XXVI: 9; XXXVI: 29); Imazeki & Hongo (1975, **1**: 124, Pl. 58: 320); Teng (1996: 507); Wojewoda *et al*. (1993: 125).

Geastrum quadrifidum Pers.: Pers.

Syn. Meth. Fung. 133. 1801.

G. quadrifidum Pers., Neues Mag. Bot. **1**: 86. 1794. – *Lycoperdon coronatum* Scop., Fl. Carniol., ed. 2, **2**: 490. 1772.

Basidiocarp 15–35 mm in diam., 40–70 mm high. Exoperidium, fornicate, cream-coloured to ochraceus, split star-like into 4–5 rays. Endoperidium grey- to lilac-brown when young, ochraceous to brown with age. Peristome fibrillose. Peristome distinctly delimited.

Hyphae of endo- and exoperidium smooth, hyaline, thick-walled. Threads of capillitium 3–8 μm wide, smooth to finely encrusted, red-brown, thin- to thick-walled, branched. Basidiospores 4–6 μm in diam., globose, verrucose, brown. Spore-print violet-brown.

SPECIMENS EXAMINED. Paekdu-san Mts: taiga between Paekdu-san Mt. peak (1) and Samji-yon town, (8), alt. *ca* 1700 m, spruce forest (*Picea ajanensis* and *P. koraiensis*), 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28940; between Tuman-gang River (5) and Taehongdan (6), alt. *ca* 1500 m, mixed forest, under *Picea ajanensis*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28942. – On ground.

DISTRIBUTION IN ASIA. China, India, Japan, Kazakhstan, Russia (e.g. Siberia).

NOTES. New to North Korea. Known also from Europe, North America, South America, South Africa, Australia and New Zealand.

REFERENCES. Bottomley (1948: 591); Breitenbach & Kränzlin (1986: 382, Pl. 500); Dörfelt (1985: 48, Figs 53–70); Eckblad & Ellingsen (1984: 37); Hansen & Knudsen (1997: 343); Pilát (1958a: 142–143, 172); Shvartsman & Filimonova (1970: 168, Fig. 59); Sosin (1973: 106, Fig. 57); Sunhede (1990: 338, Figs 146–152).

Gomphaceae Donk 1961

Gomphus floccosus (Schwein.) Singer

Lloydia **8**: 140. 1945.

Cantharellus floccosus Schwein., Trans. Am. Phil. Soc. **2**: 153. 1832. For further synonyms see Corner (1966: 119).

Basidiocarp divided into pileus and stipe. Pileus up to 50 mm in diam., cyathiform or infundibuliform. Upper surface flocculose-squamulose, yellow, orange to subochraceous. Hymenophore with narrow, vein-like, dichotomously forked, anastomosing ridges, l.0–1.5 mm wide, reticulate to subporoid, orange to subochraceous. Flesh whitish. Stipe up to 100 × 5–10 mm, hollow, glabrous, concolorous.

Hyphal system monomitic. Hyphae 2–20 μm wide, thin- or somewhat thick-walled, without clamps. Cystidia absent. Basidia 60–85 × 10–12 μm, with 4 sterigmata, without basal clamp. Basidiospores 10–17 × 5–8 μm, elongate-elliptic, finely rough, thick-walled, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Kuchung Falls (26), 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27062; Kumgang-san Mts: near Onjong-ri (60), 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27063; shore of Samil-po Lake, *leg. W. Wojewoda*, 13 Aug. 1983, KRAM-F 27064. – Pine forest, on ground, under *Pinus densiflora*.

DISTRIBUTION IN ASIA. China (e.g. Tibet), Japan, Korea, Nepal, Pakistan and Russia (e.g. Primorski Krai).

NOTES. Known also from North America (Canada and United States).

REFERENCES. Adhikari (1990: 115); Anonymous (1978: 137; 1983a: 101); Azbukina *et al*. (1984: 40); Corner (1966: 119); Domański (1978: 100); Govorova (1999: 231); Imazeki & Hongo (1975, **1**: 103, Pl. 47: 269); Teng (1996: 309); Vasilyeva (1978: 179, Pl. 204); Zhao *et al*. (1983: 76, 80, Pl. 16: 1–2).

Phallaceae Corda 1842

Lysurus mokusin (Cibot: Pers.) Fr.

Syst. Mycol. **2**: 286. 1823.

Phallus mokusin Cibot, Nov. Comm. Acad. Sc. Petrop. **19**: 373. 1775: Pers., Syn. Fung. 245, 1801. For further synonyms see Dring (1980: 74).

Unexpanded basidiocarp up to 30 mm in diam., subglobose, whitish. Receptacle 60–100 × 10–20 mm. Stipe 5–10 mm thick, hollow, columnar, whitish to pale flesh-coloured, 4–6-angled, bearing apically 4–6 arms, 15–25 mm long, acuminate, rugulose, orange. Gleba olivaceous, foetid. Volva white, with white strands.

Basidiospores 3.5–5.0 × 1.5–2.0 μm, elliptic, smooth. Wall up to 0.5 μm thick (Fig. 124).

SPECIMEN EXAMINED. Pyongyang, near Pyongyang Hotel, square with *Salix babylonica*, on bank of Taedong-gang River (40), near Taedongmun Street, on ground, 1 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27817.

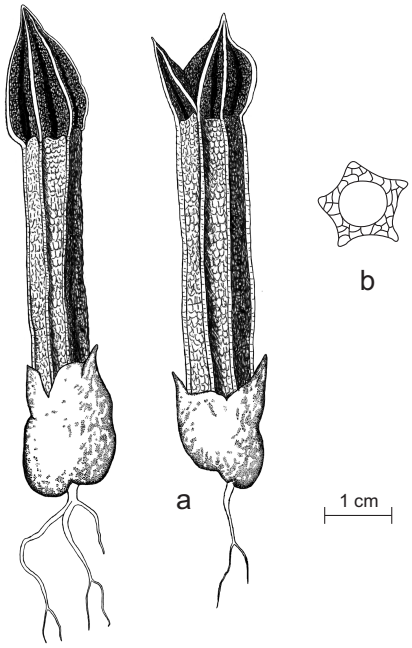


Fig. 124. *Lysurus mokusin* (Cibot: Pers.) Fr.: a – basidiocarps, b – section of stems base (KRAM-F 27817).

DISTRIBUTION IN ASIA. China, Japan and Korea.

NOTES. Known also from North America (United States) and Australia, probably introduced.

REFERENCES. Anonymous (1978: 181; 1983a: 126); Cunningham (1944: 104, Pl. XII: 2); Dring (1980: 74, Fig. 23C–E); Imazeki & Hongo (1975, **1**: 121, Pl. 57: 311); Lloyd (1909: 36, Fig. 37); Teng (1996: 491, Fig. 327); Wojewoda *et al*. (1990: 59, Pl. without number: e-f, after p. 64; 1993: 125, 128); Ying *et al*. (1983: 164).

Mutinus bambusinus (Zoll.) E. Fischer

Ann. Jard. Bot. Buitenzorg **6**: 30. 1887.

Phallus bambusinus Zoll., Syst. Verz. Indish. Arch. **1**: 11. 1854. – *Cynophallus bambusinus* (Zoll.) Rea, Brit. Basid. 23. 1922.

Basidiocarp 43–70 mm high. Head 10–20 mm long, pale raspberry red. Stipe up to 30–45 mm high, toward head and in centre pale pink, below lighter, whitish pink. Volva 18–22 mm high, whitish. Smell weak, pleasant or foetid.

Basidiospores 4.0–4.5 × 1.5–2.0 μm, subcylindric. Spore-mass dark olive (Fig. 125).

SPECIMENS EXAMINED. Myohyang-san Mts: in Hyang-san River Valley, above Myohyang-san Hotel (20), alt. *ca* 50 m, deciduous forest with *Pinus densiflora*, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29045; Kumgang-san Mts: near Onjong-ri village (60), at foot of Sujong Mt., alt. *ca* 50–100 m, mixed forest, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29044. – On ground.

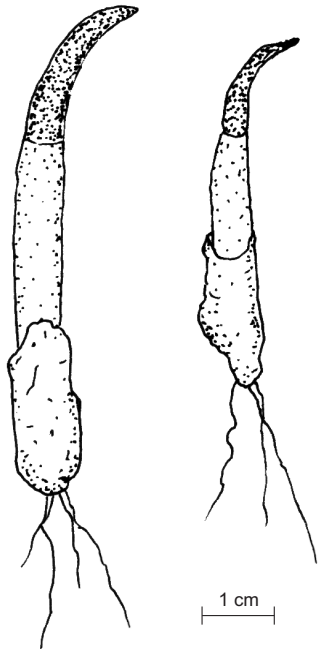


Fig. 125. *Mutinus bambusinus* (Zoll.) E. Fischer: basidiocarps (KRAM-F 29045).

DISTRIBUTION IN ASIA. China, Indonesia (Java), Japan, Korea, Sri Lanka and Vietnam.

NOTES. Known also from Africa (Kivu, Rwanda and Burundi), and South America (Brazil). It has been noted, adventitious, in hot-houses at Kew, Great Britain.

REFERENCES. Anonymous (1983a: 126); Bottomley (1948: 513, Pl. X: 2); Demoulin & Dring (1975: 364, Fig. 12); Imazeki & Hongo (1975, **2**: 168, Pl. 56: 327); Lloyd (1909: 28, Fig. 26); Pilát (1958a: 57, Fig. 10); Teng (1996: 487); Wojewoda *et al.* (1993: 128).

Phallus duplicatus Bosc

Mag. Ges. Naturforsch. Freunde Berlin 86. 1811.

Phallus impudicus var. *duplicatus* (Bosc) Krieglst. – *Dictyophora duplicata* (Bosc) E. Fischer, *in* Sacc., Syll. Fung. 7: 6. 1888. For further synonyms see Pilát (1958a: 73).

Receptacle 120–180 mm high. Head 30 × 20 mm, campanulate. Hymenophore reticulate, covered with slimy brownish gleba with upleasant smell. Veil white, extending below head, made up of thick cellular threads. Stipe 80 × 15 mm, white, with cellular-spongy walls, hollow.

SPECIMEN EXAMINED. Myohyang-san Mts: Hyang-san River Valley, above Myohyang-san Hotel (20), alt. *ca.* 100 m, deciduous forest with *Pinus densiflora*, on ground, 4 Aug. 1983, *leg. W. Wojewoda*, specimens not preserved.

DISTRIBUTION IN ASIA. China, Kazakstan, and Russia (e.g. Siberia, and Far East: Primorski Krai).

NOTES. New to North Korea. Known also from Europe (rare), North America (very common).

REFERENCES. Azbukina *et al.* (1984: 60); Gorlenko *et al.* (1980: 248); Lloyd (1909: 20, Fig. 16); Pilát (1958a: 73, Fig. 16); Sosin (1973: 147, Fig. 97); Teng (1996: 489, Fig. 322); Vasilyeva. (1978: 177, Pl. 198).

Phallus impudicus L.: Pers.

Syn. Meth. Fung. 242. 1801.

P. impudicus L., Spec. Plant. 1648. 1753.

Basidiocarp consisting of head and stipe. Head conic-campanulate, soft, light to dark olivaceous, with slimy gleba. Smell sweetish-carrion-like. Hymenophore reticulate, covered by olive, foetid spore mass. Stipe (receptacle) white, hollow, with cellular-spongy walls. Volva whitish.

Generative hyphae 1.5–2.5 μm, 1.5–2.5 μm wide, smooth, hyaline, thin-walled, with clamps. Hyphae of endoperidium 1.5–3.0 μm wide, gelatinized with brownish pigmentation, with clamps. Basidia 18.0–23.0 × 3.0–4.5 μm, slenderly clavate, with 6–8 sterigmata and basal clamp. Basidiospores 3.5–4.5 × 1.5–2.0 μm, elliptic, smooth, brownish, thin-walled, with 2 oil-drops, non-amyloid.

SPECIMEN EXAMINED. Shore of Soham-ho Lake (32), mixed forest, on ground, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29234.

DISTRIBUTION IN ASIA. Caucasus, China, India, Iran, Japan, Kazakhstan, Korea, Mongolia, Pakistan, Russia (e.g. Siberia and Far East) and Sri Lanka.

NOTES. Known also from Europe and Africa.

REFERENCES. Anonymous (1978: 185; 1983a: 126), Azbukina *et al*. (1984: 60); Breitenbach & Kränzlin (1986: 400, Pl. 528); Eckblad (1976: 69); Imazeki & Hongo (19875, **1**: 121, Pl. 57: 312); L. Lange (1974: 42); Lloyd (1909: 20, Fig. 16); Pilát (1936: 422; 1958a: 60, Figs 2–3, 11–12); Shvartsman & Filimonova (1970: 23, Fig. 2); Sosin (1973: 146, Fig. 96); Teng (1996: 488, Fig. 321); Ying *et al*. (1983: 163).

Phallus rugulosus (E. Fischer) O. Kuntze

Rev. Gen. Plant. **2**: 865. 1891.

Ityphallus rugulosus E. Fischer, Ann. Jard. Buitenzorg **6**: 35. 1887.

Receptacle 150–205 × 13–20 mm, sheathed at base by whitish volva. Head 28–40 × 13–14 mm, campanulate, orange-red (without gleba), rugose. Gleba olivaceous-brown to olivaceous-black. Stipe 135–165 mm high, hollow, with spongy walls, whitish toward the volva, in centre very light orange-red, at upper part red with pinkish tint. Volva white.

Basidiospores 4.0–4.5 × 2.0 µm.

SPECIMENS EXAMINED. Pyongyang town: Central Botanical Garden (36), under trees, 3 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27791; Mangyongdae (41), forest park with *Pinus densiflora*, 2 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27792. – On ground.

DISTRIBUTION IN ASIA. China, Japan and Korea.

REFERENCES. Anonymous (1978: 186; 1983a: 126); Imazeki & Hongo (1975, **2**: 169, Pl. 56: 331); Lloyd (1909: 18, Fig. 9); Teng (1996: 488); Wojewoda *et al*. (1993: 125, 128, as *Phallus rubicundus*).

Pseudocolus fusiformis (E. Fischer) Lloyd

Synops. Known Phall. 53. 1909.

Anthurus javanicus (Penz.) Cunnin., Proc. Linn. Soc. N.S.W. **56**: 186. 1931. – *Colus fusiformis* E. Fischer, Denkschr. Schweiz. Ges. Nat. **32**: 64. 1890. – *Pseudocolus javanicus* (Penz.) Lloyd., Lloyd, Mycol. Notes **28**: 358. 1907 [non *Anthurus javanicus* ss. Teng 1996). – *?P. schellenbergiae* (Sumstine) Johnson, Ohio Biol. Survey Bull. **22**: 338. 1929. For further synomyms see Dring (1980: 65).

Young basidicocarp 25 × 17 mm, ovoid, egg-like, arising on white mycelial strands, white. Mature basidiocarp 35–70 × 10–25 mm. Receptacle with hollow stipe dividing into 3 vertical, orange, pink-red or red columns. Gleba almost black. Smell weak to strong, unpleasant, excrement-like.

Basidiospores 3.0–4.5 × 1.5–2.0 µm, elliptic, smooth, hyaline, thin-walled (Fig. 126).

SPECIMENS EXAMINED. Kumgang-san Mts: near Samson Rock (56), Onjong-gang Stream Valley, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27813; Okryu-dong Valley (59), below Kuryong Falls, alt. *ca* 500 m, 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27815; alt. *ca* 500 m, 20 July 1986, *leg. Z. Heinrich*, KRAM-F 28025; *ca* 10 km of Onjong-ri (60), Onjong-gang Valley, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27814; Chanto Forest (61), alt. *ca* 50–100 m, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 27816. – Mixed forests, on ground.

DISTRIBUTION IN ASIA. Caucasus, Indonesia (Java), Japan, Korea and Russia (e.g. Far East).

NOTES. Known also from Réunion, Australia, New Zealand, Hawaii, East United States. The North American stations are perhaps introductions.

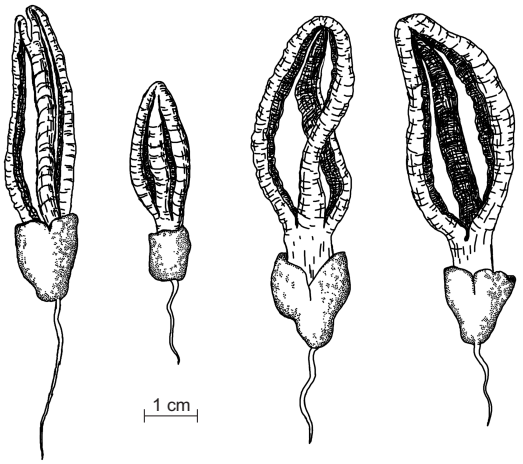


Fig. 126. *Pseudocolus fusiformis* (E. Fischer) Lloyd: basidiocarps (KRAM-F 27813).

REFERENCES. Anonymous [1978: 182, as *Pseudocolus schellenbergiae* (Sumst.) John. – *P. 'japonicus'* Penzig; 1983a: 126, as *Pseudocolus schellenbergiae*]; Cunningham (1944: 103, Pl. X: 4); Dring (1980: 65, Fig. 21A–D); Imazeki & Hongo (1975, **1**: 122, Pl. 57: 314); Lloyd (1909: 53, Fig. 68); Pilát (1958a: 83, Fig. 18: 1–2); Sosin (1973: 142, Fig. 91); Wojewoda *et al*. (1990: 59, Pl. Without number: g, after p. 64; 1993: 125, 128).

Ramariaceae Corner 1970

Ramaria eumorpha (P. Karst.) Corner

Monogr. *Clavaria* all. Gen. 575. 1950.

Clavariella eumorpha P. Karst., Symb. Myc. Fenn. **9**: 55; Hattsv. 2: 185. 1882. – *Clavaria eumorpha* (P. Karst.) Sacc., Syll. Fung. **6**: 701. 1888. – *C. invalii* Cotton & Wakef., Trans. Brit. Mycol. Soc. **6**: 176. 1919. – *Ramaria invalii* (Cooton & Wakef.) Donk, Rev. Niederl. Homobas. Aphyll. **2**: 113.1933. – *R. corrugata* (P. Karst.) Schild ss. Schild. – *R.. abietina* (Pers.: Fr.) Quél. ss. Gramberg, Henning *et auct., non* Pers. = *R. abietina* ss. Michael *et al*. 1983a: 312, Pl. 132).

Basidiocarp to 70 mm high, clavarioid, dichotomously dividing branches, with acute apices, pale ochraceous yellow. Flesh white. Taste mild to slightly bitter. Stipe 3–10 mm thick, stout, distinct, base with white tomentum and whitish or yellowish rhizomorphs.

Hyphal system monomitic. Hyphae 3–10 µm wide, smooth, hyaline, thin- to thick-walled, some swollen, with clamps. Basidia 35.0–55.0 × 5.5–8.5 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 5.8–10.6 × 3.8–5.8 µm, oblong-elliptic, verrucose-spinose, yellow to pale ochraceous, thin- to somewhat thick-walled (Fig. 127).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53199; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53195. – Taiga, on ground, under coniferous trees, among fallen needles.

DISTRIBUTION IN ASIA. China.

NOTES. This species may be confused e.g. with *R. flaccida* (Fr.) Bourd.

REFERENCES. Anonymous (1983a: 100); Corner (1950: 575); Hansen & Knudsen (1997: 276, Fig. 555);

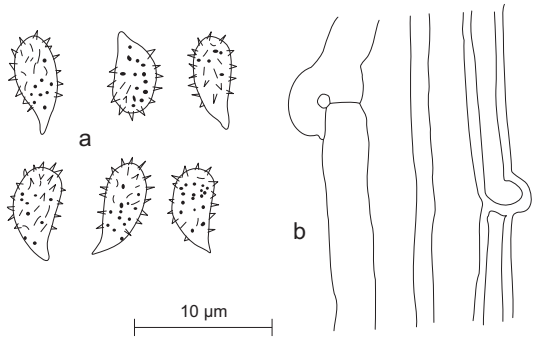


Fig. 127. *Ramaria eumorpha* (P. Karst.) Corner: a – basidiospores, b – hyphae (KRAM-F 53195).

Jülich (1984: 103); Michael *et al*. (1983a: 312, Pl. 133); Parmasto (1965: 124); Pilát (1958b: 163); Teng (1996: 302).

Ramaria obtusissima (Peck) Corner

Monogr. *Clavaria* all. Gen. 609. 1950.

Clavaria obtusissisma Peck, Bull. N.Y. St. Mus. **167**: 39. 1913.

Basidiocarp up to 60 mm high, clavarioid, dichotomously dividing branches, light yellow, then some wine-coloured. Ends of branches with blunt and short tips. Flesh white, soft, brittle. Taste slightly bitter. Stipe 5 mm thick, stout.

Hyphal system monomitic. Hyphae 3–10 µm wide, smooth, hyaline, thin- to somewhat thick-walled, with clamps. Basidia 55.0–77.0 × 7.7–9.5 µm, slenderly clavate, with 2–4 sterigmata and basal clamp. Basidiospores 8.7–15.5 × 3.8–5.8 µm, cylindric-elliptic, smooth, hyaline, thin- to slightly thick-walled, with oil-drops, non-amyloid (Fig. 128).

SPECIMEN EXAMINED. Suian-Mts (48), alt. *ca* 200 m, mixed forest, on ground, 5 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 53196.

DISTRIBUTION IN ASIA. China and Russia (Primorski Krai).

NOTES. Known also from North America (Canada and United States).

REFERENCES. Anonymous (1983a: 100); Breitenbach & Kränzlin (1986: 364, Pl. 472); Corner (1950:

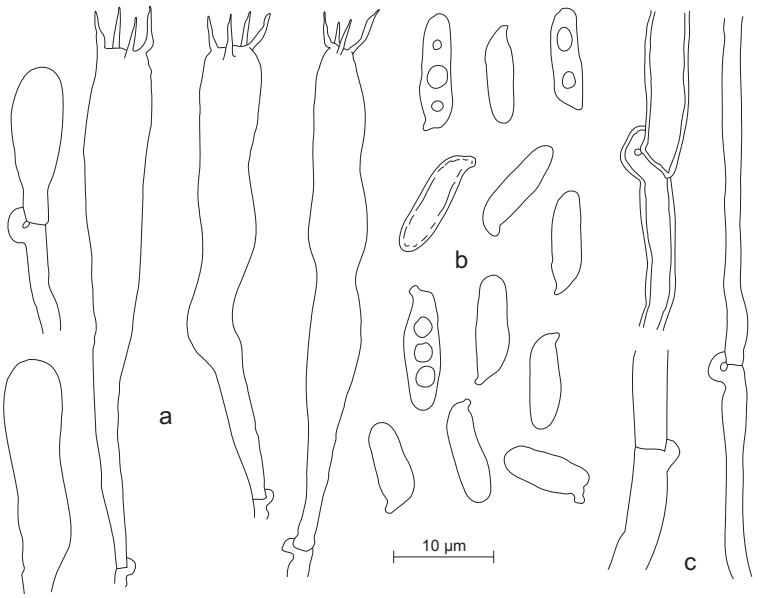


Fig. 128. *Ramaria obtusissima* (Peck) Corner: a – basidia, b – basidiospores, c – hyphae (KRAM-F 53196).

609); Hansen & Knudsen (1997: 274, Fig. 564); Jülich (1984: 107); Parmasto (1965: 142, Fig. 102); Pilát (1958b: 179, Pl. XXXVa-b); Teng (1996: 302).

Polyporales Gäum. 1926

Albatrellaceae (Pouzar) Nuss 1980

Albatrellus confluens (Fr.) Kotl. & Pouzar

Česká Mykol. **11**: 154. 1957.

Polyporus confluens Fr., Syst. Mycol. **1**: 355. 1821. – *Scutiger confluens* (Fr.) Bondartsev & Singer, Ann. Mycol. **39**: 47. 1941.

Basidiocarp centrally or laterally stipitate. Pileus 40–100 mm in diam. Upper surface convex, smooth or tuberculate, finely tomentose, areolate with age, yellow-orange, pinkish buff to orange-brown. Margin sharp, incurved. Flesh corky-fleshy. Smell pleasant. Taste somewhat bitter. Hymenophore porose. Pores 2–4(–5) per mm, circular to angular, at first white, later cream-coloured. Stipe absent or very short.

Hyphal system monomitic. Hyphae 4–5 µm in diam., smooth, hyaline, thin-walled, with clamps. Cystidia absent. Basidia 17–24 × 4–6 µm, with 4 sterigmata and basal clamp. Basidiospores 4.0–5.0 × 2.5–3.5 µm, elliptic to ovoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Kumgang-san Mts: pine Chanto Forest (61), alt. *ca* 50 m, on ground, under *Pinus densiflora*, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52913.

DISTRIBUTION IN ASIA. China, India, Japan, Korea and Russia (e.g. Siberia).

NOTES. Cosmopolitan, circumboreal in coniferous forests, especially under *Pinus*, mycorrhizal, terrestrial, not a wood-rotting fungus.

REFERENCES. Anonymous (1983a: 108); Bondartsev (1953: 598, Fig. 162: 3); Breitenbach & Kränzlin (1986: 320, Pl. 406); Hansen & Knudsen (1997: 265, Fig. 533); Núñez & Ryvarden (2001: 189); Ryvarden & Gilbertson (1993: 87, Fig. 23); Sharma (2000: 32); Teng (1996: 369).

Albatrellus cristatus (Pers.: Fr.) Kotl. & Pouzar

Česká Mykol. **11**: 154. 1957.

Boletus cristatus Pers., Syn. Meth. Fung. 522. 1801. – *Polyporus cristatus* (Pers.): Fr., Syst. Mycol. **1**: 356.

1821. – *Scutiger cristatus* (Pers.: Fr.) Bondartsev & Singer, Ann. Mycol. **39**: 47. 1941.

Basidiocarp centrally or laterally stipitate. Upper surface greenish to buff, azonate. Hymenophore poroid white to yellowish or greenish yellow. Pores circular to angular, 2–4 per mm. Context pale buff.

Hyphal system monomitic. Hyphae 4–20 µm in diam., smooth, hyaline, thin- to thick-walled, without clamps. Cystidia absent. Basidia 20–30 × 7–10 µm, with 4 sterigmata, without basal clamp. Basidiospores 5–7 × 4–5 µm, broadly elliptic, smooth, hyaline, with slightly thickened walls, non-amyloid.

SPECIMENS EXAMINED. Suian-san Mts (48), alt. *ca* 200 m, mixed forest, 5 Sept. 1982, *leg*. *K. Zarzycki*, KRAM-F 52914; Kumgang-sam Mts: pine Chanto Forest (61), alt. *ca* 50 m, under *Pinus densiflora*, 21 July, *leg*. *W. Wojewoda*, KRAM-F 52915. – On ground.

DISTRIBUTION IN ASIA. Caucasus, China, Japan, Korea and Vietnam.

NOTES. Circumboreal, temperate areas in Asia, Europe and eastern North America.

REFERENCES. Anonymous (1983a: 108); Bondartsev (1953: 598, Fig. 162: 3); Breitenbach & Kränzlin (1986: 320, Pl. 407); Núñez & Ryvarden (2001: 190); Ryvarden & Gilbertson (1993: 89, Fig. 24); Teng (1996: 369).

Atheliaceae Jülich 1982

Amphinema byssoides (Pers.: Fr.) J. Erikss.

Symb. Bot. Upsal. **16**: 112. 1958.

Thelephora byssoides Pers., Syn. Meth. Fung. 577. 1801. – *T. byssoides* Pers.: Fr., Syst. Mycol. **1**: 452. 1821.

Basidiocarp corticioid, resupinate, loosely adnate to substrate, thin, almost athelioid. Hymenophore arachnoid, furfuraceous, cream-coloured, ochre- to sulfur yellow. Marginal zone irregularly fringed with rhizomorphs. Consistency loosely filamentous, fibrous to thin and membranous.

Hyphal system monomitic. Hyphae 2–4 µm wide, smooth or finely granulose, pale-yellowish, thin- to thick-walled, with clamps. Cystidia up to 130 µm long, 3.8–5.8 µm wide, cylindric, hyphalike, blunt, densely covered with small granules toward tips, thin- to thick-walled, yellowish, with several clamped septa. Basidia up to 18–23 × 5–6 µm, clavate, with 4 sterigmata. Spores 3.6–4.2 × 2.4–3.0 µm, elliptic to oval, smooth, hyaline, thin-walled or with thickened wall, with one drop, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: under Paekdu-san Mt. peak (1), alt. *ca* 2000 m, near upper forest line, taiga with *Larix olgensis* and *Juniperus*, on dead twigs of *Juniperus nana*, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30291; slightly below upper forest line, alt. *ca* 1900 m, taiga, on fallen trunk of coniferous tree (?*Abies nephrolepis*), 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30322; *ca* 20 km SE of Paekdu-san Mt. peak, alt. *ca* 1800 m, taiga, on basidiocarps of *Coniophora olivacea* growing on fallen trunk of *Picea* sp., 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM F29098; *ca* 30 km SE of Paekdu-san Mt. peak, alt. *ca* 1500 m, taiga with *Larix olgensis* and *Picea*, on fallen, decayed trunk of coniferous tree, 3 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29000; shore of Samji-yon Lake (7), taiga, on fallen decayed trunk of *?Larix olgensis*, 1 Sept. 1983, *leg*. *W. Wojewoda*; taiga with *Picea*, on stump of coniferous tree, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29062; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, in taiga with *Larix*, *Abies*, and *Picea*, on fallen decayed trunk, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29001, 29002; *ca* 10 km S of Samji-yon town, alt. *ca* 1300 m, taiga with *Abies*, *Larix and Picea*, on fallen dead rotten trunk of coniferous tree, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 52779 (together with *Coniophora olivacea*); Myohyang-san Mts: near Chontae Falls (28), alt. *ca* 300 m, mixed forest, on bare soil, 16 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30289.

DISTRIBUTION IN ASIA. China, India, Iraq, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 98, Pl. 73); Domański (1988: 83); Eriksson & Ryvarden (1973: 81, Fig. 29, Pls. 5–6); Ginns & Lefebvre (1993: 19); Jülich & Stalpers (1980: 41); Maekawa (1994: 40, Fig. 27); Maekawa & Zang (1995: 88); Mukhin (1993: Tab. 1); Rattan (1977: 264, Figs A-C, p. 265); Rattan *et al*. (1978: 767, Fig. 4a–d).

Athelia bombacina Pers.

Mycol. Eur. **1**: 85. 1822.

Basidiocarp corticioid, resupinate, appressed tightly to substrate, pellicular, thin. Hymenophore smooth to slightly tuberculate, whitish, cream-coloured to ochre. Consistency soft.

Hyphal system monomitic. Hyphae 2–4 μm wide, thin- to thick-walled, smooth or encrusted, hyaline, with clamps. Cystidia absent. Basidia 14.4–15.6 × 4.5–5.0 μm, cylindric to narrowly clavate, with 4 sterigmata, and a basal clamp. Spores 3.6–4.8 × 1.8–3.0 μm, cylindric to narrowly ellipsoid, smooth, hyaline, thin-walled, some with drops, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: between Mubong (3) and Taehong-dan (6), alt. *ca* 1300–1500 m, mixed forest, on fallen trunk of coniferous tree, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30292.

DISTRIBUTION IN ASIA. Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 82, Pl. 50); Domański (1988: 103); Eriksson & Ryvarden (1973: 107, Figs 39–40); Ginns & Lefebvre (1993: 23); Jülich (1972: 62, Fig. 10); Jülich & Stalpers (1980: 49); Mukhin (1993: Tab. 1).

Athelia epiphylla Pers. ss. J. Erikss. & Ryvarden

Corticiaceae North Eur. **2**: 113, 117. 1973

A. ovata Jülich, Willdenowia Beih. **7**: 106, Fig. 107. 1972.

Basidiocarp corticioid, resupinate, easily loosened from substrate, thin, membranous. Hymenophore smooth, white to cream-coloured. Consistency cottony, soft.

Hyphal system monomitic. Hyphae 3.5–5.5 μm wide, hyaline, some coarsely encrusted, thin-walled, some with clamps. Cystidia absent. Basidia 13.2–17.4 × 7.8 μm, clavate, with 4 sterigmata, without basal clamp. Spores 4.8–8.4 × 3.6–4.8 μm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Habiro Temple (27), alt. *ca* 200 m, mixed forest, on decayed trunk, 28 June 1986, *leg*. *W. Wojewoda*, KRAM-F 30300.

DISTRIBUTION IN ASIA. Armenia, Iran and Japan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 84, Pl. 52); Domański (1988: 106); Eriksson & Ryvarden (1973: 112, Figs 42–49, Pl. 12A); Ginns & Lefebvre (1993: 23); Hallenberg (1981: 482); Jülich (1972: 78, Figs 15–16; 1984: 137, 138); Jülich & Stalpers (1980: 52); Maekawa (1993: 25, Fig. 15).

Athelia fibulata M. P. Christ.

Dansk Bot. Ark. **19**: 148. 1960.

Basidiocarp corticioid, resupinate, easily loosened from substrate, thin, membranous. Hymenophore smooth or slightly grandinioid, white to cream-coloured. Consistency soft.

Hyphal system monomitic. Hyphae 2.5–4.3 μm wide, smooth, hyaline, thin- or slightly thick-walled, with clamps. Cystidia absent. Basidia 15.6–21.6 × 4.2–6.0 μm, clavate, with 4 sterigmata and a basal clamp. Basidiospores 4.8–10.8 × 2.4–5.4 μm, narrowly elliptic to almost cylindric, smooth, hyaline, thin-walled, with drops, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: under Paekdu-san Mt. peak (1), slightly below upper forest line, alt. *ca* 1900 m, taiga with *Larix olgensis*, on stump of coniferous tree, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30297; between Paekdu-san Mt. peak and Samji-yon town, *ca* 1800 m, taiga with *Abies nephrolepis*, *Larix olgensis*, *Picea jezoensis*, and *P. koraiensis*, on fallen twigs of *Abies nephrolepis*, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29103; shore of Samji-yon Lake (7), mixed taiga, on lying trunk, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30298; on fallen dead trunk of *Betula platyphylla*, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30308.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan and Russia.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 84, Pl. 53); Domański (1988: 103); Eriksson & Ryvarden (1973: 123, Fig. 50); Ginns & Lefebvre (1993: 23); Jülich (1972: 86, Fig. 17; 1984: 137); Jülich & Stalpers (1980: 49); Maekawa (1993: 26, Fig. 16); Maekawa & Zang (1995: 88).

Fibulomyces mutabilis (Bres.) Jülich

Willdenowia Beih. **7**: 182, Fig. 43. 1972.

Corticium mutabile Bres., Fungi Trident. **2**: 59. 1892.

Basidiocarp corticioid, resupinate, pellicular, attached loosely to substrate, thin, membranous-tomentose. Hymenophore smooth, white when young, later cream-coloured. Consistency cottony, soft.

Hyphal system monomitic. Hyphae up to 4.8 (–5.4) μm wide, smooth or encrusted with crystals, hyaline, thin- or thick-walled, with clamps at all septa. Cystidia absent. Basidia 10.8–16.8 × 3.0–4.5 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 3.6–4.5 × 1.8–2.4 μm, elliptic to subcylindric, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed forest, on decayed trunk of tree, 28 June 1986, *leg*. *W. Wojewoda*, KRAM-F 30295.

DISTRIBUTION IN ASIA. China, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Konown also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 86, Pl. 57); Domański (1988: 272); Eriksson & Ryvarden (1975: 389, Figs 159, 161); Ginns & Lefebvre (1993: 67); Jülich & Stalpers (1980: 101); Maekawa (1993: 31, Fig. 21); Maekawa & Zang (1995: 90); Mukhin (1993: Tab. 1).

Irpicodon pendulus (Alb. & Schwein.: Fr.) Pouzar

Folia Geobot. Phytotax. **1**: 371. 1966.

Sistotrema pendulum Alb. & Schwein., Consp. Fung. Lusatiae. 261. 1805. – *S. conchatum* Ehrenb., Silv,. Myc. Berol. 30. 1818. – *Hydnum pendulum* (Alb. & Schwein.): Fr., Syst. Mycol. **1**: 413. 1821. – *Irpex pendulus* (Alb. & Schwein.: Fr.) Fr., Elench. Fung. 143. 1825. – *Trametes pendula* (Alb. & Schwein.: Fr.) Pilát, Atl. Polyp. 324., Fig. 138, Pl. 217: a. 1940. – *Radulum pendulinum* Nikol., *in* Savich, Flora Plant. Crypt. URSS **6**(2): 94. 1961.

Basidiocarp 15–23 mm broad, pileate, flabelliform, imbricate. Upper surface radially wrinkled, ochraceous. Hymenophore irpicoid with blunt, cylindric or flattened, irregular aculei up to 2 mm long.

Hyphal system monomitic. All hyphae smooth, hyaline, thin-walled, with clamps. Hyphae of subhymenium 2–4 μm. Some hyphae of inner trama of pileus ± widened, 10.0–13.5 μm wide, bladder-like, irregularly constricted. Some widened hyphae are filled with oily protoplasm. Cystidia absent. Basidia 12.0–20.0 × 3.0–4.8 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 3.5–4.8 × 2.0–2.5 μm, suballantoid to reniform, smooth, hyaline, thin-walled, amyloid (Fig. 129).

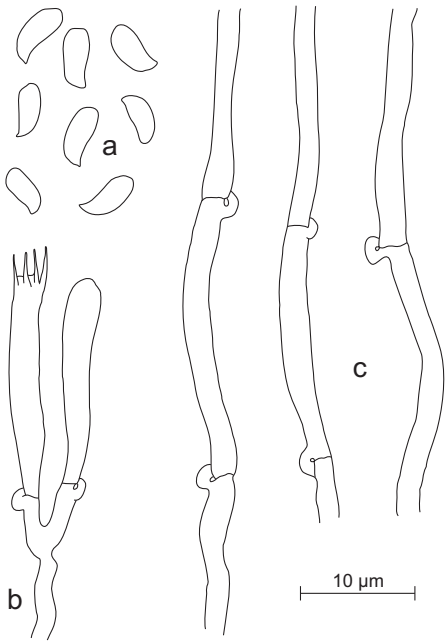


Fig. 129. *Irpicodon pendulus* (Alb. & Schwein.: Fr.) Pouzar: a – basidiospores, b – basidia, c – hyphae (KRAM-F 53055).

SPECIMEN EXAMINED. Kumgang-san Mts: pine Chanto Forest (61), alt. *ca* 50–100 m, on bark of dead trunk of *Pinus densiflora*, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53055.

DISTRIBUTION IN ASIA. Caucasus, Kazakhstan, and Russia (e.g. West Siberia).

NOTES. New to North Korea. It is a rare species in Eurasia. By some authors it is placed in Auriscalpiaceae, Hericiales.

REFERENCES. Bondartsev (1953: 557); Domański (1988: 370); Ellis & Ellis (1990: 117, Fig. 234); Eriksson & Ryvarden (1976: 741, Figs 367–369); Hansen & Knudsen (1997: 285–286); Jülich (1984: 171); Jülich & Stalpers (1980: 126); Kotlaba (1984: 23); Nikolaeva (1961: 94, Figs 38–40, Pl. VII: 3–5); Shvartsman (1964: 187); Wojewoda (2002b: 77).

Leptosporomyces fuscostratus (Burt) Hjortstam

Windahlia **17**: 58. 1987.

Corticium olivaceoalbum Bourdot & Galzin, Bull. Soc. Mycol. Fr. **27**: 239. 1911. – *C. fuscostratum* Burt, Ann.Missouri Bot. Gard. **13**: 299. 1926. – *Athelia fuscostrata* (Burt) Donk, Fungus **27**: 12. 1957. – *Confertobasidium olivaceoalbum* (Bourdot & Galzin) Jülich, Beih. Willdenowia **7**: 167, Fig. 39. 1972, ss. Jülich. – *Scytinostromella fallax* Burds. & Nakasone, Mycologia **73**: 469. 1981. – *Gloeocystidiellum olivaceoalbum* (Bourdot & Galzin.) Tellería, Nova Hedwigia **53**(1–2): 237. 1991. – *Scytinostromella olivaceoalbum* (Bourdot & Galzin) Ginns & Lefebvre, Mycologia Mem. **19**: 141. 1993.

Basidiocarp corticioid, resupinate, attached loosely to substrate, thin, membranous. Subiculum brownish with thin brownish rhizomorphs. Hymenophore smooth, cream-coloured or yellowish, sometimes with olive tint. Consistency membranous, soft.

Hyphal system monomitic. Hyphae with clamps at all septa. Hyphae in subhymenium 1.5–5.0 μm wide, smooth or sparsely encrusted with crystals, hyaline, thin-walled. Hyphae in subiculum 2–5 μm wide, smooth or encrusted with crystals, light brownish, thick-walled, with clamps. Hyphae in rhizomorphs yellow-brown to cinnamon. Cystidia absent. Basidia 8.4–14.5 × 3.6–4.8 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 3.0–3.6 × 1.8–2.1 μm, subcylindric or elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), alt. *ca* 1400 m, mixed taiga, on dead, decayed stump of coniferous tree, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30290; on dead fallen branches, 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28634 (together with *Tomentella* sp.); on fallen trunk of *?Larix olgensis*, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 30301; on decayed stump of coniferous tree, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 30697; *ca* 10 km S of Samji-yon town (8), alt. *ca* 1300 m, in taiga, on stump, 5 Sept.1983, *leg. W. Wojewoda*, KRAM-F 30304.

DISTRIBUTION IN ASIA. India, Japan and former Soviet Union.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 86, Pl. 56); Domański (1988: 174); Eriksson & Ryvarden (1973: 259, Fig. 109, Pl. 24B); Ginns & Freeman (1994: 94, Fig. 24); Ginns & Lefebvre (1993: 97); Hansen & Knudsen (1997: 149); Jülich (1984: 140); Jülich & Stalpers (1980: 79); Maekawa (1993: 33, Fig. 23); Rattan (1977: 267, Figs A-C, p. 271).

Leptosporomyces galzinii (Bourdot) Jülich

Willdenowia Beih. **7**: 192, Fig. 45. 1972.

Corticium galzinii Bourdot, Rev. Sci. Bourbonn. **23**: 11. 1910. – *Athelia galzinii* (Bourdot) Donk, Fungus **27**: 12. 1957. – *A. grisea* M. P. Christ., Dansk Bot. Ark. **19**: 153. 1960.

Basidiocarp corticioid, resupinate, thin, pellicular, loosely adnate. Margin indeterminate. Hymenophore smooth, whitish with yellowish tint. Consistency soft.

Hyphal system monomitic. Hyphae 2–3 μm wide, smooth, hyaline, thin-walled in hymenium and subhymenium, or with slightly thickened walls in subiculum, with clamps. Cystidia absent. Basidia 8–12 × 3–4 μm, subclavate, with 4 sterigmata and basal clamp. Basidiospores 3.0–3.6 × 1.8–2.4 μm, narrowly elliptic to subcylindric, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Mubong (3) and Taehong-dan (6), alt. *ca* 1200–1500 m, taiga with *Larix olgensis* on lying dead trunk, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30302; *ca* 10 km S of Samji-yon town (8), alt. *ca* 1300 m, taiga with *Larix*, *Abies*, and *Picea*, on stump of coniferous tree, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30305.

DISTRIBUTION IN ASIA. Armenia, China, Kazakhstan, Russia (e.g. West Siberia) and Turkey.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1991: 35, Pl. 270); Eriksson & Ryvarden (1976: 803, Fig. 402); Ginns & Lefebvre (1993: 97); Hansen & Knudsen (1997: 149, Fig. 225); Jülich (1972: 192, Fig. 45; 1984: 142); Jülich & Stalpers (1980: 143); Maekawa & Zang (1995: 91); Mukhin (1993: Tab. 1).

Piloderma byssinum (P. Karst.) Jülich

Ber. Deutsch. Bot. Ges. **81**: 418. 1969.

Lyomyces byssinus P. Karst., Meddn. Soc. Fauna Fl. Fenn. **11**: 137. 1884. – *Piloderma sphaerosporum* Jülich, Willdenowia Beih. **7**: 235, Fig. 55. 1972.

Basidiocarp corticioid, resupinate, membranous, thin, attached loosely to substrate. Margin irregularly fringed with fine white rhizomorphs. Hymenophore smooth, whitish. Consistency cottony, soft.

Hyphal system monomitic. All septa without clamps. Hyphae in subhymenium 2–3 μm wide, smooth, hyaline, thin-walled. Basal hyphae 2.5–4.0 μm, thin- to thick-walled, strongly covered with needle-shaped crystals. Cystidia absent. Basidia 10.8–18.0 × 3.6–4.8 μm, clavate, with short stalk and 4 sterigmata. Basidiospores 3.0–3.6 × 2.5–3.6 μm, broadly elliptic, smooth, hyaline, with thickened walls, with an oil-drop, non-amyloid (Fig. 130).

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed forest, on decayed stump of coniferous tree, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30293; shore of Samji-yon Lake (7), mixed taiga with *Abies*, *Betula*, *Larix*, *Picea*, and *Pinus*, on decayed stump, 1 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30309; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, mixed taiga, on decayed stumps, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30303, 30685; *ca* 10 km S of Samji-yon town, alt. *ca* 1300 m, taiga, on decayed trunk of coniferous tree, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 30307.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan and Russia.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 168, Pl. 180); Domański (1991: 182); Eriksson *et al*. (1981: 1193, Figs 609–613 & 616A); Ginns & Lefebvre (1993:

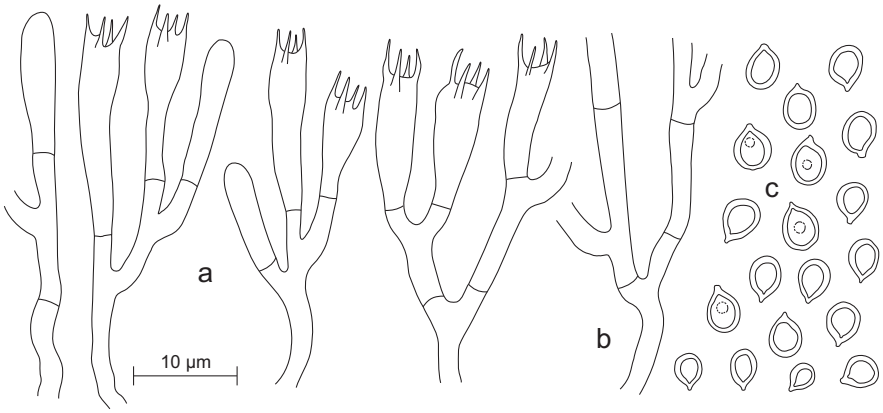


Fig. 130. *Piloderma byssinum* (P. Karst.) Jülich: a – basidia, b – hyphae, c – basidiospores (KRAM-F 30303).

128); Hansen & Knudsen (1997: 153, Fig. 234); Jülich (1972: 221, Fig. 51); Jülich & Stalpers (1980: 191); Maekawa (1993: 35, Fig. 24); Maekawa *et al.* (2002: 92).

Plicatura crispa (Pers.: Fr.) Rea

Brit. Basidiomyc. 626. 1922.

Cantharellus crispus Pers., Neues Mag. Bot. **1**: 106. 1794. – *C. crispus* Pers.: Fr., Syst. Mycol. **1**: 323. 1821. – *Trogia crispa* (Pers.: Fr.) Fr., Monogr. Hymenomyc. Suec. **2**: 244. 1863. – *Plicatura faginea* (Schrader) P. Karst., Bidr. Känn. Finl. Nat. Folk **48**: 342. 1889. – *Plicaturopsis crispa* (Pers.: Fr.) Reid, Persoonia **3**(1): 150. 1964.

Basidiocarp stereoid, semicircular, flabellatae to conchate. Upper surface tomentose, with concentric zones, ochraceous to red-brown. Margin undulating. Hymenophore lamellate-venose. Lamellae whitish to grey-ochraceous.

Hyphal system monomitic. Hyphae smooth or encrusted with small crystals, hyaline, thin- to thick-walled, with clamps. Cystidia absent. Basidia 11.0–14.0 × 2.5–4.0 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 3.6–4.2 × 0.9–1.2 μm, cylindric, allantoid, smooth, hyaline, thin-walled, with 2 oil-drops.

SPECIMENS EXAMINED. Myohyang-san Mts: Hyangsan-gang River Valley, near Myohyang-san Hotel (20), alt. *ca* 100–150 m, mixed forest, on fallen dead deciduous twigs, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30687: near Kuchung Falls (26), alt. *ca* 700 m, deciduous forest, on fallen dead trunk of *Pinus densiflora*, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30689; near Habiro Temple (27), alt. *ca* 200 m, mixed forest, on dead fallen branches of deciduous tree, 6 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30688; under Wonman Mt. peak (31), alt. *ca* 1000 m, mixed forest, on fallen dead trunk of *Betula* sp., 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29177; Kumgang-san Mts: Myonggyongdae Ravine (58), alt. *ca* 800 m, mixed forest, on dead fallen deciduous twig, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30686.

DISTRIBUTION IN ASIA. China, Kazakhstan and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Azbukina *et al.* (1984: 33); Breitenbach & Kränzlin (1986: 170, Pl. 183); Eriksson *et al.* (1981: 1215, Figs 621, 622–624); Ginns & Lefebvre (1993: 130); Hansen & Knudsen (1997: 163); Maekawa *et al.* (2002: 92); Mukhin (1993: Tab. 1); Pilát (1934: 291; 1936: 391); 1940: 63), Syarzhanina (1994: 77); Teng (1996: 310).

Tylospora fibrillosa (Burt) Donk

Taxon **9**: 220. 1960.

Hypochnus fibrillosus Burt., Ann. Mo. Bot. Gard. **3**: 238. 1916.

Basidiocarp corticioid, resupinate, membranous, thin, attached loosely to substrate. Margin sharply bounded to diffuse. Hymenophore smooth or arachnoid to tomentose, whitish to cream-coloured. Consistency cottony, soft.

Hyphal system monomitic. All septa without clamps. Hyphae 3.5–5.0 μm wide, smooth or encrusted with granules, hyaline, thin- to thick-walled. Cystidia absent. Basidia 13–18 × 5–6 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 5.0–6.0 × 3.5–5.0 μm irregularly oval, distinctly lobed, warted, hyaline, thin-walled.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon city (8), alt. *ca* 1400 m, mixed taiga, on fallen trunk of coniferous tree (*Larix olgensis*), 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29035.

DISTRIBUTION IN ASIA. Reported e.g. from Japan.

NOTES. New to North Korea. Mycorrhizal.

REFERENCES. Breitenbach & Kränzlin (1986: 192, Pl. 216); Domański (1992: 178, Pls. 301: o; 308 f-g); Ginns & Lefebvre (1993: 177); Hansen & Knudsen (1997: 151, Fig. 231); Hjortstam *et al.* (1988: 1587, Fig. 851); Jülich (1972: 244, Fig. 57; 1984: 151); Jülich & Stalpers (1980: 268); Maekawa (1993: 37, Fig. 26).

Boreostereaceae Jülich 1982

Boreostereum radiatum (Peck) Parmasto

Consp. Syst. Cortic. 187. 1968.

Stereum radiatum Peck, Bull. Buffalo Soc. Nat. Hist. **1**: 62. 1873.

Basidiocarp up to 700 μm, stereoid, narrowly effused-reflexed, coriaceous, with narrow, reflexed margin. Hymenophore even, tuberculate or riadially folded, ferrugineous to brown.

Hyphal system dimitic. All septa without clamps. Generative hyphae 2–4 μm, hyaline to yellowish, thin-walled. Skeletal hyphae up to 4.5 μm, thick-walled. Cystidia 3–4 μm wide, immersed or projecting up to 25 μm, filiform, thin-walled, encrusted. Basidia 25–30 × 5–6 μm, subclavate, with 4 sterigmata, and basal clamp. Spores 5.5–6.0 × 3.0–4.0 μm, cylindric, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga with *Larix*, *Quercus*, *Populus*, and *Betula*, on decayed fallen trunk of coniferous tree (?*Larix olgensis*), 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30406.

DISTRIBUTION IN ASIA. China, Korea and Russia (East and West Siberia, and Far East).

NOTES. Known also e.g. from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 102); Azbukina *et al*. (1984: 33); Davydkina (1980: 110, Pls. VI: 32, VII: g); Domański (1988: 117); Ginns & Lefebvre (1993: 28); Jahn (1971: 111, Fig. 1r); Jülich & Stalpers (1980: 54); Mukhin (1993: Tab. 1); Teng (1996: 290); Wojewoda *et al*. (1993: 125, 127).

Corticiaceae Herter 1910

Cytidia salicina (Fr.) Burt

Ann. Missouri Bot. Gard. **11**: 10. 1924.

Thelephora salicina Fr., Syst. Mycol. **1**: 442. 1821.

Basidiocarp *ca* 5–10 mm in diam., discoid. Consistency subgelatinous. Upper surface of pileus whitish, farinose or floccose. Hymenophore smooth, even or tuberculate, bright orange to red.

Hyphal system monomitic. All hyphae with clamps. Hyphae 2–4 μm wide, thin- or slightly thick-walled, smooth, hyaline. Cystidia absent. Dendrohyphidia 2.5–3.0 μm, strongly branched, thick-walled, brownish. Basidia very long, 70–90 × 6–9 μm, slenderly clavate with 4 large curved sterigmata and basal clamp. Basidiospores 10.8–13.8 × 4.0–4.2 μm, allantoid, hyaline, smooth, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: between Mubong (3) and Samji-yon town (8), alt. *ca* 1500 m, taiga with *Larix olgensis*, on dead, attached twigs of *Salix* sp., 4 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29039.

DISTRIBUTION IN ASIA. China, Japan and Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Azbukina *et al*. (1984: 32); Breitenbach & Kränzlin (1986: 114, Pl. 97); Domański (1988: 229, Pls. 240: 2; 241: 7); Eriksson & Ryvarden (1975: 333, Figs 132–134); Ginns & Lefebvre (1993: 50); Jahn (1979: 90, Pl. 56); Karpova-Benois (1972: 150); Maekawa (1994: 11, Fig. 7); Maekawa *et al*. (2002: 85); Maekawa & Zang (1995: 90); Mukhin (1993: Tab. 1).

Dendrothele alliacea (Quél.) Lemke

Persoonia **3**(3): 366. 1965.

Corticium alliaceum Quél., C. R. Ass. Fr. Av. Sci. **12**: 505. 1884.

Basidiocarp corticioid, resupinate. Hymenophore smooth, whitish to grey-whitish, pruinose. Margin distinctly bounded. Consistency soft.

Hyphal system monomitic. Hyphae 1–3 μm, smooth (some with scattered crystals), hyaline, thin-walled, without clamps. Dendrohyphidia up to 1 μm wide, hyaline, thin-walled, branched, numerous. Gloeocystidia 25–35 × 8–12 μm, clavate to fusiform, somewhat thick-walled, smooth, hyaline, with apical appendix. Basidia 35–40 × 9–11 μm, cylindric or clavate, with 4 sterigmata, without basal clamp. Basidiospores 12.0–14.5 × 6.0–7.0 μm, narrowly elliptic to almost cylindric, smooth, hyaline, some thick-walled, some with oil-drops, non-amyloid (Fig. 131).

SPECIMENS EXAMINED. Suian-san Mts (48): near ruins of castle, alt. *ca* 200 m, mixed forest, on bark of fallen twigs of deciduous tree, 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 30699.

DISTRIBUTION IN ASIA. Israel.

NOTES. New to North Korea. Known also from

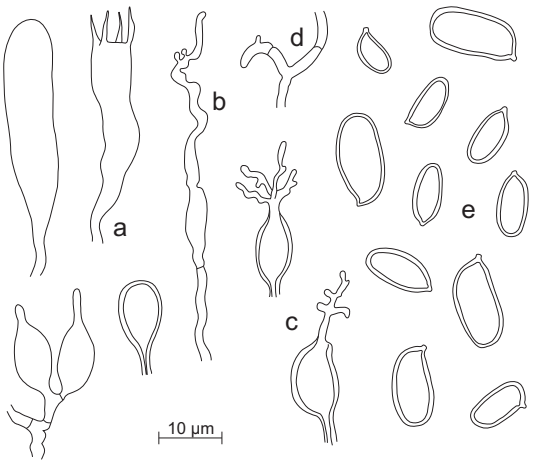


Fig. 131. *Dendrothele alliacea* (Quél.) Lemke: a – basidia, b – dendrohyphidium, c – cystidia, d – hyphae, e – basidiospores (KRAM-F 30699).

Europe and North America (Canada and United States) and Africa.

REFERENCES. Binyamini (1998: 311, Fig. 3); Breitenbach & Kränzlin (1986: 80, Pl. 47); Domański (1988: 236); Eriksson & Ryvarden (1975: 354, Fig. 144-b-f); Ginns & Lefebvre (1993: 56); Hansen & Knudsen (1997: 182); Jülich (1984: 119); Jülich & Stalpers (1980: 91); Pouzar (2001: 129).

Punctularia strigosozonata (Schwein.) Talbot

Bothalia **7**(1):143.1958.

Merulius strigosozonatus Schwein., Trans. Am. Phil. Soc. **4**: 160. 1834. – *Phlebia strigosozonata* (Schwein.) Lloyd, Myc. Writ. **4**: Letter 46: 6. 1913. For further synonyms see Wojewoda (2001: 502).

Basidiocarp effuso-reflex, stereoid, dimidiate or rarely corticioid, resupinate, coriaceous-ceraceous, sessile. Consistency gelatinous. Upper surface velutinous, coarsely tomentose, zonate, with black-brown concentric furrows. Margin lighter brown, yellow-brown to reddish brown. Hymenophore phlebioid, subgelatinous, at first smooth, then with elongate, radial ridges or irregular knobs, dark brown-violaceous.

Hyphal system monomitic. All hyphae with clamps, up to 5(–6) µm wide, hyaline, slightly yellowish, yellow or brown, thin- or thick-walled, smooth, hyaline. Cystidia absent. Dendrohyphidia 20–35 × 1–2 µm, richly branched, at first hyaline, then yellowish to grey-brown. Basidia 30–60 × 4–5 µm, slenderly clavate or subcylindric, with 4 sterigmata and basal clamp. Spores 6.0–8.4 × 3.0–4.2 µm, ovate or elliptic, hyaline, smooth, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), near ruins of castle, alt. *ca* 1500 m, mixed taiga, on fallen trunk of deciduous tree, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30409; Myohyang-san Mts: near Kuchung Falls (26), alt. *ca* 700 m, deciduous forest, on decayed stump of deciduous tree, 7 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 30411, 30414; Pyongyang town: Central Botanical Garden (36), on stump of deciduous tree, 26 Sept.1984, *leg*. *W. Wojewoda*, KRAM-F 30408; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, on fallen trunk of deciduous tree, 6 July 1986, *leg*. *W. Wojewoda*, KRAM-F 30407; Kumgang-san Mts: in Myonggyong-dae Valley (58), alt. *ca* 600 m, deciduous forest, on fallen dead trunk of *Fraxinus rhynchophylla*, 17 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 30410.

DISTRIBUTION IN ASIA. China, Japan, Korea, Malaya, Russia (West and East Siberia and Far East), and Taiwan.

NOTES. Known also from Europe, North America (Canada, Mexico and United States), South America (Brazil, Chile and Venezuela), South Africa, Australia, Tasmania and New Zealand.

REFERENCES. Anonymous (1983a: 104); Davydkina (1980: 109, Fig. 38, Pl. VII: 38); Eriksson *et al*. (1981: 1229, Figs 629–630); Ginns & Lefebvre (1993: 134); Imazeki & Hongo (1975, **2**: 124, Pl.. 40: 242); Maekawa (1994: 19, Fig. 13); Maekawa *et al*. (2002: 92); Maekawa & Zang (1995: 92); Mukhin (1993: Tab. 1); Wojewoda (2001: 501, Fig. 1; 2002c: 81); Wojewoda *et al*. (1993: 125, 128); Wu (1990: 4).

Terana caerulea (Lamarck: Fr.) Kuntze

Rev. Gen. Pl. **2**: 872. 562. 1891.

Byssus caerulea Lamarck, Fl. France, Ed. 2, **1** (Meth. Anal.): 103. 1795. – *Thelephora indigo* Schwein., Schrift. Naturf. Ges. Lepzig **1**: 107. 1822. – *T. caerulea*

(Lamarck): Fr., Elench. Fung. **1**: 202. 1828. – *Corticium caeruleum* (Lamarck: Fr.) Fr., Epicr. Syst. Mycol. 562. 1838. – *Pulcherricium caeruleum* (Lamarck: Fr.) Parmasto, Consp. System. Cortic. 133. 1968.

Basidiocarp corticioid, resupinate, effused to slightly reflexed, membranaceous. Consistency waxlike and soft. Margin lighter coloured, fimbriate to slightly tomentose. Hymenophore smooth to slightly tuberculate, blue.

Hyphal system monomitic. Hyphae 2.0–5.5 µm, smooth, bluish, thin- or thick walled, with clamps. Cystidia absent. Dendrohyphidia 31.0–42.0 × 4.0–4.5 µm, between basidia, with basidium-like shape, irregularly branched, with vermiform outgrowths at tips, greenish in KOH. Basidia 25.0–35.0 × 5.5–6.5 µm, slenderly clavate, hyaline to bluish, with 4 sterigmata, sometimes with lateral outgrowths, and with basal clamp. Basidiospores 6.0–8.4 × 4.0–5.5 µm, elliptic, hyaline or slightly bluish, smooth, thin-walled, non-myloid.

SPECIMENS EXAMINED. Myohyang-san Mts: between Habiro Temple (27) and Chontae Falls (28), alt. *ca* 250 m, deciduous forest, on fallen dead deciduous branches, 16 Aug. 1984, *leg. W. Wojewoda*, KRAM-F 30662; Suian-san Mts (48), alt. *ca* 200–300 m, between ruins of castle and hospital, mixed forest, on dead fallen deciduous twigs, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30663.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Indonesia (Java), Iran, Japan, Korea, Nepal, Taiwan and Turkey.

NOTES. Known also from Europe, Africa (Tunisia, Kenya) and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 101); Breitenbach & Kränzlin (1986: 106, Pl. 87); Cunningham (1963: 34); Domański (1991: 205); Eriksson *et al.* (1981: 1226, Fig. 628); Ginns & Lefebvre (1993: 134); Hallenberg (1981: 488); Kotlaba (1976: 157); Maekawa (1994: 17, Fig. 18); Maekawa *et al.* (2002: 92); Maekawa & Zang (1995: 92); Pilát (1940: 63); Rattan (1977: 304, Figs J-L, p. 302, Pl. 5c); Tellería (1990: 93); Teng (1996: 294, as *Corticium caeruleum*); Wojewoda *et al.* (1993: 125, 128); Wu & Chen (1989: 1–4, Figs 1–2); Zhao *et al.* (1983: 65).

Cyphellaceae Lotsy 1907

Radulomyces confluens (Fr.: Fr.) M. P. Christ.

Dansk Bot. Arkiv **19**(2): 230. 1960.

Thelephora confluens Fr., Obs. Mycol. **1**: 152. 1815. – *T. confluens* Fr.: Fr., Syst. Mycol. **1**: 447. 1821. – *Cerocorticium confluens* (Fr.: Fr.) Jülich & Stalpers, Verh. Kon. Ned. Akad. Wetensch., **74**: 73. 1980.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Consistency waxy, watery-ceraceous or almost gelatinous when fresh. Hymenophore smooth or tuberculate-verrucose, cream-coloured to greyish-ochraceous with bluish tint.

Hyphal system monomitic. All hyphae with clamps, 1–3 µm wide, smooth, hyaline, thin-walled. Cystidia absent. Basidia 35.0–55.0 × 6.0–8.5 µm, clavate, sinuous, with 4 sterigmata and basal clamp. Basidiospores 6.6–10.8 × 5.4–7.2 µm, elliptic or subglobose, smooth, hyaline, young thin-walled, mature with slightly thickened walls, with rather distinct apiculus, non-amyloid, some with granular, oily contents.

SPECIMENS EXAMINED. Paekdu-san Mts: Chongbong Mt. (9), alt. *ca* 1460 m, mixed taiga, on fallen dead twigs of deciduous tree, 1 June 1986, *leg. W. Wojewoda*, KRAM-F 30323.

DISTRIBUTION IN ASIA. China, Iran, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 110, Pl. 93); Domański (1991: 213); Cunningham (1963: Fig. 27); Eriksson *et al.* (1981: 1239, Figs 633–634); Ginns & Lefebvre (1993: 135); Hallenberg (1978: 71; 1981: 488); Maekawa (1994: 94, Fig. 68); Maekawa *et al.* (2002: 92; 2003: 408); Mukhin (1993: Tab. 1); Pilát (1940: 63).

Radulomyces copelandii (Pat.) Hjortstam & Spooner

in Hjortstam *et al.*, Kew. Bull. **45**(2): 314. 1990.

Hydnum copelandii Pat., Leafl. Philipp. Bot. **6**(104): 2251. 1914. – *Acia licentii* Pilát, Ann. Mycol. **38**: 66., Pls. I: 4; II: 3. 1940. – *Oxydontia copelandii* (Pat.) S. Ito, Mycol. Fl. Japan **2**(4): 189. 1955. – *Radulum licen-*

tii (Pilát) Nikolaeva, Flora Spor. Rast. SSSR, **6**(2): 98. 1961. – *Sarcodontia copelandii* (Pat.) Imazeki, Col. Illustr. Fungi Japan *2*: 127. 1965. – *Mycoacia copelandii* (Pat.) Aoshima & H. Furuk., Trans. Mycol. Soc. Japan 7(2–3): 136. 1966. – *Radulomyces licentii* (Pilát) Parmasto, Consp. Syst. Cortic. 111. 1968. – *Radulodon licentii* (Pilát) Ryvarden, Česká Mykol. **30**(1): 40. 1976. – *Radulodon copelandii* (Pat.) Maekawa, Rep. Tottori Mycol. Inst. **31**: 93, Fig. 63. 1993. For further synonyms see Hjortstam *et al*. (1990: 314).

Basidiocarp resupinate. Hymenophore hydnoid. Spines 4.5–7.5 × 0.1–0.2 mm, smooth, conic to flattened, pale brown. Subiculum between spines distinct, concolorous.

Hyphal system monomitic. All hyphae hyaline, thin-walled, smooth, with clamps. Subicular hyphae 2.0–3.5 µm wide. Cystidia absent. Basidia 20.0–30.0 × 6.5–7.0 µm, clavate, with oily content, 4 sterigmata and a basal clamp. Basidiospores 6.0–7.2 µm in diam., globose or subglobose, smooth, hyaline, thin-walled, with oil-drops, non-amyloid (Fig. 132).

SPECIMEN EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan village (6), alt. *ca* 1500 m, mixed taiga with *Larix*, *Populus* and *Quercus*, on fallen deciduous twigs, 24 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30639.

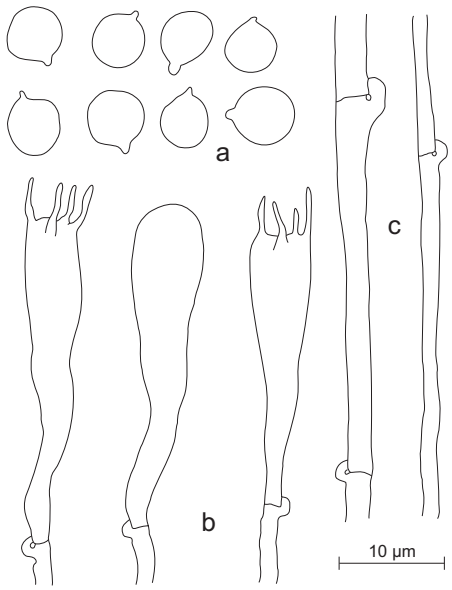


Fig. 132. *Radulomyces copelandii* (Pat.) Hjortstam & Spooner: a – basidiospores, b – basidia, c – hyphae (KRAM-F 30639).

DISTRIBUTION IN ASIA. China, Japan, Korea, Malaysia, Philippines, Russia (e.g. Far East) and Sri Lanka.

NOTES. New to North Korea. This species has a monomitic hyphal system and it is not accepted in *Radulodon*. According to Stalpers (1998) and Nakasone (2001) *Radulodon licentii* is a synonym of *Radulomyces colepandii*.

REFERENCES. Azbukina *et al*. (1984: 33, 38); Domański (1991: 209); Hjortstam *et al*. (1990: 314, Fig. 4); Nakasone (2001: 171); Nikolaeva (1961: 98, Figs 43–44); Ryvarden (1972: 2073–2076); 1976a: 38–40, Fig. 1c–e); Stuchlik & Komorowska (1997: 277, Fig. 1, as *Radulodon licentii*); Wojewoda *et al*. (1993: 128, as *R. licentii*).

Fomitopsidaceae Jülich 1982

Daedalea quercina (L.) Pers.: Fr.

Syst. Mycol. **1**: 333. 1821.

Agaricus quercinus L., Spec. Plant. 1176. 1753. – *Daedalea quercina* (L.) Pers., Syn. Meth. Fung. 500. 1801.

Basidiocarp semicircular, up to 100 mm in diam., sessile, broadly attached. Upper surface uneven, tuberculate, light brown to grey-brown. Margin sharp. Trama light brown, coffee-brown, corky, weakly zonate. Taste sharpish. Hymenophore with labyrinthine lamellae, beige with pink tint.

Hyphal system trimitic. Generative hyphae 1.5–2.0 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 3–5 µm wide, smooth, yellowish, thick-walled, branched. Binding hyphae 25–4 µm wide, branched. Basidia 10.0–13.5 × 3.5–4.5 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 3.5–4.5 × 2.0–2.5 µm, elliptic to oval, smooth, hyaline, thin-walled, non-amyloid, with oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount between Tuman-gang River (5) and Taehong-dan (6), alt. *ca* 1000–1500 m, mixed forest, on fallen, dead trunk of *Quercus* ?*mongolica*, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28955; Pagyon Ravine, near Pagyon Falls (65): alt. *ca* 300 m, deciduous forest, on trunk of *Quercus* sp., 22 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28954.

DISTRIBUTION IN ASIA. China, India, Iran, Kazakhstan, Korea and Russia.

NOTES. Known also from Europe and North Africa, in the range of *Quercus*.

REFERENCES. Anonymous (1983a: 105); Bondartsev (1953: 571, Pl. CLXX: 1–3); Breitenbach & Kränzlin (1986: 304, Pl. 383); Hallenberg (1981: 493); Jahn (1979: 132, Pl. 105); Kotlaba (1984: 147, Pl. 22: 54); Niemelä & Uotila (1977: 36); Núñez & Ryvarden (2001: 264); Pilát (1940: 75); Sharma (2000: 54); Shvartsman (1964: 601, Fig. 265); Zhao *et al*. (1983: 83).

Fomitopsis pinicola (Swartz: Fr.) P. Karst.

Krit. Finl. Basidsv. 306. 1889.

Boletus pinicola Swartz, Svenska Vetensk.-Akad. Handl. **1810**: 88. 1810. – *Polyporus pinicola* (Swartz): Fr., Syst. Mycol. **1**: 372. 1821. – *Fomes marginatus* (Pers.) Gillet, Champ. Fr. **1**: 683. 1878.

Basidiocarp up to 200 mm broad, bracket-like to ungulate, broadly attached. Upper surface tuberculate, with broad concentric zones, smooth, crustose, grey to blackish or orange-red to yellow or grey-pink. Margin rounded, even, whitish, cream-coloured or yellowish when young, brownish when old. Trama cream-coloured to ochraceous, hard, concentrically zonate. Smell intensely acidic. Taste bitter. Hymenophore porose, cream-coloured or yellowish when young, brownish when old. Pores rounded, 3–4 per mm.

Hyphal system trimitic. Generative hyphae 1.5–3.0 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 3.5–5.5 µm wide, thick-walled. Binding hyphae 2–3 µm wide, thick-walled, with short branches. Cystidia absent. Basidia 12.0–22.0 × 5.5–7.5 µm, with 4 sterigmata and basal clamp. Basidiospores 5.5–8.0 × 2.5–4.0 µm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Tuman-gang River (5) and Taehong-dan (6), alt. *ca* 1000–1500 m, taiga, on stump of ?*Larix olgensis*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28953; shore of Samji-yon Lake (7), taiga, on lying trunk of coniferous (?*Picea*) tree, 30 June 1986, *leg. W. Wojewoda*, KRAM-F 52896; *ca* 25 km N of Samjiyon town (8), alt. *ca* 1700 m, coniferous forest with *Larix olgensis*, *Picea ajanensis* and *P. koraiensis*, on lying dead trunk of *Picea* sp., 30 June 1986, *leg. W. Wojewoda*, KRAM-F 27993.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Korea, Mongolia, Nepal, Pakistan, Russia (West Siberia and Pimorski Krai), Taiwan, Thailand, Turkey and Vietnam.

NOTES. Circumboreal species in the coniferous zone, and extends southward to pine forest in Asia and Central America.

REFERENCES. Anonymous (1983a: 106); Azbukina *et al*. (1984: 35); Bondartsev (1953: 293, Fig. 67, Pls. VI: 1, LXXXVI: 3, XC); Breitenbach & Kränzlin (1986: 306, Pl. 387); Hallenberg (1981: 493); Imazeki & Hongo (1975, **1**: 115; 2: 150); Jahn (1979: 150, Pl. 123); Kotlaba (1984: 158, Pl. 36: 86); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 37); Núñez & Ryvarden (2001: 301); Pilát (1940: 77); Ryvarden & Gilbertson (1993: 263, Fig. 126); Sharma (2000: 63); Shvartsman (1964: 377, Figs 165–166); Teng (1996: 333); Uranchimehg *et al*. (1983: 375); Vasudeva (1962: 168); Zhang (1999: 372); Zhao *et al*. (1983: 85).

Oligoporus caesius (Schrad.: Fr.) Gilb. & Ryvarden

Mycotaxon **22**: 365. 1985.

Boletus caesius Schrad., Spic. Flora Germ. 167. 1794. – *Polyporus caesius* (Schrad.): Fr., Syst. Mycol. **1**: 360. 1821. – *Postia caesia* (Schrad.: Fr.) P. Karst. 1881. – *Tyromyces caesius* (Schrad.: Fr.) Murrill, North Am. Fl. **9** (1): 34. 1907.

Basidiocarp pileate. Pileus 20–50 mm broad, semicircular, flabellate, sessile, narrowly attached at centre. Upper surface finely hispid-pilose, tuberculate, weakly zonate, white when young, then blue, sometimes ochraceous to light brownish with only slight blue color. Margin undulating, sharp, whitish. Flesh fibrous, soft. Hymenophore porose. Pores rounded-angular, 4–5 per mm.

Hyphal system monomitic. Hyphae 2.0–3.5 µm wide, smooth, hyaline, thin- to thick-walled, with clamps. Cystdia absent. Basidia 8.0–12.0 × 4.5–5.5 µm, cylindric-clavate, with 4 sterigmata and basal clamp. Basidiospores 4.0–5.0 × 1.5–2.0 µm, cylindric-elliptic, smooth, hyaline, thin-walled, with oil-drops.

SPECIMEN EXAMINED. Paekdu-san Mts: below Paekdu-san Mt. peak (1), alt. *ca* 1800 m, taiga with *Larix olgen-*

sis, *Picea ajanensis*, *P. koraiensis* and *Abies nephrolepis*, on trunk of dead coniferous tree, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28994.

DISTRIBUTION IN ASIA. China, India, Japan, Korea, Russia (e.g. Siberia and Far East) and Turkey.

NOTES. Cosmopolitan, circumglobal species, widely distributed throughout coniferous forests in Asia, Europe, North America and Africa.

REFERENCES. Anonymous (1983a: 109); Bondartsev (1953: 198, Fig. 51: 6; Pl. L); Breitenbach & Kränzlin (1986: 272, Pl. 334); Hattori & Zang (1995: 100); Imazeki & Hongo (1975, **1**: 113, Pl. 53: 293); Jahn (1979: 118, Pl. 90); Kotlaba (1984: 98); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 364); Pilát (1936: 259; 1940: 71); Ryvarden & Gilbertson (1994: 404, Figs 190–191); Ryvarden & Johansen (1980: 600); Sharma (2000: 93); Teng (1996: 381).

Oligoporus leucomallellus (Murrill) Gilb. & Ryvarden

Mycotaxon **22**(2): 364. 1985.

Tyromyces leucomallellus Murrill, Bull. Torrey Bot. Club **67**: 63. 1940. – *T. gloeocystidiatus* Kotl. & Pouzar, Česká Mykol. **18**: 207. 1964. – *Postia leucomallella* (Murrill) Jülich 1982.

Basidiocarp pileate, effused-reflexed or resupinate. Upper surface of pileus smooth, white to cream-coloured, then discoloured to dirty brown. Hymenophore poroid. Pores angular, 3–4 per mm. Contex of fresh basidiocarp white, up to 2 mm thick.

Hyphal system monomitic. Hyphae smooth, hyaline, thin- to thick-walled, with clamps. Cystidia (gloeocystidia) 10.0–30.0 × 3.5–7.0 μm, clavate, thin- to thick-walled, rarely projecting. Basidia 10–20 × 4–6 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 4.8–6.0 × 1.0–1.5 μm, subcylindric, hyaline, smooth, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Habiro Temple (27), mixed forest on fallen dead trunk of coniferous tree (?*Pinus densiflora*), 6 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52901.

DISTRIBUTION IN ASIA. China and Russia (e.g. W Siberia and Kamchatka).

NOTES. New to North Korea. Widespread species in temperate and boreal coniferous forests.

REFERENCES. Domański (1972: 171, Figs 69–70); Hansen & Knudsen (1997: 236, Fig. 461); Jahn (1979: 116, Pl. 88); Jülich (1984: 340); Kotlaba (1984: 98); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 369); Ryvarden & Gilbertson (1994: 418, Fig. 202).

Oligoporus obductus (Berk.) Gilb. & Ryvarden

Mycotaxon **22**(2): 365. 1985.

Polyporus obductus Berk., Lond. J. Bot. **4**: 304. 1845. – *P. osseus* Kalchbr., Matem. Term. Közlem. **3**: 217. 1865. – *Osteina obducta* (Berk.) Donk, Schweiz. Z. Pilzk. **44**(6): 86. 1966.

Basidiocarp laterally stipitate or substipitate. Pileus 20–90 × 15–50 mm. Upper surface smooth, azonate, whitish, cream-coloured to pale yellowish. Context white, soft. Hymenophore poroid, white to yellowish. Pores 3–5 per mm. Stipe 30–40 × 5–10 mm, whitish.

Hyphal system monomitic. Tramal hyphae 2–4 μm wide, thin-walled, with clamps, contextual hyphae thick-walled. Basidia 15–30 × 5–6 μm, narrowly clavate, with 4 sterigmata and basal clamp. Basidiospores 5–6 × 2–3 μm, cylindric, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 30 km E of Paekdu-san Mt. peak (1), alt. *ca* 1800–1900 m, taiga, 3 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 25474, 52943; shore of Samji-yon Lake (7), near Samji-yon Hotel, mixed taiga, alt. *ca* 1400 m, 3 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 52942; *ca* 5 km S of Samji-yon town (8), taiga, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 52944–52945; near Chonbong Hill (9), mixed taiga, 1 July 1986, *leg*. *W. Wojewoda*, KRAM-F 52941; between Rimyongsu (10) and Potae (11), alt. *ca* 1250 m, taiga with *Larix olgensis*, 1 July 1986, *leg. Z. Heinrich*, KRAM-F 28104. – On roots and on dead fallen trunk of *Larix olgensis* roots.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan, Mongolia and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Circumpolar species in the coniferous zone, known from Central Europe, Asia and North America, rare, growing on dead wood of conifers, rarely on hardwoods.

REFERENCES. Breitenbach & Kränzlin (1986: 324, Pl. 413); Domański *et al*. (1973: 73, Fig. 56B); Gilbertson & Ryvarden (1987: 478, Fig. 233); Kotlaba (1984: 169); Núñez & Ryvarden (2001: 370); Ryvarden & Gilbertson (1994: 422, Fig. 206); Teng (1996: 371); Wojewoda *et al*. (1993: 128).

Piptoporus betulinus (Bull.: Fr.) P. Karst.

Meddn. Soc. Fauna Fl. Fenn. **6**: 9. 1881.

Boletus betulinus Bull., Herb. Fr. Pl. 312. 1787. – *Polyporus betulinus* (Bull.): Fr., Syst. Mycol. **1**: 358. 1821.

Basidiocarp pileate, conchate to flabellate, sessile or with very short stipe. Upper surface smooth, mebranaceous, without zones, at first cream-whitish, then ochraceous brown to grey-brown. Hymenophore porose, white to cream-whitish. Pores 3–4 per mm, rounded to somewhat angular. Flesh white, corky and soft. Smell pleasant. Taste somewhat bitter.

Hyphal system dimitic. Generative hyphae 1.5–3.0 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 3.0–6.5 µm wide, smooth, hyaline, thick-walled to solid. Cystidia absent. Basidia 10.0–28.0 × 3.5–5.5 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 4.5–6.5 × 1.5–2.0 µm, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: Mupo, bank of Tuman-gang River (4), alt. *ca* 1400 m, mixed taiga, on lying trunk of *Betula platyphylla*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52995; basalt mount between Tuman-gang River (5) and Taehong-dan (6), alt. *ca* 1300–1500 m, mixed taiga, on dead standing trunk of *Betula platyphylla*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28957; Chongbong Mt. (9), alt. *ca* 1400 m, mixed taiga with *Larix* and *Betula*, on dead *Betula* sp. trunk, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 52996.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Korea, Russia (e.g. Siberia and Primorski Krai) and Taiwan.

NOTES. Boreal species, circumpolar throughout the range of *Betula*.

REFERENCES. Anonymous (1978: 155; 1983a: 108); Azbukina *et al*. (1984: 37); Bondartsev (1953: 271, Fig. 61: 1; Pls. LXXV; LXXVI: 4–5); Breitenbach & Kränzlin (1986: 318, Pl. 404); Hallenberg (1981: 495); Imazeki & Hongo (1975, **2**: 140, Pl. 45: 268); Jahn (1979: 130, Pl. 103); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 412); Pilát (1936: 369; 1940: 70); Ryvarden & Gilbertson (1994: 545, Fig. 285); Shvartsman (1964: 357, Fig. 153); Teng (1996: 373); Vasudeva (1962: 53); Zhao *et al*. (1983: 90).

Ganodermataceae (Donk) Donk 1948

Ganoderma applanatum (Pers.) Pat.

Bull. Soc. Mycol. Fr. **5**: 67. 1889.

Boletus applanatus Pers., Obs. Mycol. **2**: 2. 1799. – *Elfvingia applanata* (Pers.) P. Karst., Krit. Öfvers. Finl. Basidsv. 334. 1889. – *Ganoderma lipsiense* (Batsch) Atk., Ann. Mycol. **6**: 189. 1908. For further synonyms see Donk (1974: 67).

Basidiocarp pileate, sessile. Upper surface dark grey-brown, tuberculate, zonate. Hymenophore poroid, grey-brown. Pores 5–6 per mm.

Hyphal system trimitic. Generative hyphae 2.0–2.5 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 3.0–4.5 µm wide, brown, thick-walled. Binding hyphae 2–4 µm wide, brown, strongly branched. Cystidia absent. Basidia 10.0–14.0 × 4.5–7.0 µm, ventricose, with 4 sterigmata. Basidiospores 7.0–8.0 × 4.5–6.0 µm, broadly elliptic, light brown, indistinctly verrucose, with double wall, truncate, non-amyloid (Fig. 133).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 500 m, mixed forest, on stump of deciduous tree, 13 June 1986, *leg. W. Wojewoda*, KRAM-F 28901; deciduous forest, on stump of deciduous tree, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 27926; near Myohyang-san Hotel (20), alt. *ca* 100 m, deciduous forest, on dead trunk, 6 June 1985, *leg B. Zarzycka*, KRAM-F 28903; mixed forest, on stump of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28902; on stump, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 29232; Pyongyang town: Central Botanical Garden (36), on living *Magnolia* ?*ovata* trunk, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 28905; Kumgang-san Mts: below Onjong-ryong Pass (54), alt. *ca* 800 m, mixed forest, on stump, 16 Sept. 1982, *leg. W. Wojewoda*, KRAM-F 28904; Okryu-dong Valley (59), near Kumgang-mun Gate, alt. *ca* 350 m, mixed forest, on trunk of deciduous tree, 5 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28900; Onjong-ri village (60), alt.

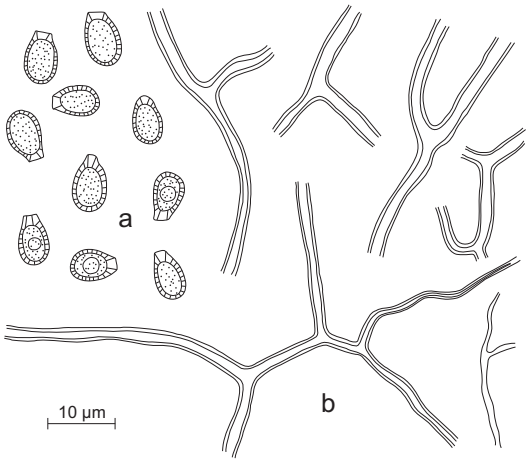


Fig. 133. *Ganoderma applanatum* (Pers.) Pat.: a – basidiospores, b – hyphae (KRAM-F 28902).

ca 100 m, park, on stump of deciduous tree, 21 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29233.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Iran, Japan, Kazakhstan, Korea, Philippines, Russia (West Siberia, Yakutia and Primorski Krai), Taiwan, Thailand, Turkey and Vietnam.

REFERENCES. Anonymous (1978: 162; 1983a: 105); Azbukina *et al*. (1984: 35); Bondartsev (1953: 426, Figs 27, 104–105, Pls. CII: 3, 5; CIX: 3; CXXIII: 2; CXXVII: 1); Breitenbach & Kränzlin (1986: 332, Pl. 425); Domański (1974: 57); Hallenberg (1981: 496); Hattori & Zang (1995: 102); Jülich (1982: 457, Pl. 9a); Kotlaba (1984: 56, Pl. 31: 76); L. Lange (1974: 23); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 35); Núñez & Ryvarden (2000: 41, Fig. 9B); Park & Cho (1985: 107); Pilát (1934: 266; 1940: 78); Ryvarden & Gilbertson (1993: 269, Fig. 129); Sharma (2000: 65); Sokół (2000: 35, Photo 1–8, Fig. 1); Teng (1996: 328); Zhang (1999: 372); Zhao (1989: 101, Fig. 47); Zhao *et al*. (1983: 86).

Gloeophyllaceae Jülich 1982

Gloeophyllum abietinum (Bull.: Fr.) P. Karst.

Bidr. Känn. Finl. Nat. Folk **37**: 80. 1882.

Agaricus abietinus Bull., Herb. Fr. 442. 1789. – *Daedalea abietina* (Bull.): Fr., Syst. Mycol. **1**: 334. 1821.

Basidiocarp pileate. Pileus flabellate or conchate. Upper surface hispid-tomentose when young, then glabrous, zonate, red- or dark brown, with whitish to yellow-brown marginal zone when young. Flesh thin, fibrous, brownish. Smell absent. Taste mild to somewhat bitter. Hymenophore lamellate, with 7–9(–12) ochraceous to grey-brown lamellae per cm near margin of basidiocarp.

Hyphal system trimitic. Generative hyphae 1.5–2.0 µm wide, hyaline, thin- to thick-walled, with clamps. Skeletal hyphae 3–6 µm wide, thick-walled to solid. Binding hyphae 2.0–3.5 µm wide, thick-walled, branched. Cystidia 35.0–45.0 × 4.5–6.0 µm, smooth, with tips sometimes encrusted, thick-walled, brownish. Basidia 20.0–32.0 × 4.5–6.5 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 7–12 × 3–4 µm, cylindric to allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Shore of Soham-ho Lake (32), on pole of wooden fence, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52964; Kumgang-san Mts: near Manmulsang Rocks (55), alt. *ca* 800 m, mixed forest, on fallen, dead trunk of old *Pinus densiflora*, 18 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52960; shore of Samil-po Lake, forest with *P. densiflora*, on little bridge of wood of *P. densiflora*, 13 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52967, 52968.

DISTRIBUTION IN ASIA. China, India, Japan, Kazakhstan, Korea, Russia (e.g. Siberia and Primorski Krai), Taiwan and Turkey.

NOTES. Temperate species, not common in North America.

REFERENCES. Anonymous (1983a: 106); Azbukina *et al*. (1984: 35); Bondartsev (1953: 280, Fig. 64, Pls. LXXXIII: 2–7, LXXXIV: 3); Breitenbach & Kränzlin (1986: 308, Pl. 389); Hansen & Knudsen (1997: 243, Fig. 480); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 37); Núñez & Ryvarden (2001: 306); Ryvarden & Gilbertson (1993: 285, Fig. 136); Sharma (2000: 68); Shvartsman (1964: 626, Fig. 279); Teng (1996: 389).

Gloeophyllum odoratum (Wulfen: Fr.) Imazeki

Bull. Tokyo Sci. Mus. **6**: 75. 1943.

Boletus odoratus Wulfen, Pl. Rar. Carinth. Jacq. Collect. **2**: 150. 1788. – *Polyporus odoratus* (Wulfen): Fr.,

Syst. Mycol. **1**: 37. 1821. – *Anisomyces odoratus* (Wulfen: Fr.) Pilát, Atl. Polyp. 331. 1940.

Basidiocarp 30–90 × 20–50 mm, pulvinate, broadly attached. Upper surface hirsute, zonate, cinnamon brown to grey-brown. Margin paler. Smell of anis. Pores (1–)2(–3) per mm, angular. Hymenophore poroid, brown.

Hyphal system trimitic. Generative hyphae 2–4 µm wide, thin-walled, smooth, with clamps. Skeletal hyphae 3–5 µm wide, smooth, thick-walled, yellowish or brown. Cystidia (cystidioles) not seen. Basidia 16.0–25.0 × 4.5–7.0 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 6–8 × 3–4 µm, cylindric, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 25 km N of Samji-yon town (8), alt. *ca* 1600 m, taiga, on stumps and fallen trunks of *Picea*, 30 June 1986, *leg*. *W. Wojewoda*, KRAM-F 52900.

DISTRIBUTION IN ASIA. Caucasus, China, Japan, Kazakhstan, Russia (Siberia and Primorski Krai) and Taiwan.

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 35); Bondartsev (1953: 581, Fig. 157, Pls. CL: 7, CLXXII: 1); Breitenbach & Kränzlin (1986: 310, Pl. 392); Hansen & Knudsen (1997: 241, Fig. 481); Jahn (1979: 144, Pl. 117); Kotlaba (1984: 152); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 308); Ryvarden & Gilbertson (1993: 286, Fig. 137); Shvartsman (1964: 365, Figs 157–158); Teng (1996: 390).

Gloeophyllum sepiarium (Wulfen: Fr.) P. Karst.

Ryssl., Finl. Skand. Halföns Hattsvamp. **2**: 79. 1882.

Agaricus sepiarius Wulfen, Pl. Rar. Carinth. Jacq. Collect. **1**: 347. 1786. – *Daedalea sepiaria* (Wulfen): Fr. Syst. Mycol. **1**: 333. 1821. – *Lenzites sepiaria* (Wulfen: Fr.) Fr., Epicr. Syst. Mycol. 407. 1838.

Basidiocarp pileate, sessile, dimidiate, flabellate, often imbricate. Upper surface tomentose to hispid, orange, reddish brown, brown to almost black, zonate. Margin sharp. Hymenophore porose, labyrithine to lamellate, with 15–20 pores or lamellae per cm near margin of basidiocarp.

Hyphal system trimitic. Generative hyphae 2–3 µm wide, smooth, hyaline, thin- to thick-walled, with clamps, skeletal hyphae 2.5–4.5 µm wide, brown, thick-walled, binding hyphae 2.5–4.5 µm wide, brown, thick-walled. Cystidia slenderly fusoid, obtuse to subulate, 30.0–50.0 × 3.0–5.5 µm, smooth, hyaline, thin- to somewhat thick-walled. Basidia 35.0–45.0 × 3.0–5.5 µm, slenderly clavate, with 4 sterigmata and basa clamp. Basidiospores 8.0–12.0 × 3.0–4.5 µm, cylindric, slightly allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Paekdu-san Mt. peak (1) and Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix olgensis*, *Picea jezoensis*, *Abies nephrolepis*, *Ledum palustre* and *Vaccinium uliginosum*, on fallen trunk of coniferous tree, 30 Sept.1984, *leg*. *W. Wojewoda*, KRAM-F 29281; shore of Samji-yon Lake (7), alt. *ca* 1400 m, mixed taiga, on coniferous stump, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52959; *ca* 5 km S of Samji-yon town (8), mixed taiga, on dead fallen trunk of coniferous tree, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 52958; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, on board of wooden bridge, 4 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52970; Taesong-san Mts: Chujak Mt. peak (35), forest with *Pinus densiflora*, on trunk of this tree, 29 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52969; Central Botanical Garden (36), on pole of wooden pergola, 9 July 1986, *leg*. *W. Wojewoda*, KRAM-F 52957; near Tomb of King Kongmin (64), little, mixed forest with *Pinus*, on stump of *P. densiflora*, 21 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 53108.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Japan, Kazakhstan, Korea, Pakistan, Russia (e.g. West Siberia and Primorski Krai), Thailand, Turkey and Vietnam.

REFERENCES. Anonymous (1983a: 106); Azbukina *et al*. (1984: 35); Breitenbach & Kränzlin (1986: 308, Pl. 390); Hansen & Knudsen (1997: 242, Fig. 482); Imazeki & Hongo (1975, **1**: 139, Pl. 65: 382); Jahn (1979: 144, Pl. 116); Kotlaba (1984: 151); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 309); Pilát (1940: 77); Ryvarden & Gilbertson (1993: 290, Fig. 139); Sharma (2000: 68); Shvartsman (1964: 623, Fig. 278); Teng (1996: 389); Vasudeva (1962: 53); Zhang (1999: 373); Zhao *et al*. (1983: 87).

Gloeophyllum trabeum (Pers.: Fr.) Murrill

N. Am. Flora **9**: 129. 1908.

Agaricus trabeus Pers., Syn. Meth. Fung. 29. 1801. – *Coriolopsis trabea* (Pers.: Fr.) Bondartsev & Singer, Ann. Mycol. **39**: 62. 1941. – *Daedalea trabea* (Pers.): Fr., Syst. Mycol. **1**: 335. 1821.

Basidiocarp pileate, flabellate. Upper surface tuberculate, at first finely tomentose, then glabrous, cinnamon to ochraceous brown. Hymenophore porose, labyrinthine to semi-lamellate, light brown, 2–4 pores or lamellae per mm.

Hyphal system dimitic. Generative hyphae 1.5–3.0 μm wide, smooth, hyaline, thin- to thick-walled, with clamps. Skeletal hyphae 2.0–4.5 μm, smooth, brown, thick-walled. Cystidia (cystidioles) 20.0–35.0 × 4.5–6.0 μm, clavate to fusoid, conic to obtuse, smooth, hyaline or yellow, thin-walled. Basidia 25.0–30.0 × 6.5–9.0 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 6.5–9.0 × 3.0–4.5 μm, elliptic or subcylindric, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Habiro Temple (27), alt. *ca* 200 m, on wooden bench, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 52978.

DISTRIBUTION IN ASIA. Caucasus, China, India, Japan, Korea, Nepal, Russia (e.g. Siberia and Far East), Taiwan and Turkey.

NOTES. New to North Korea. Cosmopolitan species, most common in temperate areas.

REFERENCES. Bondartsev (1953: 533, Fig. 142, Pl. CLXVII: 3–6); Breitenbach & Kränzlin (1986: 310, Pl. 391); Kotlaba (1984: 150); Núñez & Ryvarden (2001: 313, Fig. 97); Ryvarden & Gilbertson (1993: 292, Fig. 140); Sharma (2000: 69); Teng (1996: 390); Zhao *et al*. (1983: 88).

Hapalopilaceae Jülich 1982

Bjerkandera adusta (Willd.: Fr.) P. Karst.

Meddn. Soc. Fauna Fl. Fenn. **5**: 38. 1879.

Boletus adustus Willd., Fl. Berl. Prodr. 392. 1787. – *Gloeoporus adustus* (Willd.: Fr.) Pilát, Atl. Champ. Eur., Polyp. 152. 1937. – *Polyporus adustus* (Willd.): Fr., Syst. Mycol. **1**: 363. 1821.

Basidiocarp polyporoid, pileate or semipileate, flabellate, usually imbricate. Upper surface tomentose, becoming glabrous when old, ochraceous to grey-brownish. Margin whitish to blackish. Hymenophore porose, with 4–6 pores per mm, light grey, dark grey or blackish.

Hyphal system monomitic. Hyphae 2–6 μm wide, thin- to thick-walled, hyaline, smooth, with clamps. Cystidia absent. Basidia 8.0–12.0 × 2.5–3.0 μm, cylindric-clavate, with 4 sterigmata and basal clamp. Basidiospores 4.5–5.5 × 2.0–3.0 μm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: valley of stream near Naegok (13), alt. *ca* 1000 m, mixed forest, on deciduous tree, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28430; Onsou-pyong near Naegok (13), *ca* 15 km NE of Pochonbo, alt. *ca* 800 m, mixed forest, on wood, 27 June 1986, *leg. Z. Heinrich*, KRAM-F 27861, 27875; Myohyang-san Mts: valley near Sangwon-am Monastery (19), alt. *ca* 600 m, deciduous forest, on deciduous stump, 12 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 52971; Hyang-san River Valley, near Myohyang-san Hotel (20), mixed forest, on living twigs of *Cornus controversa*, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 28892; deciduous forest, on stump of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52890; Kuchung Falls in Manpok Valley (26), alt. *ca* 850 m, deciduous forest, on decayed stump, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52894; above Habiro Temple (27), alt. *ca* 300 m, deciduous forest, on trunk of deciduous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28946. between Habiro Temple (27) and Isonnam Falls (29), alt. *ca* 200 m, deciduous forest, on fallen branch of deciduous tree, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52891; Pyongyang town: Central Botanical Garden (36), on stump of *Populus* sp., 26 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28945; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, on trunk, 6 July 1986, *leg. Z. Heinrich*, KRAM-F 28153; alt. *ca* 250 m, deciduous forest, on stump of deciduous tree, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 52893; Kumgang-san Mts: below Kuryong Falls, Okryu-dong Stream Valley, (59), alt. *ca* 700 m, deciduous forest, on stump of deciduous tree, 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52895; 20 July 1986, *leg. Z. Heinrich*, KRAM-F 28019; Onjong-gang Valley, above Onjong-ri village (60), alt. *ca* 100 m, mixed forest, on stump of deciduous tree, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28947; pine Chanto Forest (61), alt. *ca* 150 m, on stump of deciduous tree, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52892;

Pagyon Ravine (65), alt. *ca* 300 m, deciduous forest, on deciduous tree, 26 July 1986, *leg. H. Komorowska*, KRAM-F 28267

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Iran, Iraq, Japan, Kazakhstan, Korea, Pakistan, Russia (e.g. Siberia and Far East), Taiwan, Thailand and Vietnam.

NOTES. Cosmopolitan species, quite common, especially in temperate areas.

REFERENCES. Anonymous (1983a: 104); Azbukina *et al*. (1984: 34); Bondartsev (1953: 236); Breitenbach & Kränzlin (1986: 268, Pl. 329); Hallenberg (1981: 492); Hattori & Zang (1995: 96); Jahn (1979: 130, Pl. 102); Kotlaba (1984: 113); Morris (1990: 329); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 230); Pilát (1936: 359; 1940: 71); Rattan *et al*. (1978: 772, Figs 9a–d); Ryvarden & Gilbertson (1993: 168, Fig. 72); Sharma (2000: 41); Shvartsman (1964: 337, Fig. 148); Teng (1996: 374); Vasudeva (1962: 53); Zhang (1999: 371); Zhao *et al*. (1983: 82).

Bjerkandera fumosa (Pers.: Fr.) P. Karst.

Meddn. Soc. Fauna Fl. Fenn. **5**: 38. 1879.

Boletus fumosus Pers., Synop. Meth. Fung. 530. 1801. – *Polyporus fumosus* (Pers.): Fr., Syst. Mycol. **1**: 367. 1821.

Basidiocarp polyporoid, piletate or semipileate, flabellate, usually imbricate. Upper surface even, smooth, finely velutinous, becoming glabrous when old, ochraceous. Margin sharp, whitish to cream-coloured. Hymenophore porose, with 2–4 pores per mm, whitish to cream-coloured.

Hyphal system monomitic. Hyphae 2–6 µm wide, thin- to thick-walled, hyaline, smooth, with clamps. Cystidia absent. Basidia 20–25 × 5–7 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 5.0–6.5 × 2.5–3.5 µm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Kumgang-san Mts: Onjonggang Valley, above Onjong-ri village (60), alt. *ca* 100 m, deciduous forest, on bank of stream, on stump of deciduous tree, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28948.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Russia (e.g. Primorski Krai), Thailand and Uzbekistan.

NOTES. New to North Korea. Known from temperate areas of Europe and North America.

REFERENCES. Azbukina *et al*. (1984: 34); Breitenbach & Kränzlin (1986: 268, Pl. 330); Hallenberg (1981: 492); Kotlaba (1984: 113); Núñez & Ryvarden (2001: 230); Ryvarden & Gilbertson (1993: 170, Fig. 73); Shvartsman (1964: 340, Fig. 149); Teng (1996: 374); Zhang (1999: 371).

Hyphodermataceae Jülich 1982

Hyphoderma cremeoalbum (Höhn. & Litsch.) Jülich

Persoonia **8**(1): 80. 1974.

Corticium cremeoalbum Höhn. & Litsch., Wiesner Festschr. 63. 1908.

Basidiocarp resupinate, corticioid, thin. Hymenophore smooth, white to cream-coloured. Margin pruinose.

Hyphal system monomitic. Hyphae 3–4 µm wide, hyaline, smooth, thin-walled, with clamps at all septa. Cystidia absent. Basidia 30–45 × 5–6 µm, clavate or suburniform, with basal clamp. Basidiospores 7.2–13.2 × 4.8–6.6 µm, narrowly elliptic to subcylindric, smooth, hyaline, thin-walled, with one or more oil-drops, non-amyloid.

SPECIMEN EXAMINED. Suian-san Mts (48): near ruins of castle, alt. *ca* 200 m, mixed forest, on dead trunk of *Pinus densiflora*, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 30329.

DISTRIBUTION IN ASIA. China and Russia (e.g. W Siberia).

NOTES. New to North Korea. Known also from Europe and North America (United States).

REFERENCES. Domański (1988: 306); Eriksson & Ryvarden (1975: 465, Figs 204–205); Ginns & Lefebvre (1993: 81); Hansen & Knudsen (1997: 199); Jülich (1984: 184); Jülich & Stalpers (1980: 110); Maekawa & Zang (1995: 90); Mukhin (1993: Tab. 1).

Hyphoderma mutatum (Peck) Donk

Fungus **27**: 15. 1957.

Corticium mutatum Peck, Rep. New York St. Mus. **43** (St. Bot.): 69. 1890. – *Radulum mutatum* (Peck) Nikolaeva, Flora Plant. Crypt. URSS, **6**(2): 90. 1961.

Basidiocarp resupinate, corticioid, membranaceous, thin. Hymenophore smooth to slightly undulating-tuberculate, white to cream-coloured. Margin distinctly bounded to fringed.

Hyphal system monomitic. Hyphae 3–4 μm wide, hyaline, smooth, thin-walled, with clamps. Cystidia of two kinds: (1) gloeocystidia 50–100 × 7–9 μm, almost cylindric, ± constricted, thin-walled enclosed in hymenium, and (2) lamprocystidia 25–35 × 8–10 μm, conic, encrusted, thick-walled, hyaline. Basidia 30–40 × 6–9 μm, clavate or suburniform, with 4 sterigmata and basal clamp. Basidospores 12.0–13.5 × 3.6–4.2 μm, cylindric to suballantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Pagyon Ravine, near Pagyon Falls (65), alt. *ca* 300 m, on fallen twig of deciduous tree, 26 July 1986, *leg*, *Z. Heirich*, KRAM-F 28181.

DISTRIBUTION IN ASIA. Iran, Japan and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 132, Pl. 125); Domański (1988: 311); Eriksson & Ryvarden (1975: 491, Figs 219–220); Ginns & Lefebvre (1993: 82); Hallenberg (1978: 57, 1981: 484); Hansen & Knudsen (1997: 199, Fig. 350); Jülich (1984: 185); Jülich & Stalpers (1980: 112); Maekawa (1994: 55, Fig. 38); Mukhin (1993: Tab. 1); Nikolaeva (1961: 90, Figs 34–35, Pl. VIII: 2).

Hyphoderma praetermissum (P. Karst.) J. Eriksss. & Strid

Corticiaceae North Eur. **3**: 505, Figs 229–234. 1975.

Corticium praetermissum P. Karst., Bidr. Känn. Finl. Nat. Folk **48**: 423. 1889.

Basidiocarp resupinate, corticioid, thin. Hymenophore smooth to slightly tuberculate, white to cream-coloured or grey-whitish. Margin distinctly bounded.

Hyphal system monomitic. Hyphae 3–4 μm wide, hyaline, smooth, thin-walled, with clamps. Cystidia of 3 kinds: (1) gloeocystidia 50–100 × 7–10 μm, almost fusiform, thin-walled, enclosed in hymenium, with yellowish, homogeneous contents, (2) cystidia 15–80 × 6–9 μm, projecting, cylindric, capitate, thin-walled, hyaline, some encrusted at tips with crystals, and (3) stephanocysts *ca* 10–12 μm in diam., pyriform, with toothed equatorial zone, enclosed in subhymenium. Basidia 20–25 × 6–7 μm, clavate with 4 sterigmata and a basal clamp. Basidiospores 6.0–9.6 × 3.6–5.4 μm, cylindric to ovoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: E slope of Paekdu-san Mt., *ca* 15 km E of Paekdu-san Mt. peak (1), slightly below upper forest line, alt. *ca* 1900 m, scattered forest with *Larix olgensis*, on fallen dead decayed trunk of *Larix olgensis*, 30 June1986, *leg. W. Wojewoda*, KRAM-F 29079; *ca* 10 km S of Samji-yon town (8), alt. *ca* 1300 m, on lying decayed trunk, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30331; Myohyang-san Mts: below Sangwon-am Monastery (19), alt. *ca* 600 m, deciduous forest, on fallen dead deciduous branches, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30683; alt. *ca* 500 m, mixed forest, on stump of ?*Pinus densiflora*, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 29078; near Myohyang-san Hotel (20), Hyang-san River Valley, alt. *ca* 100 m, mixed forest, on fallen dead decayed trunk, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 30330; on *Prunus maackii* trunk, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 29107; Suian-san Mts (48): near ruins of castle, alt. *ca* 150–200 m, mixed forest, on fallen dead decayed trunk, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 30328; Kumgang-san Mts: near Onjong-ryong Pass (54), alt. *ca* 800 m, mixed forest, on fallen decayed trunk, 16 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30333; pine Chanto Forest (61), alt. *ca* 50 m, with *Pinus densiflora*, on decayed stump of tree, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29007; Okryu-dong Valley (59), near Kuryong Falls, alt. *ca* 700 m, *leg. W. Wojewoda*, mixed forest, on stump of *Quercus* ?*mongolica*, 20 July 1986, *leg. W. Wojewoda*, KRAM-F 30332.

DISTRIBUTION IN ASIA. China, Iran, Japan, South Korea, Russia (e.g. West Siberia) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 132, Pl. 126); Domański (1988: 327); Eriksson & Ryvarden (1975: 505, Figs 229–234); Ginns & Lefebvre (1993: 83); Hallenberg (1978: 57; 1981: 484); Hansen

& Knudsen (1997: 201, Fig. 352); Jülich (1984: 188); Jülich & Stalpers (1980: 118); Lin & Chen (1990: 74, Figs 4–5); Maekawa (1994: 58, Fig. 41); Maekawa *et al*. (2002: 86); Maekawa & Zang (1995: 90); Mukhin (1993: Tab. 1); Rattan (1977: 362, Figs H-K, p. 361, Pl. 5D); Wu (1990: 77, Figs 50a–e, 51a–d).

Hyphoderma puberum (Fr.) Wallr.

Fl. Crypt. Germ. 576. 1833.

Thelephora pubera Fr., El. Fung. **1**: 215. 1828.

Basidiocarp resupinate, corticioid, thin. Hymenophore smooth, cream-ochre.

Hyphal system monomitic. Hyphae 3–4 μm wide, hyaline, smooth, thin-walled, with clamps. Cystidia (lamprocystidia) 60–90 × 10–15 μm, fusiform-conic, enclosed in hymenium or subhymenium, or strongly projecting, thin- or thick-walled, hyaline, strongly encrusted. Basidia 20–30 × 5–8 μm, clavate or subclavate, with 4 sterigmata and a basal clamp. Basidiospores 7.0–10.0 × 3.5–5.4 μm, subcylindric or elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 550 m, mixed forest, on decayed stump, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 29090.

DISTRIBUTION IN ASIA. China, Iran, Japan, Korea and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 134, Pl. 127); Domański (1988: 309, Pls. 226: 1; 244: 1); Eriksson & Ryvarden (1975: 513, Figs 535–538); Ginns & Lefebvre (1993: 84); Hallenberg (1978: 57; 1981: 484); Hansen & Knudsen (1997: 199, Fig. 353); Jülich (1984: 184); Jülich & Stalpers (1980: 111); Maekawa (1994: 60, Fig. 42); Maekawa *et al*. (2002: 87); Maekawa & Zang (1995: 91); Mukhin (1993: Tab. 1); Rattan (1977: 359, Figs A–D, p. 359); Wu (1990: 80, Fig. 52a–g).

Hyphoderma setigerum (Fr.) Donk

Fungus **27**: 15. 1957.

Thelephora setigera Fr., Elench. Fung. **1**: 208, 1828. – *Odontia setigera* (Fr.) Miller, Mycologia **26**: 19, Pl. II, Fig. 3. 1934.

Basidiocarp resupinate, corticioid, thin. Hymenophore very variable, smooth, irregularly tuberculate, slightly odontioid with small teeth on smooth surface, to almost raduloid with fibrillose teeth, white, cream-coloured to ochraceous. Margin thick, fimbriate. Consistency wax-like, soft.

Hyphal system monomitic. Hyphae 3–4 μm wide, hyaline, smooth, thin-walled, with clamps. Cystidia (septocydtidia) 66.0–108.0 × 7.2–12.0 μm, cylindric, multiply septate, with clamps at septa, thick-walled, projecting. Basidia 30–40 × 6–7 μm, cylindric-clavate or suburniform, with 4 sterigmata and basal clamp. Spores 6.0–11.4 × 3.6–5.4 μm, cylindric, suballantoid to elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1300–1500 m, mixed taiga, on fallen dead twigs of deciduous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29077; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 550 m, mixed forest, on fallen dead trunk of *Pinus densiflora*, 13 July1986, *leg. W. Wojewoda*, KRAM-F 29080; near Myohyang Hotel (20), bank of Hyang-san River, alt. *ca* 100 m, mixed forest, on fallen twig of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30334, 30397; 12 July 1986, *leg. W. Wojewoda*, KRAM-F 29054: near Habiro Temple (27), alt. *ca* 200 m, deciduous forest, on fallen dead twig of deciduous tree, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 29104; Pyongyang town: Central Botanical Garden (36), on stump of *Metasequoia glyptostroboides*, 26 Sept. 1984, *leg. W. Wojewoda*., KRAM-F 28988; Suian-san Mts: (48), near hospital, alt. *ca* 200 m, deciduous forest, on fallen twigs of deciduous tree, 25 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29008; Kumgang-san Mts: near Myonggyong-dae Rock (58), alt. *ca* 1000 m, mixed forest, on fallen decayed twig, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29009; Pagyon Ravine, below Pagyon Falls (65), alt. *ca* 250 m, mixed forest, on fallen dead twig of deciduous tree, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29047; 26 July 1986, *leg. W. Wojewoda*, KRAM-F 29048.

DISTRIBUTION IN ASIA. China, India (North Western Himalayas), Iran, Japan, Russia (Eest and West Siberia, Far East) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 134, Pl. 129); Domański (1988: 307); Eriksson & Ryvarden (1975: 527, Figs 245–250); Ginns & Lefebvre (1993: 85); Hallenberg (1978: 57; 1981: 494); Hansen & Knudsen (1997: 199, Fig. 355); Jülich (1984: 184); Jülich & Stalpers (1980: 110); Lin & Chen (1990: 78, Figs 7–8); Nikolaeva (1961: 106, Figs 49–50); Maekawa (1993: 10; 1994: 62, Fig. 44); Maekawa *et al*. (2002: 87); Maekawa & Zang (1995: 91); Mukhin (1993: Tab. 1); Rattan (1977: 358, Figs L-O, p. 361); Wu (1990: 82, Fig. 53a–e).

Hyphoderma tsugae (Burt) J. Erikss. & Strid

in J. Erikss. & Ryvarden, Corticiaceae North Eur. **3**: 541, Fig. 254. 1975.

Corticium tsugae Burt, Ann. Miss. Bot. Gard. **13**: 276. 1926.

Basidiocarp resupinate, corticioid, thin. Hymenophore smooth, pale ochraceous.

Hyphal system monomitic. Hyphae 3–4 μm wide, hyaline, smooth, thin-walled, with clamps. Cystidia of 2 kinds: (1) projecting, fusiform acute cystidia (leptocydtidia), 45–75 × 5–8 μm, thin-walled, projecting, (2) enclosed, capitate cystidia 30–40 × 4–7 μm, apically excreting brown, resinous amorphous matter. Basidia 20–30 × 6–7 μm, clavate, sligtly constricted or sinuous, with 4 sterigmata and basal clamp. Spores 8.5–9.0 × 3.6–5.0 μm, elliptic, smooth, hyaline, thin-walled, with oil-drops, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: near Naegok village (13), alt. *ca* 1000 m, mixed forest, on stump, 27 June 1986, *leg. W. Wojewoda*, KRAM-F 30335.

DISTRIBUTION. Reported from Europe and North America (United States). According to some authors it is a synonym of *H. pallidum* (Bres.) Donk, Fungus 27: 15. 1957.

NOTES. New to North Korea.

REFERENCES. Domański (1988: 321); Ginns & Lefebvre (1993: 83); Jülich (1984: 188); Jülich & Stalpers (1980: 118).

Hypochnicium albostramineum (Bres.) Hallenberg

Mycotaxon **24**: 434. 1985.

Hypochnus albostramineus Bres., Ann. Mycol. **1**: 109. 1903.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Hymenophore smooth, whitish.

Hyphal system monomitic. Hyphae 2.5–3.5 μm, smooth, hyaline, thin- or thick-walled, with clamps at all septa. Cystidia 54–72 × 6–7 μm long, subcylindric, thin-walled, hyaline, sometimes slightly constricted, enclosed or projecting. Basidia 30.0–40.0 × 4.5–5.0 μm, subclavate or subcylindric, sometimes constricted and ± sinuous, with 4 sterigmata and basal clamp. Basidiospores (4.2–)6.7–9.7(–11.6) × (4.2–)7.7(–8.7) μm, broadly elliptic, ovoid or subglobose, finely verrucose, hyaline, thick-walled, mostly 1-guttulate, non-amyloid.

SPECIMEN EXAMINED. Kumgang-san Mts: below Onjong-ri Pass (54), alt. *ca* 800 m, mixed forest, on decayed stump, 16 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30336.

DISTRIBUTION. Known from Europe (e.g. Poland).

NOTES. New to North Korea. This species was described by Bresadola (1903) from material collected by Polish mycologist Bogumir Eichler in Poland. Basidiospores of closely related species are smaller: *Hypochnicum punctulatum* (Cooke) J. Erikss. 5.0–6.5(–7) μm, and *H. eichleri*: 7.0–8.0(–8.5) × 5.5–7.0 μm.

REFERENCES. Hallenberg (1985: 431–436).

Hypochnicium caucasicum Parmasto

Izv. Akad. Nauk. Estonsk. SSR, Ser. Biol. **16**(4): 385. 1967.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Hymenophore tuberculate, cream-coloured.

Hyphal system monomitic. Hyphae 2.5–3.5 μm, smooth, hyaline, thin- or thick-walled, with clamps at all septa. Cystidia 80–100 × 6–8 μm long, subcylindric, thin-walled, hyaline, sometimes slightly constricted, enclosed or projecting. Basidia 30.0–40.0 × 4.5–5.0 μm, subclavate or subcylindric, sometimes constricted and ± sinuous, with 4 sterigmata and basal clamp. Basidiospores 4.8–6.0(–7.2) × 4.8–5.5(–6.0) μm, broadly

elliptic or subglobose, finely verrucose, hyaline, thick-walled, mostly 1-guttulate, non-amyloid.

SPECIMEN EXAMINED. Ryongak-san Mt. (42), alt. *ca* 280 m, on soil, stumps and stones, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30341.

DISTRIBUTION IN ASIA. Caucasus and Iran.

NOTES. New to North Korea. Also known from Europe. According to Jülich & Stalpers (1980: 124) it is a synonym of *H. punctulatum* (Cooke) J. Erikss.

REFERENCES. Eriksson & Ryvarden (1976: 724–725, Fig. 357); Hallenberg (1981: 485); Tellería (1990: 66).

Hypochnicium erikssonii Hallenberg & Hjortstam

Windahlia **18**: 43–45. 1990.

H. sphaerosporum (Höhn. & Litsch.) J. Erikss., Symb. Bot. Upsal. **16**(1): 1001. 1958 ss. auct.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Hymenophore almost smooth to the naked eye, with small granules or porose-reticulate under the lens, pale cream to light ochre.

Hyphal system monomitic. Hyphae 2.5–3.5 µm, smooth, hyaline, thin- or thick-walled, with clamps at all septa. Cystidia 60–160 × 6–12 µm, subcylindric or subfusoid, thin-walled, hyaline, sometimes slightly constricted, enclosed or projecting. Basidia 25.0–30.0 × 4.5–5.0 µm, subclavate or subcylindric, sometimes constricted and ± sinuous, with 4 sterigmata and basal clamp. Basidiospores 4.8–7.2 × 4.8–5.5(–6.0) µm, broadly elliptic or subglobose, smooth, hyaline, thick-walled, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), Hyang-san River Valley, alt. *ca* 100–150 m, mixed forest, on decayed stump, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30340, 30633; near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on dead fallen trunk of *Pinus densiflora*, 5 Aug.1983, *leg. W. Wojewoda*, KRAM-F 30339; Suian-san Mts (48): hospital in forest, alt. *ca* 200 m, deciduous forest, on fallen dead deciduous branches, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 30631; near ruins of castle, alt. *ca* 200 m, mixed forest, on trunk of *Acer* sp., 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29632.

DISTRIBUTION. Reported e.g. from Europe.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 140, Pl. 136); Jülich & Stalpers (1980: 123).

Hypochnicium globosum Sheng H. Wu

Acta Bot. Fennica **142**: 110, Fig. 72a–e. 1990.

Basidiocarp corticioid, effused, ceraceous when young, crustaceous and tough when old. Hymenophore yellow or cream, smooth when young, slightly tuberculate and cracked when old.

Hyphal system monomitic, hyphae 2.9–5.0 µm wide, thin-walled or slightly thick-walled, smooth, hyaline, with clamps. Basidia clavate with four sterigmata. Spores (6.7–)9.0–12.0 (–14.4) × (6.7–)8.4–10.8(–12.0) µm, globose, subglobose or obovate, hyaline, smooth, thick-walled, wall (0.9–)1.0–1.5(–2.0) µm thick.

SPECIMENS EXAMINED. Myohyang-san Mts: near Unson Falls (23), mixed forest, on rotten stump, 14 July 1986, *leg. W. Wojewoda*, KRAM-F 52751; Pyongyang town: Central Botanical Garden (36), on living trunk of *Metasequoia glyptostroboides*, 7 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 52758; Suian-san Mts (48): alt. *ca* 200 m, mixed forest, on fallen trunks and branches of deciduous and coniferous (*Pinus densiflora*) trees, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 52752, 52753, 52754, 52755, 52756, 52757.

DISTRIBUTION IN ASIA. China, Japan and Taiwan.

NOTES. New to North Korea.

REFERENCES. Maekawa (1994: 88, Fig. 63); Maekawa *et al*. (2002: 89).

Hypochnicium lundellii (Bourd.) J. Erikss.

Symb. Bot. Upsal. **16**(1): 101. 1958.

Corticium lundellii Bourd., *in* J. Erikss., Sv. Bot. Tidskr. **43**: 56. 1949.

Basidiocarp corticioid, resupinate. Hymenophore smooth, slightly verrucose to tuberculate, white to watery bluish, drying white cream to cream. Consistency soft, somewhat wax-like.

Hyphal system monomitic. Hyphae 3.0–5.5 µm wide, smooth, hyaline, thin- to thick-walled, with clamps. Cystidia absent. Basidia 25.0–35.0 × 4.5–6.0 µm, slenderly clavate, with 4 sterigmata and

basal clamp. Basidiospores 6.0–7.0 × 4.5–5.0 μm, elliptic, smooth, hyaline, thick-walled, with oil-drops, non-amyloid.

SPECIMENS EXAMINED. Nampo town port (42): park, on ground, 25 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29057; Pagyon Ravine (65), alt. *ca* 250 m, deciduous forest, on fallen dead deciduous branches, 20 July 1986, *leg. W. Wojewoda*, KRAM-F 30682.

DISTRIBUTION IN ASIA. India (North Western Himalayas).

NOTES. New to North Korea. Known also from Europe and North America (United States).

REFERENCES. Breitenbach & Kränzlin (1986: 138, Pl. 134); Domański (1988: 358); Eriksson & Ryvarden (1976: 713, Fig. 350); Ginns & Lefebvre (1993: 92); Hansen & Knudsen (1997: 203, Fig. 365); Rattan (1977: 324, Figs D-F, p. 322).

Hypochnicium punctulatum (Cooke) J. Erikss.

Symb. Bot. Upsal. **16**(1): 101. 1958.

Corticium punctulatum Cooke, Grevillea **6**: 132. 1878.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Hymenophore smooth or tuberculate, cream-coloured, cracked when dry.

Hyphal system monomitic. Hyphae 4.0–4.5 μm wide, smooth, hyaline, thin- or thick-walled, with clamps at all septa. Cystidia 65.0–140.0 × 7.2–9.5 μm, subcylindric or fusiform, sometimes slightly constricted, thin-walled, hyaline, smooth, enclosed or projecting. Basidia 30.0–40.0 × 5.5–6.5 μm, subclavate, or subcylindric, sometimes constricted and ± sinuous, with 4 sterigmata and basal clamp. Spores 4.8–7.2 × 4.8–5.4(–6.6) μm, broadly elliptic or subglobose, finely verrucose or echinulate, hyaline, thick-walled, mostly 1-guttulate, non-amyloid.

SPECIMENS EXAMINED. Shore of Soham-so Lake (32), mixed forest with *Pinus densiflora*, on stump of coniferous tree (?*Pinus densiflora*), 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29052; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, on stump of tree, 5 July 1986, *leg. W. Wojewoda*, KRAM-F 29091.

DISTRIBUTION IN ASIA. China, India (e.g. North Western Himalayas), Japan and Russia (West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 138, Pl. 135); Domański (1988: 366); Eriksson & Ryvarden (1976: 723, Figs 345a, 355–358); Ginns & Lefebvre (1993: 92); Maekawa (1994: 91, Fig. 66); Maekawa *et al*. (2002: 89); Mukhin (1993: Tab. 1); Rattan (1977: 320, Figs F-G, p. 325, Pl. 5B).

Intextomyces contiguus (P. Karst.) J. Erikss. & Ryvarden

Corticiaceae North Eur. **4**: 737, Figs 365–366. 1976.

Corticium contiguum P. Karst., Acta Soc. Fauna Fl. Fenn. **2**: 1. 1881.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Hymenophore smooth, tuberculate or odontioid, greyish white, cracked when dry.

Hyphal system monomitic. Hyphae 2–3 μm wide, indistinct, smooth, hyaline, thin-walled, with clamps at all septa. Cystidia absent. Basidia 10.0–26.4 × 4.0–6.0 μm, short cylindric or suburniform, sometimes constricted, with 4 sterigmata. Spores 3.6–6.0 × 3.0–4.2 μm, elliptic or ovoid, often subangulate, smooth, hyaline, thick-walled, sometimes 1-guttulate, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), Hyang-san River Valley, alt. *ca* 100–150 m, mixed forest, on fallen twig of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30337; deciduous forest, on dead trunk of *Prunus maackii*, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 28422; between Habiro Temple (27) and Chontae Falls (28), alt. *ca* 250 m, deciduous forest, on dead fallen twig of deciduous tree, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28308.

DISTRIBUTION IN ASIA. Russia (West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1988: 369); Eriksson & Ryvarden (1976: 737, Figs 365–366); Ginns & Lefebvre (1993: 93); Jülich & Stalpers (1980: 125); Mukhin (1993: Tab. 1).

Subulicystidium longisporum (Pat.) Parmasto

Consp. Syst. Cortic. 121. 1968.

Hypochnus longisporus Pat., J. Bot. (Morot) **8**: 221. 1894. – *Peniophora longispora* (Pat.) Höhn., Ann. Mycol. **3**: 325. 1905.

Basidiocarp corticioid, resupinate, effuse, adnate, thin. Consistency soft. Hymenophore smooth, arachnoid-farinose, whitish to greyish.

Hyphal system monomitic. All hyphae with clamps, 2–4 μm wide, hyaline, thin- or thick-walled, weakly encrusted, with clamps at all septa. Cystidia 40–75 × 3–4 μm, subulate, thin- or thick-walled, strongly encrusted, with thin-walled, smooth, apex not encrusted. Basidia 10.0–13.0 × 3.5–5.0 μm, subclavate or suburniform, with encrustation in basal part, with 4 sterigmata and basal clamp. Spores 10.0–13.0 × 1.5–2.5 μm, narrowly cylindric, narrowly fusoid or sigmoid, smooth, hyaline, thin-walled, with oil-drops, non-amyloid (Fig. 134).

SPECIMENS EXAMINED. Paekdu-san Mts: between Mubong (3) and Taehong-dan (6), alt. *ca* 1300–1500 m, taiga with *Larix olgensis*, on stump, 23 Sept. 984, *leg. W. Wojewoda*, KRAM-F 29061; Chonbong Hill (9), alt. *ca* 1400 m, mixed forest, on fallen decayed twigs, 31 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29034; between Soham-ho Lake (32) and Pyongsong town, deciduous forest, on fallen decayed trunk, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29051.

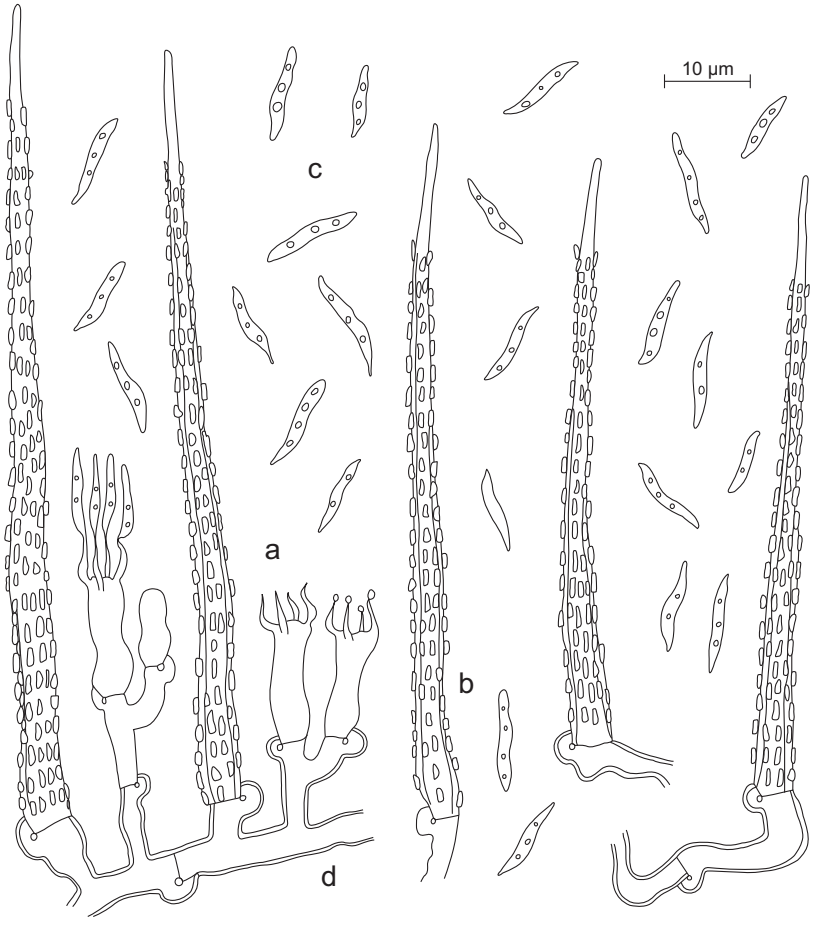


Fig. 134. *Subulicystidium longisporum* (Pat.) Parmasto: a – basidia, b – cystidia, c – basidiospores, d – hyphae (KRAM-F 29061).

DISTRIBUTION IN ASIA. China, India (North Western Himalayas), Iran, Japan, Russia (e.g. Yakutsk region) and Taiwan.

NOTES. New to North Korea. Known also from North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 186, Pl. 206); Cunnigham (1963: 128, Fig. 79); Domański (1992: 126, Pls 295c–d, 312); Eriksson *et al*. (1984: 1145, Figs 759F–G, 763–765); Ginns & Lefebvre (1993: 155); Hallenberg (1978: 75; 1981: 489); Karpova-Benois (1972: 145); Maekawa (1994: 96, Fig. 69); Maekawa *et al*. (2002: 93; 2003: 408); Maekawa & Zang (1995: 93); Rattan (1977: 231, Figs D-G, p. 385); Teng (1996: 283); Wu (1990: 116, Fig. 76a–d).

Meruliaceae P. Karst. 1881

Byssomerulius corium (Pers.: Fr.) Parmasto

Eesti NSV Tead. Akad. Toimet., Biol. **16**: 383. 1967.

Merulius corium Pers.: Fr., Elench. Fung. 58. 1828. – *Meruliopsis corium* (Pers.: Fr.) Ginns., Canad. J. Bot. **54**: 126. 1976.

Basidiocarp corticioid, resupinate or effuso-reflexed, stereoid, pileate. Pileus finely tomentose. Young hymenophore whitish, later greyish-ochraceous, merulioid.

Hyphal system monomitic. All hyphae without clamps. Basal hyphae with thickened wall, subhymenial hyphae 2–3 μm, thin-walled, smooth, hyaline. Cystidia absent. Basidia up to 24.0 × 4.2 μm, narrowly clavate, with 4 sterigmata. Spores 4.2–6.0 × 1.8–2.5 μm, narrowly elliptic to subcylindric, smooth, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Kumgang-san Mts: Okryu-dong Valley (59), below Kuryong Falls, bank of Okryu-dong Stream, alt. *ca* 600 m, mixed forest, on fallen twig of deciduous tree, 5 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 29092, 29084; near Onjong-ri village (60), alt. *ca* 50 m, forest with *Pinus densiflora*, on stump of *Pinus densiflora*, 21 July 1986, *leg. W. Wojewoda*, KRAM-F 29089; alt. *ca* 100 m, mixed forest, on stump, 21 July 1986, *leg. W. Wojewoda*, KRAM-F 30344.

DISTRIBUTION IN ASIA. China, India, Iran and Russia (e.g. West Siberia and Primorski Krai).

NOTES. New to North Korea. A cosmopolitan species. Known also from Europe and North America (Canada and United States).

REFERENCES. Azbukina *et al*. (1984: 32); Breitenbach & Kränzlin (1986: 144, Pl. 144); Cunningham (1963: 323, Pl. V: 3); Domański (1991: 63); Eriksson & Ryvarden (1973: 191, Figs 81–82, Pl. 16); Ginns & Lefebvre (1993: 103); Hallenberg (1978: 51, 1981: 482); Maekawa & Zang (1995: 91); Michael *et al*. (1988: 164, Fig. 17); Mukhin (1993: Tab. 1); Sharma (2000: 44); Teng (1996: 312).

Chondrostereum purpureum (Schum.: Fr.) Pouzar

Česká Mykol. **13**: 17. 1959.

Thelephora purpurea Schum.: Fr., Syst. Mycol. **1**: 440. 1821. – *Stereum purpureum* (Schum.: Fr.) Fr., Epicr. Syst. Mycol. 548. 1938.

Basidiocarp corticioid, resupinate or effused-reflexed, stereoid, pileate. Upper surface of pileus hirsute-tomentose, grey-whitish. Indistinctly zonate with lighter margin. Hymenophore violaceous, smooth or tuberculose-undulating.

Hyphal system monomitic, All hyphae 2–3 μm, with clamps, smooth, hyaline, thin- or thick-walled. Cystidia: (1) leptocystidia 50.0–70.0 × 4.5–7.0 μm, few, fusoid, some encrusted at the apex, projecting, (2) bladder-like cystidia 7–13 μm in diam., in subhymenium. Basidia 40–55 × 5–7 μm, slenderly clavate with 4 sterigmata, and basal clamp. Spores 5.0–8.0 × 2.5–3.5 μm, elliptic, allantoid to subcylindric, hyaline, smooth, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Sokdamgugok village (47), forest, on stump of deciduous tree, 7 July 1986, *leg. W. Wojewoda*, KRAM-F 29003.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Iran, Japan, Kazakhstan, Korea, Nepal (N Western Himalayas) and Russia (e.g. Far East and Siberia).

NOTES. A cosmopolitan species.

REFERENCES. Anonymous (1983a: 102); Azbukina *et al*. (1984: 32); Breitenbach & Kränzlin (1986: 180, Pl. 198); Cunningham (1963: 224, Fig. 129); Davydkina (1980: 94, Fig. 23–26, Pl. I: 10); Domański (1988: 165, Pl. 235: 1); Ginns & Lefebvre (1993: 39); Hallenberg (1978: 51; 1981: 483); Imazeki & Hongo (1975, **2**: 120,

Pl. 38: 229); Jahn (1979: 88, Pl. 52); Maekawa (1993: 71, Fig. 48); Mukhin (1993: Tab. 1); Pilát (1934: 324; 1940: 65); Rattan (1977: 276, Fig. on p. 277, Pl. 8B); Teng (1996: 287, Fig. 245a); Zhao *et al*. (1983: 67).

Cylindrobasidium evolvens (Fr.: Fr.) Jülich

Persoonia **8**(1): 72. 1974.

Thelephora evolvens Fr., Obs. Mycol. **1**: 154. 1815. – *T. evolvens* Fr.: Fr., Syst. Mycol. **1**: 441. 1821. – *Corticium evolvens* (Fr.: Fr.) Fr., Epicr. Syst. Mycol. 557. 1838. – *Basidioradulum evolvens* (Fr.: Fr.) Parmasto, Consp. Syst. Cort. 112. 1968. – *Cylindrobasidium laeve* (Pers.: Fr.) Chamuris, Mycotaxon **20**(2): 587. 1984.

Basidiocarp resupinate, corticioid or effused-reflexed, stereoid, subpileate. Hymenophore smooth or tuberculate-verrucose, cream-coloured or greyish-ochre. Margin slightly filamentous-fringed. Consistency waxy, soft.

Hyphal system monomitic. Hyphae 2–3 μm wide, thin- or somewhat thick-walled, smooth, hyaline, with clamps. Cystidia (leptocystidia) 45–60 × 5–7 μm, fusiform, smooth, hyaline, thin-walled, enclosed or slightly projecting. Basidia 30–45 × 5–8 μm, narrowly clavate, hyaline, thin-walled, with 4 sterigmata and basal clamp. Spores 7–9 × 4–6 μm, elliptic, lacrymoid, pyriform to subglobose, smooth, hyaline, thin-walled, non-amyloid, often agglutinated in groups of 2–4.

SPECIMENS EXAMINED. Paekdu-san Mts: near Naegok village (13), alt. *ca* 1000 m, mixed forest, on fallen twigs of deciduous tree, 27 June 1986, *leg. W. Wojewoda*, KRAM-F 29050; Myohyang-san Mts: below Sangwon-am Monastery (19), alt. *ca* 500 m, mixed forest, on fallen dead deciduous twig, 13 July 1986, *leg. Z. Heinrich*, KRAM-F 27942; Pyongyang town: Central Botanical Garden (36), on hanging dead twig of living shrub *Wistaria floribunda*, 7 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28976.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Mongolia, Russia (West Siberia and vicinity of Yakutsk), and Taiwan.

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 101, as *Corticium evolvens*); Breitenbach & Kränzlin (1986: 110, Pl. 92); Eriksson & Ryvarden (1976: 569, Figs 263–265); Ginns & Lefebvre (1993: 48); Hallenberg (1981: 482); Hansen & Knudsen (1997: 184); Jülich (1984: 156); Jülich & Stalpers (1980: 87); Karpova-Benois (1972: 146); Maekawa (1993: 5; 1994: 45, Fig. 31); Maekawa & Zang (1995: 90); Michael *et al*. (1988: 163, Fig. 15); Mukhin (1993: Tab. 1); Rattan (1977: 353, Figs H-I, p. 356); Tellería (1990: 44); Uranchimehg *et al*. (1983: 374); Wu (1990: 61).

Dacryobolus karstenii (Bres.) Oberw. *ex* Parmasto

Consp. Syst. Cortic. 98. 1968.

Stereum karstenii Bres., Atti Imp. Regia Accad. Rovereto, Ser. 3, **3**(1): 108. 1897.

Basidiocarp corticioid, resupinate, subceraceous to membranaceous. Hymenophore smooth or tuberculate, whitish, cream, pale yellowish to pale ochraceous.

Hyphal system dimitic. Hyphae 2–3 μm, smooth, hyaline, thin- or thick-walled, with clamps. Subiculum consisting of thick-walled hyphae. Cystidia: (1) pseudocystidia up to 200 μm long, 4–7 μm wide, cylindric, thick-walled, apically thin-walled, encrusted, swelling in KOH, enclosed in subhymenium and projecting, (2) hymenial cystidia, 50–75 × 3–4 μm, thin- or thick-walled, cylindric or subclavate, covered with crystals, and projecting. Basidia 30–40 × 2–3 μm, very narrow, slenderly clavate or subfusoid, with 4 sterigmata, and basal clamp. Basidiospores 4.8–6.0 × 1.0–1.5 μm, allantoid to subcylindric, hyaline, smooth, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Kumgang-san Mts: Myonggyong-dae Ravine (58), alt. *ca* 800 m, in mixed forest, on decayed trunk of coniferous tree, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30640; Onjong-ri village (60), Onjong-ri Stream Valley, near Onjong-ri Hotel, alt. *ca* 50 m, pine forest, on fallen trunk of *Pinus densiflora*, 21 July 1986, *leg. H. Komorowska*, KRAM-F 28384.

DISTRIBUTION IN ASIA. China, India (North Western Himalayas) and Japan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1988: 232, Pl. 241: 8); Eriksson & Ryvarden (1975: 341, Fig. 137–139); Ginns

& Lefebvre (1993: 53); Maekawa (1993: 73, Fig. 49); Oberwinkler (1965: 41, Pl. VI: 24); Pilát (1940: 64); Rattan (1977: 280, Figs A-C, p. 283); Tellería (1990: 39)

Gloeoporus dichrous (Fr.: Fr.) Bres.

Hedwigia **53**: 75. 1912.

Polyporus dichrous Fr., Observ. Mycol. **1**: 125. 1815. – *P. dichrous* Fr.: Fr., Syst. Mycol. **1**: 364.1821.

Basidiocarp 15–30 mm wide, pileate. Upper surface cream, tomentose. Margin whitish, sharp. Context white to cream. Hymenophore porose, at margin sterile. Pores 4–6 per mm, surface reddish brown.

Hyphal system monomitic. Hyphae 1–3 μm wide, smooth, hyaline, thin- to thick-walled, with clamps. Cystidia absent. Basidia 12–18 × 3–4 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 3.0–5.0 × 0.7–1.2 μm, allantoid to cylindric, smooth, hyaline, thin-walled, some with 2 oil-drops, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 30 km E of Paekdu-san Mt. peak (1), alt. *ca* 1500 m, mixed taiga, on fallen dead trunk of deciduous tree (*Betula* ?*platyphylla*), 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52992.

DISTRIBUTION IN ASIA. Caucasus, China, India, Japan, Kazakhstan, Russia (e.g. West Siberia, Kamchatka and Primorski Krai), Taiwan and Vietnam.

NOTES. New to North Korea. Cosmopolitan species.

REFERENCES. Azbukina *et al*. (1984: 35); Bondartsev (1953: 255, Figs 51: 5; 59; Pl. LXIX: 1–2); Breitenbach & Kränzlin (1986: 292, Pl. 355); Domański *et al*. (1973: 64, Figs 25: A, 26–27); Enderle & Laux (1980: 88); Hansen & Knudsen (1997: 157); Hattori & Zang (1995: 96); Kotlaba (1984: 115); Michael *et al*. (1988: 167, Fig. 25); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 315); Ryvarden & Gilbertson (1993: 295, Fig. 142, as *Gloeoporus taxicola*!); Sharma (2000: 69); Shvartsman (1964: Figs 140–142); Vasudeva (1962: 53).

Gloeoporus taxicola (Pers.: Fr.) Gilb. & Ryvarden

Mycotaxon **22**: 364. 1985.

Xylomyzon taxicola Pers., Mycol. Europ. **2**: 32. 1825. – *X. taxicola* Pers.: Fr., Elench. Fung. **1**: 62. 1828. – *Meruliopsis taxicola* (Pers.: Fr.) Bondartsev, *in* Parmasto, Eesti NSV Tead. Akad. Tomet., Biol. Seer. **8**: 274. 1959.

Basidiocarp corticioid, resupinate. Hymenophore merulioid or irregularly poroid, reddish to almost black. Pores 2–4 per mm, angular, orange-red-brown to dark red-brown. Margin whitish.

Hyphal system monomitic. Hyphae 3–7 μm wide, smooth, hyaline, thin- or thick-walled, without clamps. Cystidia absent. Cystidioles 10.0–25.0 × 2.0–3.5 μm long, subulate, smooth, hyaline, thin-walled, in hymenium. Basidia 15.0–24.0 × 3.5–5.0 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 3.0–5.5 × 1.0–1.5 μm, allantoid to subcylindric, hyaline, smooth, thin-walled, non-amyloid, with 2 oil-drops.

SPECIMEN EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), Hyangsan-gang River Valley, alt. *ca* 150–200 m, mixed forest, on fallen dead trunk of *Pinus densiflora*, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30643.

DISTRIBUTION IN ASIA. China, Japan, Kazakhstan and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 154, Pl. 157); Ginns & Lefebvre (1993: 104); Domański (1991: 61); Jahn (1979: 110, Pl. 83); Jülich & Stalpers (1980: 154); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 316); Ryvarden & Gilbertson (1993: 296, Fig. 141, as *Gloeoporus dichrous*); Shvartsman (1964: 287, Figs 129–130).

Phlebia fuscoatra (Fr.: Fr.) Nakasone

Sydowia **49**(1): 59. 1997.

Hydnum fuscoatrum Fr., Nov. Florae Suec. 39. 1814. – *H. fuscoatrum* Fr.: Fr., Syst. Mycol. **1**: 416. 1821. – *Mycoacia fuscoatra* (Fr.: Fr.) Donk, Medd. Nederl. Mycol. Ver. **18–20**: 152. 1931. For further synonyms see Ginns & Lefebvre (1993: 105).

Basidiocarp resupinate, effused, Consistency wax-like. Hymenophore hydnoid, with cylindric to subulate, whitish-yellowish to brown spines 1.0–3.0 × 0.3–0.5 mm.

Hyphal system monomitic. Hyphae thin- to thick-walled, hyaline, with clamps at all septa. Cystidia of 2 kinds: (1) leptocystidia 30.0–45.0 × 3.5–4.0 µm, smooth, hyaline, thin-walled, fusoid, in hymenium, (2) hyphal ends up to 10 µm, hyaline, thinwalled, strongly encrusted at tips of spines. Basidia 25–35 × 4–5 µm, narrowly clavate, with 4 sterigmata and basal clamp. Spores 4.5–5.5 × 2.0–2.5 µm, elliptic to subcylindric, hyaline, smooth, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, on very decayed stump, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28632.

DISTRIBUTION IN ASIA. China, India (N Western Himalayas) and Russia (West Siberia and Primorski Krai).

NOTES. New to North Korea.Known also from Europe and North America (Canada and United States).

REFERENCES. Azbukina *et al*. (1984: 32); Breitenbach & Kränzlin (1986: 162, Pl. 169); Domański (1991: 67); Eriksson & Ryvarden (1976: 881, Figs 441–443); Ginns & Lefebvre (1993: 105); Maekawa *et al*. (2002: 90); Mukhin (1993: Tab. 1); Rattan (1977: 285, Figs H-J, p. 283).

Phlebia radiata Fr.

Syst. Mycol. **1**: 427. 1821.

Merulius merismoides Fr., Obs. Mycol. 235. 1818. – *Phlebia aurantiaca* (Sow.: Fr.) J. Schröt., *in* Cohn, Krypt.-Fl. Schlesien **3**(1), 4: 461. 1888. – *P. merismoides* (Fr.): Fr. Syst. Mycol. **1**: 427. 1821.

Basidiocarp resupinate, effused, slightly effused or slightly effused-reflexed, subgelatinous when fresh, corneous when dried. Hymenophore radially-irregularly plicate or ± tuberculate, pinkish red, orange-red to violaceous-red when fresh; margin fimbriate-strigose.

Hyphal system monomitic. Hyphae with clamps at all septa, in subhymenium thin-walled,

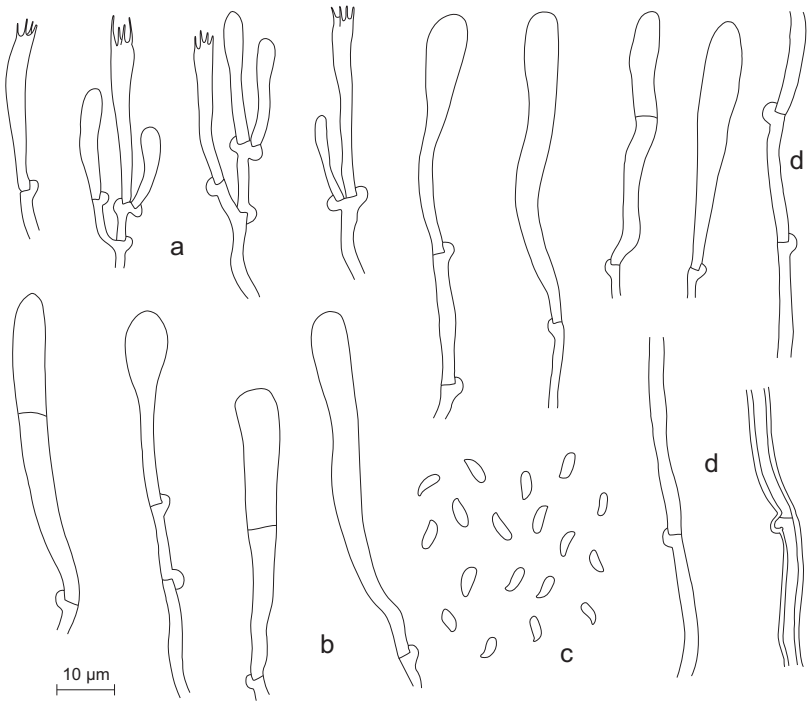


Fig. 135. *Phlebia radiata* Fr.: a – basidia, b – cystidia, c – basidiospores, d – hyphae (KRAM-F 30368).

in subiculum thick-walled. Cystidia 25.0–60.0 × 7.0–9.5 μm, in subhymenium, tube-like or clavate, thin-walled, enclosed, not projecting, few. Basidia 25.0–35.0 × 2.4–4.0 μm, narrowly clavate, with 4 sterigmata and basal clamp. Spores 3.6–4.8 × 1.5–2.0 μm, allantoid, suballantoid to oblong-elliptic, hyaline, smooth, thin-walled, non-amyloid (Fig. 135).

SPECIMENS EXAMINED. Pyongyang town: Central Botanical Garden (36), on trunk of living *Quercus altissima*, 9 July 1986, *leg. W. Wojewoda*, KRAM-F 29095; Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest with *Castanea* sp., *Pinus densiflora* and *Quercus mongolica*, on *Juglans mandshurica*, 16 July 1986, *leg. H. Komorowska*, KRAM-F 51709; Sokdamgukok village (47), mixed forest with *Pinus densiflora* and *Quercus mongolica*, on fallen dead deciduous twig, 7 July 1986, *leg. W. Wojewoda*, KRAM-F 30648; Suian-san Mts (48), alt. *ca* 200 m, between ruins of castle and hospital, deciduous forest, on fallen dead deciduous, trunk, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 30649; near Pagyon Falls (65), alt. *ca* 300 m, deciduous forest, on stump of deciduous tree, 26 July 1986, *leg. W. Wojewoda*, KRAM-F 30368.

DISTRIBUTION IN ASIA. China (Tibet), India, Japan, Kazakhstan and Russia (e.g. Siberia).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 166, Pl. 176); Christiansen (1960: 163, Fig. 156); Domański (1991: 163); Eriksson *et al*. (1981: 1153, Figs 588–590); Ginns & Lefebvre (1993: 122); Jahn (1979: 92, fig. 59); Jülich (1984: 164); Maekawa (1993: 88, Fig. 59); Mukhin (1993: Tab. 1); Pilát (1934: 287; 1936: 391); Rattan (1977: 293, Figs A-B, p. 298, Pl. 8A); Shvartsman (1964: 268, Fig. 121); Teng (1996: 311); Zhao *et al*. (1983: 77).

Phlebia rufa (Pers.: Fr.) M. P. Christ.

Dansk Bot. Ark. **19**(2): 164. 1960.

Merulius rufus Pers., Syn. Meth. Fung. 498. 1801. – *M. rufus* Pers.: Fr., Syst. Mycol. **1**: 327. 1821.

Basidiocarp 8–30 × 6–15 mm, resupinate, closely adnate, effuse, in the living state ceraceous-fleshy, when dried membranaceous-coriaceous, yellowish-brown. Hymenophore reticulately folded, merulioid to almost poroid.

Hyphal system monomitic; all hyphae with clamps, embedded in gelatinous matrix, 2–3 μm wide, thin-walled, hyaline. Cystidia narrowly clavate or fusiform, 40.0–90.0 × 6.5–9.7 μm, hyaline, thin-walled. Basidiospores 3.8–4.8 × 1.9–2.5 μm, suballantoid, hyaline, smooth, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Ryongak-san Mt. (42), alt. *ca* 200 m, mixed forest, on stump of deciduous tree, 16 July 1986, *leg. Z. Heinrich*, KRAM-F 27973; Kumgang-san Mts: near Onjong-ri (60), alt. *ca* 100 m, forest, on fallen dead twig of deciduous tree, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 27803.

DISTRIBUTION IN ASIA. Iran and Russia (e.g. West Siberia, near Yakutsk and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 32); Breitenbach & Kränzlin (1986: 166, Pl. 177); Domański (1991: 146); Eriksson *et al*. (1981: 1157, Figs 591–594); Hallenberg (1978: 71; 1981: 487); Karpova-Benois (1972: 143); Mukhin (1993: Tab. 1); Pilát (1934: 291).

Phlebia tremellosa (Schrad.: Fr.) Nakasone & Burds.

Mycotaxon **21**: 245. 1984.

Merulius tremellosus Schrad., Spic. Fl. Germ. 139. 1794. – *M. tremellosus* Schrad.: Fr., Syst. Mycol. **1**: 327. 1821.

Basidiocarp semipileate or pileate, stereoid, sessile. Upper surface of pileus hairy, hispid from white tomentum, white to yellowish with pink tint. Margin white to somewhat translucent. Hymenophore merulioid, folded, reticulate-porose, yellow, orange to salmon-pink. Consistency soft, subgelatinous when fresh.

Hyphal system monomitic. Hyphae 2–4 μm, smooth, hyaline, thin-walled, with clamps at all septa. Cystidia (cystidioles) 25–40 × 3–4 μm, hyaline, thin-walled, cylindric or subcylindric, some encrusted. Basidia 20.0–25.0 × 2.4–4.0 μm, narrowly clavate, with 4 sterigmata and basal clamp. Basidiospores 3.5–4.0 × 1.0–1.5 μm, allantoid, smooth, hyaline, thin-walled, some with 2 oil-drops, non-amyloid (Fig. 136).

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed taiga with *Larix olgensis*,

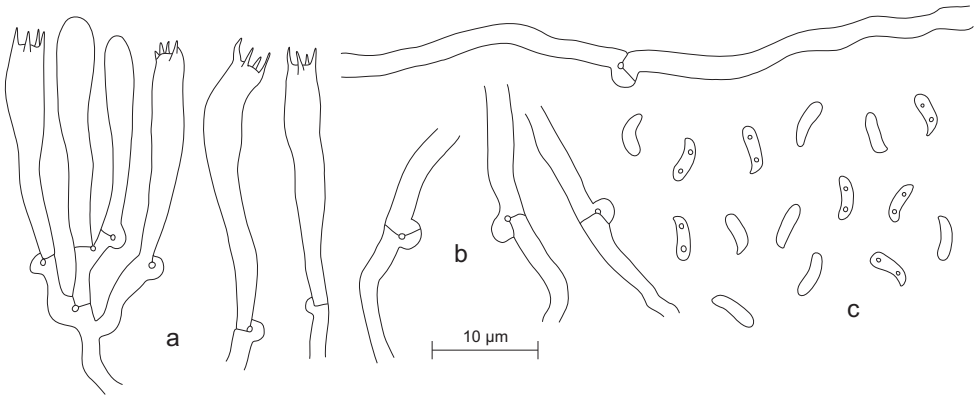


Fig. 136. *Phlebia tremellosa* (Schrad.: Fr.) Nakasone & Burds.: a – basidia, b – hyphae, c – basidiospores (KRAM-F 28951).

Betula and *Picea*, on decayed stump, 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28952; Myohyang-san Mts: between Habiro Temple (27) and Hyang-san Stream Valley, alt. *ca* 150 m, mixed forest, on stump of tree, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28951; near Habiro Temple, alt. *ca* 200 m, mixed forest, on stump, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 29010.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Iran, Japan, Kazakhstan, Korea, Mongolia and Russia (e.g. Siberia and Primorski Krai).

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 104); Azbukina *et al.* (1984: 32); Breitenbach & Kränzlin (1986: 146, Pl. 145); Domański (1991: 147); Eriksson & Ryvarden (1976: 865, Figs 432–434); Hallenberg (1981: 486); Imazeki & Hongo (1975, **1**: 136, Pl. 63: 365); Jahn (1979: 92, Pl. 58); Maekawa (1993: 91, Fig. 62); Mukhin (1993: Tab. 1); Pilát (1934: 293; 1936: 392; 1940: 63); Sharma (2000: 87); Shvartsman (1964: 273, Fig. 123); Teng (1996: 311); Zhao *et al.* (1983: 78).

Resinicium bicolor (Alb. & Schwein.: Fr.) Parmasto

Consp. Syst. Cortic. 97. 1968.

Hydnum bicolor Alb. & Schwein., Consp. Fung. 270. 1801. – *H. bicolor* Alb. & Schwein.: Fr., Syst. Mycol. **1**: 417. 1821. – *Odontia bicolor* (Alb. & Schwein.: Fr.) Quél., Enchir. Fung. 195. 1886.

Basidiocarp resupinate, effused, adnate, thin. Consistency wax-like. Hymenophore irregularly odontioid, with small conic teeth up to 0.3 mm long, whitish, cream-coloured to ochre when fresh; margin not determinate.

Hyphal system monomitic. Hyphae 1.5–3.5 µm wide, hyaline, smooth, thin-walled, with clamps at all septa. Cystidia of 2 kinds: (1) capitate halocystidia with apical smooth, thin-walled bladder, 10–18 µm wide, (2) star-like astrocystidia (cystidioles), hyaline, smooth and pointed with star-like tuft of crystals *ca* 10–15 µm in diam. Basidia 12.0–22.0 × 4.5–7.0 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5.5–7.0 × 2.5–3.5 µm, elliptic or suballantoid, hyaline, smooth, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 10 km S of Samji-yon town (8), on fallen, decayed trunk, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30690; Naegok (13), alt. *ca* 1000 m, mixed forest, on fallen dead decayed trunk, 27 June 1986, *leg. W. Wojewoda*, KRAM-F 29110.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Japan, Nepal (North Western Himalayas), Russia (e.g. West Siberia) and Taiwan.

NOTES. New to North Korea. A cosmopolitan species. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 168, Pl. 178); Domański (1976: 58, Figs 11; 1991: 221); Eriksson *et al.* (1981: 1265, Figs 648–649); Ginns & Lefebvre (1993: 137); Lin & Chen (1990: 106, Figs

29–30); Maekawa (1993: 95, Fig. 64); Maekawa *et al*. (2002: 92); Maekawa & Zang (1995: 92); Mukhin (1993: Tab. 1); Nikolaeva (1961: 119, Figs 66–68, Pl. XIX); Rattan (1977: 289, Figs F-I, p. 298); Zhao *et al*. (1983: 65).

Scopuloides rimosa (Cooke) Jülich

Persoonia **11**: 422.

Peniophora rimosa Cooke, Grevillea **9**: 94. 1881. – *Odontia hydnoides* (Cooke & Massee) Höhn., Sitzb. Akad. Wiss. Wien. Math.-nat. Kl. **118**: 817. 1909. – *Peniophora hydnoides* Cooke & Massee, *in* Cooke, Grevillea **16**: 77. 1888. – *Phlebia hydnoides* (Cooke & Massee) M. P. Christ., Dansk Bot. Ark. **19**: 175, Fig. 171. 1960. – *Scopuloides hydnoides* (Cooke & Massee) Hjortstam & Ryvarden, Mycotaxon **9**: 509. 1979. For further synonyms see Ginns & Lefebvre (1993: 139).

Basidiocarp corticioid, resupinate, effused, adnate, thin, hyaline whitish blue, or bluish grey with pinkish tint. Margin indistinct. Consistency wax-like. Hymenophore tuberculate to subodontioid, with small conic teeth up to 0.3 mm long.

Hyphal system monomitic. Hyphae 3.5–7.0 µm wide, hyaline, smooth, thin- to thick-walled, without clamps. Cystidia (lamprocydtidia) of 2 kinds: (1) non-septate, conic cystidia, 44.0–67.0 × 7.5–11.5 µm, strongly encrusted in apical part, thick-walled, (2) septocystidia 50.0–100.0 × 6.0–13.5 µm, septate, cylindric, hyaline, thick-walled, covered with crystals. Basidia 9–14 × 3–5 µm, cylindric-clavate, with 4 sterigmata, without basal clamp. Basidiospores 3.5–3.8 × 1.5–2.5 µm, elliptic to suballantoid, hyaline, smooth, thin-walled, non-amyloid (Fig. 137).

SPECIMEN EXAMINED. Kumgang-san Mts: below Onjong-ryong Pass (54), alt. *ca* 700 m, mixed forest, on fallen decayed stump, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 53019.

DISTRIBUTION IN ASIA. Caucasus, India, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 160, Pl. 166); Domański (1992: 32, Pl. 297 e-i); Eriksson *et al*. (1984: 1293, Figs 661–669A–D); Ginns & Lefebvre (1993: 139); Jülich & Stalpers (1980: 203); Maekawa (1993: 69, Fig. 47); Mukhin (1993: Tab. 1); Nikolaeva (1961: 131, Figs 82–83); Rattan (1977: 297, Figs D-F, p. 302).

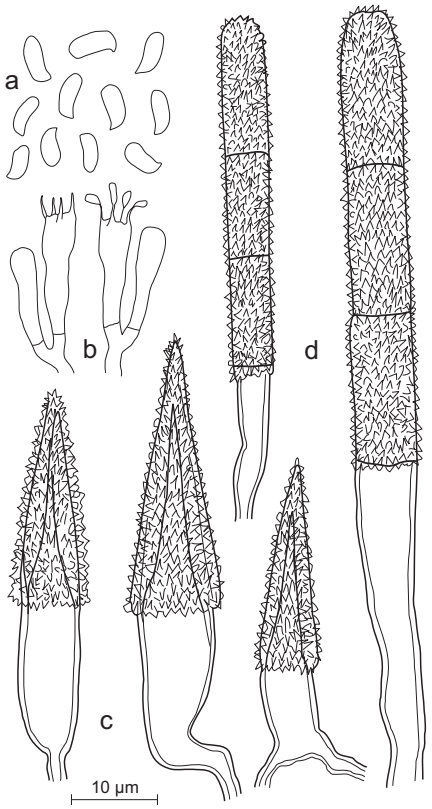


Fig. 137. *Scopuloides rimosa* (Cooke) Jülich: a – basidiospores, b – basidia, c – non-septate cystidia, d – septocystidia (KRAM-F 53019).

Phanerochaetaceae Jülich 1982

Erythricium laetum (P. Karst.) J. Erikss. & Hjortstam

Svensk. Bot. Tidskr. **64**(2): 166. 1970.

Hyphoderma laetum P. Karst., Rev. Myc. **11**: 206. 1889. – *Corticium laetum* (P. Karst.) Bres., Ann. Mycol. **1**(1): 94. 1903.

Basidiocarp resupinate, corticioid, thin, loosely attached to substrate. Hymenophore irregularly

wrinkled, salmon-pink. Dried fruitbody grey with very faint pinkish tint. Margin sterile, whitish.

Hyphal system monomitic. All hyphae without clamps, 3–10 µm wide, hyaline, smooth, thin- or thick-walled, without clamps. Cystidia absent. Basidia 66.0–72.0 × 9.6–10.0 µm, clavate, with 4 sterigmata, without basal clamp. Spores 6.6–12.6(–13.2) × 5.4–8.4(–10.2) µm, ovoid, broadly elliptic to subglobose, thick-walled, smooth, hyaline, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100 m, bank of Hyangsan-gang River, at road, on living but diseased trunk of *Robinia pseudoacacia*, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 30630; on slope of Wonman Mt. (31), alt. *ca* 700 m, deciduous forest, on bare soil, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30641.

DISTRIBUTION. Reported from Europe and North America (United States).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 130, Pl. 121); Domański (1988: 266); Eriksson & Ryvarden (1975: 371, Figs 150a–f, 151); Ginns & Lefebvre (1993: 62); Hansen & Knudsen (1997: 166); Jülich & Stalpers (1980: 98).

Lopharia mirabilis (Berk. & A. Braun) Pat.

Bull. Soc. Myc. Fr. **11**: 14, Pl. I. 1895.

Radulum mirabile Berk. & A. Braun, J. Linn. Soc. Bot. **14**: 61. 1873.

Basidiocarp 25–30 × 12–15 mm, effused reflexed, coriaceous when fresh, stiff and hard when dry, beige-coloured. Hymenophore irpicoid-semiporoid.

Hyphal system dimitic. Generative hyphae 2.0–4.8 µm wide, thin-walled, hyaline, with clamps. Skeletal hyphae 3.8–5.0 µm wide, thick-walled, hyaline, unbranched, straight or sinuous. Cystidia 67.0–145.0 × 11.5–25.0 µm, conic, acute, thick-walled, encrusted, hyaline to pale yellowish brown with age, conspicuous with a lens, projecting up to 87 µm. Basidia 40–50 × 8–10 µm, clavate. Basidiospores not seen.

SPECIMEN EXAMINED. Pagyon Ravine (65), alt. *ca* 300 m, deciduous forest, on fallen dead twigs, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28190.

DISTRIBUTION IN ASIA. China, Indonesia, Japan, Korea, Russia (Far East: Sakhalin) and Sri Lanka.

NOTES. Known also from South Africa.

REFERENCES. Anonymous (1983a: 104); Davydkina (1980: 88, Fig. 19w); Domański (1991: 56); Hjortstam & Ryvarden (1990: 23, Fig. 4); Imazeki & Hongo (1975, **2**: 127, Pl. 40: 245); Nikolaeva (1964: 172, Fig. 127, Pl. XXXIX); Wu (2002: 293).

Phanerochaete calotricha (P. Karst.) J. Eriksss. & Ryvarden

in J. Eriksss. *et al*., Corticiaceae North Eur. **5**: 997, Figs 499–502, 534a. 1978.

Corticium calotrichum P. Karst., Revue Mycol. **10**: 73. 1888.

Basidiocarp corticioid, resupinate, thin. Hymenophore smooth, whitish, cream-coloured to ochraceous. Margin with white rhizomorphs. Consistency soft.

Hyphal system monomitic. Hyphae 3–10 µm wide, smooth, hyaline, thin- or thick-walled, without clamps. Cystidia: 10–20 × 2–3 µm long, subulate, smooth, hyaline, thin-walled, in hymenium. Basidia 25.0–30.0 × 4.5–6.0 µm, slenderly clavate, with 4 sterigmata, without basal clamp. Spores 4.0–5.0 × 2.0–2.5 µm, elliptic, hyaline, smooth, thin-walled, some with oil-drops, non-amyloid.

SPECIMEN EXAMINED. Kumgang-san Mts: near Onjong-ri village (60), alt. *ca* 200 m, mixed forest, on fallen dead deciduous branches, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30644.

DISTRIBUTION IN ASIA. Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe. According to some authors it is a synonym of *Phanerochaete sanguinea* (Fr.) Pouzar.

REFERENCES. Breitenbach & Kränzlin (1986: 154, Pl. 159); Eriksson *et al*. (1978: 1019); Jülich (1984: 215); Jülich & Stalpers (1980: 179); Mukhin (1993: Tab. 1); Tellería (1990: 83).

Phanerochaete filamentosa (Berk. & M. A. Curtis) Burds.

Distrib. Hist. Biota. S. Appalach. **4**: 278. 1976.

Corticium filamentosum Berk. & M. A. Curtis, Grevillea **1**: 178. 1873.

Basidiocarp corticioid, membranaceous, resupinate, loosely attached, smooth to slightly tuberculate, light ochraceous to orange-brown. Subiculum in KOH vinaceous. Consistency soft, wax-like. Margin fimbriate, with whitish or yellowish rhizomorphs.

Hyphal system monomitic. Hyphae 2.0–4.5 μm wide, smooth, hyaline, thin- to thick-walled, without clamps or some with clamps. Lamprocystidia 50–90 × 8–13 μm, fusiform, thick-walled, with conic, yellow encrustation at apex. Basidia 20.0–36.0 × 4.5–5.5 μm, with 4 sterigmata, without basal clamp. Basidiospores 3.6–4.2 × 2.0–3.0 μm, elliptic, smooth, hyaline, thin-walled, non-amyloid, some usually with an oil-drop.

SPECIMENS EXAMINED. Myohyang-san Mts: between Habiro Temple (27) and Chontae Falls (28), alt. *ca* 150 m, mixed forest, on fallen decayed trunk, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29094; near Isonnam Falls (29), alt. *ca* 200 m, deciduous forest, on fallen twig of deciduous tree, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29059.

DISTRIBUTION IN ASIA. India, Japan, Nepal and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 156, Pl. 160); Domański (1991: 127); Eriksson *et al*. (1978: 1001, Figs 503–504); Ginns & Lefebvre (1993: 117); Maekawa (1993: 50, Fig. 33); Mukhin (1993: Tab. 1); Rattan (1977: 256, Figs D-F, p. 261); Vasudeva (1962: 44).

Phanerochaete gigantea (Fr.: Fr.) Rattan, Abdullah & Ismail

Nova Hedwigia 29: 771, Fig. 7a–e. 1978.

Thelephora gigantea Fr., Obs. Mycol. **1**: 152. 1818. – *T. gigantea* Fr.: Fr., Syst. Mycol. **1**: 448. 1821. – *Peniophora gigantea* (Fr.: Fr.) Massee, J. Linn. Soc. Bot. **25**: 142. 1889. – *Phlebiopsis gigantea* (Fr.: Fr.) Jülich, Persoonia **10**: 137. 1978.

Basidiocarp corticioid, resupinate, membranaceous. Hymenophore smooth to verrucose-tuberculate, grey-whitish to cream-coloured. Consistency wax-like.

Hyphal system monomitic. Hyphae 2–5 μm wide, smooth, thin- to thick-walled, without clamps. Lamprocystidia 60–90 × 10–17 μm, fusoid, subulate, thick-walled, with conic encrustation at apex. Basidia 23.0–30.0 × 4.5–5.5 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 4.5–6.5 × 2.5–3.0 μm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Suian-san Mts (48): alt. *ca* 200–300 m, mixed forest, on *Pinus densiflora* stump, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30650; near Pagyon Falls (65), mixed forest, on fallen trunk of ?*Pinus densiflora*, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30367.

DISTRIBUTION IN ASIA. China, India, Iraq, Japan, Korea, Nepal and Russia (e.g. Siberia).

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous [1983a: 102, as *Peniophora gigantea* (Fr.) Cooke]; Breitenbach & Kränzlin (1986: 158, Pl. 165); Domański (1991: 179); Eriksson *et al*. (1981: 1181, Figs 604–605, 607A); Ginns & Lefebvre (1993: 127); Maekawa (1993: 67, Fig. 45); Maekawa & Zang (1995: 92); Mukhin (1993: Tab. 1); Pilát (1936: 419); Rattan (1977: 260, Figs G-I, p. 265); Teng (1996: 293); Vasudeva (1962: 44).

Phanerochaete laevis (Pers.: Fr.) J. Erikss. & Ryvarden

in J. Erikss., Hjortst. & Ryvarden, Corticiaceae North Eur. **5**: 1007, Figs 507–508. 1978.

Thelephora laevis Pers.: Fr., Syst. Mycol. **1**: 451. 1821. – *Phanerochaete affinis* (Burt.) Parmasto, Consp. System. Cortic. 84. 1968.

Basidiocap corticioid, resupinate, effused. Hymenophore smooth or tuberculate, whitish, cream-coloured, ochraceous to orange, cracking when dry. Rhizomorphs present.

Hyphal system monomitic. Hyphae 3–5 μm

wide, smooth, hyaline, in hymenium and in subhymenium thin-walled, in subiculum slightly thickened. Clamps very rare. Lamprocystidia 35.0–60.0 × 4.5–6.5 µm, subcylindric to subfusoid, subulate, thin- to thick-walled, in upper part encrusted but usually bare at apex, projecting. Basidia 28.0–35.0 × 3.5–4.5 µm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 3.6–6.0 × 2.0–3.0 µm, narrowly elliptic, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga with *Quercus*, *Populus*, *Larix*, on fallen dead decayed branches, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30645; Myohyang-san Mts: between Habiro Temple (27) and Chontae Falls (28), alt. *ca* 250 m, deciduous forest, on fallen deciduous twig, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30637.

DISTRIBUTION IN ASIA. China, India, Japan and Russia (e.g. Siberia).

NOTES. New to North Korea. Known from the whole area of the temperate Northern Hemisphere, e.g. from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 154, Pl. 158); Domański (1991: 129); Ginns & Lefebvre (1993: 114); Hansen & Knudsen (1997: 168, Fig. 275); Jülich & Stalpers (1980: 178); Maekawa (1993: 53, Fig. 35); Maekawa *et al*. (2002: 90); Mukhin (1993: Tab. 1); Pilát (1936: 420), Rattan (1977: 259, Fig. A-C, p. 261, Pl. 6C); Slysh (1960: 69, Fig. 66).

Phanerochaete sordida (P. Karst.) J. Erikss. & Ryvarden

in J. Erikss., Hjortst. & Ryvarden, Corticiaceae North Eur. **5**: 1023, Fig. 515–521. 1978.

Corticium sordidum P. Karst., Meddn. Soc. Fauna Fl. Fenn. **9**: 65. 1882. – *C. cremeum* Bres., Fungi Trid. **2**: 63. 1898. – *Peniophora cremea* (Bres.) Sacc. & Syd., Syll. Fung. **16**: 195. 1902. – *Phanerochaete cremea* (Bres.) Parmasto, Consp. Syst. Cort. 84. 1968.

Basidiocarp corticioid, thin, resupinate, ceraceous or membranaceous, loosely attached to the substrate. Hymenophore smooth, whitish, cream-ish to pale ochraceous. Margin without rhizomorphs. Consistency wax-like.

Hyphal system monomitic. Hyphae 2.0–5.5 µm wide, smooth, hyaline, in hymenium thin-walled, in subiculum thick-walled. Cystidia 55.0–100.0 × 5.5–9.5 µm, subcylindric to fusiform, smooth to strongly encrusted at apex, thin- to thick-walled toward base. Basidia 20–30 × 4–5 µm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 4.2–5.4(–6.0) × 2.5–3.0 µm, elliptic to subcylindric, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), Hyangsan-gang River Valley, alt. *ca* 100–150 m, mixed forest, on dead fallen deciduous branches, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30638; between Habiro Temple (27) and Chontae Falls (28), alt. *ca* 250 m, deciduous forest, on fallen dead deciduous branches, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30647; Taesong-san Mts: slope of Chujak Mt. (33), alt. *ca* 200 m, mixed forest, on fallen dead deciduous twig, 26 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30646.

DISTRIBUTION IN ASIA. China, Iran, Japan, Korea and Russia (West Siberia).

NOTES. Known from the whole area of the temperate Northern Hemisphere, e.g. from Europe and North America (Canada and United states).

REFERENCES. Anonymous (1983a: 102, as *Peniophora cremea* (Bres.) Sacc. & Syd.); Breitenbach & Kränzlin (1986: 156, Pl. 162); Domański (1991: 125); Eriksson *et al*. (1978: 1023, Figs 515–521); Ginns & Lefebvre (1993: 118); Hallenberg (1981: 487); Jülich & Stalpers (1980: 180); Lin & Chen (1990: 102, Fig. 26); Maekawa (1993: 58, Fig. 39; 1994: 406); Maekawa *et al*. (2002: 91); Maekawa & Zang (1995: 92); Mukhin (1993: Tab. 1); Teng (1996: 294, as *Peniophora cremea*).

Phanerochaete viticola (Schwein.) Parmasto

Izv. Akad. Nauk Estonsk. SSR, Ser. Biol. **16**: 389.

Thelephora viticola Schwein., Leipzig Nat. Ges. Schrift. **1**: 107. 1822. – *Peniophora viticola* (Schwein.) Höhn. & Litsch., K. Akad. Wiss. Wien Math.-Nat. Kl. Sitzungsb. **116** (Abt. 1): 779. 1907.

Basidiocarp corticioid, membranaceous, resupinate, effuse. Subiculum bright-orange-yel-

lowish. Hymenophore even, cream-coloured, pale greyish to greyish orange. Margin fibrillose, bright orange. Hyphal strands absent.

Hyphal system monomitic. Hyphae 2–4 μm wide, somewhat encrusted, hyaline, thin- to slightly thick-walled, without clamps. Cystidia 30.0–70.0 × 6.5–9.5 μm, cylindric, obtuse at apex, smooth, immersed or projecting. Basidia 20.0–35.0 × 5.0–6.5 μm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 8.0–10.0 × 3.5–5.5 μm, broadly elliptic, smooth, hyaline, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, taiga, on decayed stump, 5 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30694; Chonbong Hill (9), alt. *ca* 1460 m, mixed taiga, on fallen dead decayed trunk, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 30693.

DISTRIBUTION IN ASIA. China, India (North Western Himalayas) and Japan.

NOTES. New to North Korea. Known also from North America (United States).

REFERENCES. Domański (1991: 117); Ginns & Lefebvre (1993: 119); Jülich & Stalpers (1980: 176); Maekawa (1993: 63, Fig. 43); Maekawa *et al*. (2002: 91); Rattan (1977: 259, Figs H-J, p. 271); Slysh (1960: 60, Fig. 53); Vasudeva (1962: 44).

Porostereum crassum (Lév.) Hjortstam & Ryvarden

Syn. Fung. **4**: 29, Fig. 6. 1990.

Thelephora crassa Lév., Ann. Sci. Nat. Bot., Ser. 3, **2**: 209. 1844. – *Lopharia crassa* (Lév.) Boidin, Bull. Soc. Mycol. Fr. **74**: 479. 1959 (1958). – *Phanerochaete crassa* Burds., Mycol. Mem. **10**: 67. 1985. For further synonyms see Burdsal (1985: 67–68) and Jülich & Stalpers (1980: 150).

Basidiocarp corticioid to stereoid, resupinate, effused to effused-reflexed. Upper surface finely tomentose, brown, greyish brown to vinaceous-lilac. Margin rather thick, concolorous. Hymenophore smooth, pinkish brown to greyish brown.

Hyphal system dimitic. Hyphae without clamps. Generative hyphae up to 7 μm wide. Skeletal hyphae up to 9 μm wide, smooth, subhyaline to ferruginous, thin- to thick-walled. Lamprocystidia up to 90 × 11 μm, cylindric to narrowly clavate, yellowish brown, thick-walled, apically covered with subhyaline crystalline matter, projecting. Basidia 15.0–20.0 × 4.5–6.0 μm, clavate to subclavate, with 4 sterigmata, without basal clamp. Basidiospores 6–8 × 3–4 μm, elliptic to subcylindric, hyaline, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: Kuchung Falls (26), alt. *ca* 700 m, deciduous forest, on dead fallen trunk of deciduous tree, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30414.

DISTRIBUTION IN ASIA. China, India (N Western Himalayas), Japan and Russia (e.g. Far East).

NOTES. New to North Korea. Known also from Europe (one locality in Poland), North America (United States), South America, South Africa, Australia and New Zealand.

REFERENCES. Bresadola (1903: 101, as *Kneiffia purpurea*); Davydkina (1980: 89, Figs 20, Pl. IV: 19b); Domański (1991: 139); Ginns & Lefebvre (1993: 116); Hjortstam & Ryvarden (1990: 29, Fig. 9); Imazeki & Hongo (1975, **2**: 119, Pl. 37: 222); Jahn (1971: 111); Rattan (1977: 175, Figs D-E on p. 174).

Polyporaceae Fr. *ex* Corda 1839

Cerrena unicolor (Bull.: Fr.) Murrill

J. Mycol. **9**: 91. 1903.

Boletus unicolor Bull. Herb. Fr. 408. 1785. – *Daedalea unicolor* (Bull.): Fr., Syst. Mycol. **1**: 336. 1821. – *Coriolus unicolor* (Bull.: Fr.) Pat., Ess. Tax. Hym. 94. 1900. – *Polystictus unicolor* (Bull.: Fr.) Lloyd, Myc. Writ. **5**: L. **63**: 6. 1916. – *Trametes unicolor* (Bull.: Fr.) Cooke, *in* Pilát, Atl. Polyp. 279, Fig. 111. 1939. – *Phyllodontia unicolor* (Bull.: Fr.) Bondartsev & Singer, Ann. Mycol. **39**: 59. 1941.

Basidiocarp sessile, effused-reflexed, imbricate. Pileus up to 40 mm broad, dimidiate to flabelliform. Trama corky-tough, whitish to cream-coloured, separated from pileal tometum by thin, dark, almost black line. Upper surface pilose-tomentose to hirsute, concentrically zonate, light grey to grey-brownish, darker with age. Hymenophore porose or labyrinthine-porose, daedaleoid, grey to grey-brown. Pores 2–3 per mm.

Hyphal system trimitic. Generative hyphae 1.5–5.0 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 2.5–5.0 µm, smooth, hyaline, thick-walled, branched. Binding hyphae 1.5–4.0 µm wide, smooth, hyaline, thick-walled, branched. Cystidia absent. Basidia 18.0–23.0 × 4.5–5.5 µm, with 4 sterigmata, with basal clamp. Basidiospores 4.5–6.5 × 2.5–3.5 µm, cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Shore of Taesong-ho Lake (43), *ca* 30 km SW of Pyongyang town, alt. *ca* 80–100 m, deciduous forest, on trunk of *Populus* sp., 23 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52867; Kumgang-san Mts: near Kuryong Falls (59), alt. *ca* 700 m, deciduous forest, on trunk of deciduous tree, 17 Sept. 1982, *leg. K. Zarzycki*, KRAM-F52866; mixed forest, on trunk of *Acer* sp., 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F52865.

DISTRIBUTION IN ASIA. China, India, Japan, Kazakhstan, Korea, Mongolia, Russia (Siberia, Primorski Krai and Kamchatka) and Turkey.

NOTES. Cosmopolitan species in the Northern Hemisphere.

REFERENCES. Anonymous (1983a: 105, as *Coriolus unicolor*); Azbukina *et al*. (1984: 34); Bondartsev (1953: 476, Fig. 122, Pls. CVIII: 1–2; CLVII: 3); Breitenbach & Kränzlin (1986: 278, Pl. 345); Hansen & Knudsen (1997: 227, Fig. 435); Ko & Jung (1999: 182); Kotlaba (1984: 138); Mukhin (1993: Tab. 1); Pilát (1940: 76); Núñez & Ryvarden (2001: 249); Ryvarden & Gilbertson (1993: 205, Fig. 96); Sharma (2000: 47); Shvartsman (1964: 523, Figs 231–234); Teng (1996: 362); Vasudeva (1962: 53).

Coriolopsis trogii (Berk.) Domański

Mała Flora Grzybów **1**(1): 230. 1974.

Funalia trogii (Berk.) Bondartsev & Singer, Ann. Mycol. **39**: 62. 1941. – *Trametes trogii* Berk., *in* Trog, Verz. Schweiz. Schw. Suppl. **2**: 52. 1850.

Basidiocarp 100–200 mm wide, pileate, sessile, flabellate, usually imbricate. Upper surface hispid-pilose, with zones, grey-ochraceous. Margin sharp. Hymenophore porose, with 1–2 pores per mm, cream-coloured to ochraceous, sometimes with pink tint. Trama whitish cream-coloured, corky.

Hyphal system trimitic. Generative hyphae 2–4 µm wide, thin-walled, smooth, hyaline, with clamps. Skeletal hyphae 5–6 µm wide, thick-walled, hyaline, smooth. Binding hyphae 2–3 µm wide, thick-walled and strongly branched. Cystidia absent. Basidia 14.0–20.0 × 5.0–6.5 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 6.5–10.0 × 3.0–3.5 µm, cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Kuchung Falls (26), deciduous forest, on stump of deciduous tree, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52897; near Habiro Temple (27), deciduous forest, on trunk of *Quercus* ?*mongolica*, 6 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52963; Pyongyang town: Central Botanical Garden (36), on stump of *Populus* sp., 26 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53011; Taedonggang Pleasure Park (38), right bank of Taedong-gang River, near Pyongyang Hotel, on living and dead trunks of *Salix babylonica*, 11 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28956; near Taesong-ho Lake (43), on trunk of ?*Populus*, 23 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52898; near dam of lake, on stump of deciduous tree, 21 June 1985, leg. *B. Zarzycka*, KRAM-F 27782; Wonsan town (50), Botanical Garden, on trunk of *Salix babylonica*, 20 Aug.1983, *leg. W. Wojewoda*, KRAM-F 52899.

DISTRIBUTION IN ASIA. China (Tibet), Georgia, India, Iran, Japan, Kazakhstan, Korea, Russia (Siberia, Far East and Kamchatka) and Turkmenistan.

NOTES. Circumpolar in temperate forests.

REFERENCES. Anonymous (1983a; 109); Azbukina *et al*. (1984: 35); Bondartsev (1953: 531, Pl. CLXV: 5–6); Breitenbach & Kränzlin (1986: 282, Pl. 351); Hallenberg (1981: 496); Imazeki & Hongo (1975, **2**: 146, Pl. 47: 282); Mukhin (1993: Tab. 1); Pilát (1934: 264); Núñez & Ryvarden (2001: 260); Ryvarden & Gilbertson (1993: 220, Fig. 104); Sharma (2000: 132); Zhao *et al*. (1983: 98).

Daedaleopsis confragosa (Bolt.: Fr.) J. Schröt.

in Cohn, Krypt. Fl. Schles. **3**: 492. 1888.

Boletus confragosus Bolt., Hist. Fung. Suppl. **3**: 160. 1791. – *Daedalea confragosa* (Bolt.): Fr., Syst.Mycol. **1**: 336. 1821.

Basidiocarp pileate, sessile, dimidiate, flabellate, slightly convex or plane. Pileus 40–95 mm

wide. Upper surface uneven, scabrous, becoming glabrous, cinnamon or cinnamon-buff to chraceous, zonate. Margin thin, acute. Trama thin, wood-coloured, corky. Smell absent. Taste mild or somehat bitter. Hymenophore poroid, with regular pores or sometimes daedaleoid, with some pores oblong, whitish to light grey when young, then grey to dark grey-brown, pink-brownish when handled.

Hyphal system trimitic. Generative hyphae 2–3 μm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 4.0–5.5 μm wide, smooth, hyaline, thick-walled. Binding hyphae 2.0–2.5 μm wide, smooth, hyaline, thick-walled, branched. Cystidia absent. Branched dendrohyphidia present. Basidia 16.0–20.0 × 3.0–4.5 μm, clavate, with 5 sterigmata and basal clamp. Basidiospores 6.0–10.0 × 2.0–2.5 μm, cylindric, smooth, hyaline, thin-walled, non-amyloid, some with 1–2 oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount between Tuman-gang River (5) and Taehong-dan (6), alt. *ca* 1400–1500 m, mixed forest, on fallen dead trunk of *Quercus* ?*mongolica*, 29 Sept.1984, *leg. W. Wojewoda*, KRAM-F 28955; shore of Samji-yon Lake (7), mixed taiga, on *Betula platyphylla* trunk, 30 Sept.1984, *leg. W. Wojewoda*, KRAM-F 52872; Pyongyang town: Taedong Boulevard (40), on living *Salix babylonica* trunk, 10 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52871; Wonsan town, Sondowon Beach (51), park, on living *Salix babylonica* trunk, 6 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 52873; Pagyon Ravine, near Pagyon Falls (65): alt. *ca* 300 m, deciduous forest, on trunk of *Quercus* sp., 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28954.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Korea, Mongolia, Russia (West Siberia and Primorski Krai and Thailand.

NOTES. Temperate circumpolar species.

REFERENCES. Anonymous (1983a: 105); Azbukina *et al*. (1984: 35); Bondartsev (1953: 571, Pl. CLXX: 1–3); Breitenbach & Kränzlin (1986: 304, Pl. 384); Hallenberg (1981: 493); Jahn (1979: 134, Pls. 106–107); Kotlaba (1984: 147, Pl. 22: 54); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 37); Núñez & Ryvarden (2001: 267); Petrov & Belova (1999: 26); Ryvarden & Gilbertson (1993: 225, Fig. 106); Sharma (2000: 55); Shvartsman (1964: 601, Fig. 265); Teng (1996: 394); Vasudeva (1962: 51); Zhao *et al*. (1983: 83).

Daedaleopsis tricolor (Bull.: Fr.) Bondartsev & Singer

Ann. Mycol. **39**: 64. 1941.

Agaricus tricolor Bull., Hist. De Champ. **2**: 380. 1791 (non *A. tricolor* Alb. & Schwein.: Fr., Syst. Mycol. **1**: 166. 1821). – *Daedalea sepiaria* b. *tricolor* (Bull.): Fr., Syst. Mycol. **1**: 334. 1821. – *D. tricolor* (Bull.: Fr.) Pers., Mycol. Eur. **2**: 12. 1828. – *Lenzites tricolor* (Bull.: Fr.) Fr., Epicr. Syst. Mycol. 406. 1838. – *Daedaleopsis confragosa* var. *tricolor* (Bull.: Fr.) Bondartsev, Trut. Griby. 571. 1953.

Basidiocarp pileate, flabellate. Pileus up to 40–60 mm broad, semicircular to flabellate. Upper surface brown-red, zonate, uneven. Margin sharp. Trama thin, ochraceous to red-brown, corky. Smell absent. Taste mild. Hymenophore lamellate, grey-brown. Lamellae ochraceous to grey-brown.

Hyphal system trimitic. Generative hyphae 1.5–3.0 μm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 1.5–7.0 μm wide, smooth, hyaline, thick-walled. Binding hyphae 2–4 μm wide, smooth, hyaline, thick-walled. Cystidia absent. Dendrohyphidia present, thin- to thick-walled, branched. Basidia 28.0–30.0 × 3.0–4.5 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 5.5–10.0 × 2.0–2.5 μm, cylindric, smooth, hyaline, thin-walled, some with 2 oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52881; on trunk of dead decayed tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52885; Chongbong Mt. (9), alt. *ca* 1400 m, mixed taiga, on deciduous wood, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 52878; Myohyang-san Mts: valley near Sangwon-am Monastery (19), alt. *ca* 500 m, forest with *Quercus*, *Pinus* sp. and *Juglans mandshurica*, 7 June 1985, *leg. B. Zarzycka*, KRAM-F 52889; Habiro Temple (27), alt. *ca* 200 m, deciduous forest, on dead deciduous trunk, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52880, KRAM-F 52882; on twigs of deciduous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52884; on lying trunk of *Quercus mongolica*, 6 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52875, 52883; Pyongyang town (40): boulevard on Taedong River, on trunk of living *Salix* sp., 11 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52876; on living *Salix babylonica* trunk, 12 Sept. 1984, *leg. W. Wojewo-*

da, KRAM-F 52874; on *Salix* sp. trunk, 1 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52888; 20 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52877; Suian-san Mts (48), alt. *ca* 200 m, deciduous forest, on trunk of deciduous tree, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 52886; Kumgang-san Mts: above Onjong-ri village (60), alt. *ca* 100 m, on deciduous wood, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 52887; Samil-po Lake (62), mixed forest, on fallen, dead twig of deciduous tree, 19 July 1986, *leg. W. Wojewoda*, KRAM-F 28346; near Pagyon Falls (65), alt. *ca* 300 m, deciduous forest, on dead trunk of deciduous tree, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52879.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Korea, Mongolia and Russia (Siberia and Primorski Krai).

NOTES. Temperate species in Asia and Europe.

REFERENCES. Anonymous (1983a: 105); Azbukina *et al*. (1984: 35); Bondartsev (1953: 571, Pl. CLXX: 1–3); Breitenbach & Kränzlin (1986: 306, Pl. 385); Hallenberg (1981: 493); Hattori & Zang (1995: 97); Imazeki & Hongo (1975, **1**: 114, Pl. 53: 297); Niemelä & Uotila (1977: 37, Fig. 3); Núñez & Ryvarden (2001: 269); Petrov & Belova (1999: 26); Pilát (1940: 73); Ryvarden & Gilbertson (1993: 229, Fig. 108); Shvartsman (1964: 606, Figs 268–269); Teng (1996: 390); Vasudeva (1962: 51); Wojewoda (2002a: 39); Zhang (1999: 372).

Fomes fomentarius (L.: Fr.) Kickx

Flore Crypt. Flandres **2**: 237. 1867.

Boletus fomentarius L., Spec. Plant. 1176. 1753. – *Polyporus fomentarius* (L.): Fr., Syst. Mycol. **1**: 374. 1821. – *Pyropolyporus fomentarius* (L.: Fr.) Teng, Chung-kuo Ti Chen-chun. 763. 1963.

Basidiocarp pileate, ungulate, sessile. Pileus up to 150–250 mm broad. Upper surface light to dark grey, zonate, glabrous. Margin light brown. Trama yellowish brown. Smell pleasant, fungous. Hymenophore porose, pale-brown. Pores circular, 3–5 per mm.

Hyphal system trimitic. Generative hyphae 2.0–3.5 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 5–6 µm wide, smooth, hyaline, thick-walled. Binding hyphae 3–4 µm wide, smooth, hyaline, thick-walled, strongly branched. Cystidia absent. Basidia 18.0–28.0 × 6.5–9.5 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 11.0–19.0 × 4.5–6.5 µm, cylindric to elliptic-cylindric, smooth, hyaline, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Mubong (3) and Taehong-dan (6), alt. *ca* 1500 m, taiga with *Betula*, *Larix*, *Picea*, on living trunk of *Betula platyphylla*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28992; shore of Samji-yon Lake (7), mixed taiga, on fallen branch of *Betula* ?*platyphylla*, 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28949; shore of Samji-yon Lake, near Samji-yon Hotel (7), *ca* 5 km N of Samji-yon town, alt. *ca* 1450 m, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52868; *ca* 10 km S of Samji-yon town (8), alt. *ca* 1500 m, mixed taiga, on *Betula platyphylla* trunk, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52870; Chongbong Mt. (9), alt. *ca* 1400 m, mixed taiga, on *Betula platyphylla* trunk, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 52869; Myohyang-san Mts: below Wonman Mt. peak (31), alt. *ca* 1000 m, coniferous zone, coniferous forest with *Picea koraiensis*, *P. ajanensis*, and *Thuja koraiensis*, on fallen trunk of *Betula* sp., 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28950.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Korea, Mongolia, Pakistan, Russia (West Siberia and Primorski Krai) and Turkey.

NOTES. Very common species, circumboreal in Asia, Europe, North America and southward to North Africa.

REFERENCES. Anonymous (1978: 163; 1983a: 106); Azbukina *et al*. (1984: 35); Bondartsev (1953: 284, Figs 2, 65; Pl. IV: 1, LXXXV, LXXXVI: 1–3, LXXXVII: 1); Breitenbach & Kränzlin (1986: 306, Pl. 386); Hallenberg (1981: 493); Hattori & Zang (1995: 97); Imazeki & Hongo (1975, **1**: 114, Pl. 53: 298); Jahn (1979: 148, Pls. 120–121); Kotlaba (1984: 160, Pl. 25: 61); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 37); Núñez & Ryvarden (2001: 295); Pilát (1940: 77); Ryvarden & Gilbertson (1993: 254, Fig. 121); Sharma (2000: 61); Shvartsman (1964: 370, Figs 161–164); Teng (1996: 344); Uranchimehg *et al*. (1983: 375).

Laetiporus sulphureus (Bull.: Fr.) Murrill

Mycologia **12**: 11. 1920.

Boletus sulphureus Bull. Herb. Fr. Pl. 429. 1788. – *Polyporus sulphureus* (Bull.): Fr., Syst. Mycol. **1**: 357. 1821. – *Grifola sulphurea* (Bull.: Fr.) Pilát, Beih. Bot. Centralbl. **52** B: 39, Figs 3–5, Pls. II-IV: 1; VI-VII. 1935.

Basidiocarp sessile, semicircular to flabellate, imbricate. Upper surface velutinous, sulphur-yellow to orange. Trama 10–20 mm thick, white, azonate. Smell pleasant, nut-like. Hymenophore porose, sulphur-yellow. Pores 3–5 per mm, irregularly round to oblong.

Hyphal system dimitic. Generative hyphae 2–4 μm wide, smooth, hyaline, thin- to thick-walled, without clamps. Binding hyphae 3–15 μm wide, thick-walled, strongly branched. Cystidia absent. Basidia 8.0–20.0 × 5.5–8.5 μm, clavate, with 4 sterigmata, without clamps. Basidiospores 4.5–7.0 × 3.5–4.5 μm, elliptic to subglobose, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops.

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 500 m, forest with *Quercus mongolica*, on trunk of deciduous tree, 8 June 1985, *leg. B. Zarzycka*, KRAM-F 27788; near Myohyang-san Hotel (20), alt. *ca* 100 m, bank of Hyangsangang River, deciduous forest, on living trunk of *Castanea crenata*, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 53201; near Unson Falls (23), alt. *ca* 500 m, mixed forest, on living trunk of *Ulmus macrophylla*, 14 July 1986, *leg. H. Komorowska*, KRAM-F 28541; shore of Soham-ho Lake (32), deciduous forest, on stump of deciduous tree (?*Quercus*), 17 July 1986, *leg. W. Wojewoda*, KRAM-F 53202; Ryongak-san Mt. (42), alt. *ca* 240 m, deciduous forest, on living trunk on *Castanea crenata*, 16 July 1986, *leg. W. Wojewoda*, KRAM-F 53205, 53207; shore of Sohung-ho Lake, *ca* 20 km SE of Sariwon town (45), forest, on living trunk of deciduous tree, 17 July 1986, *leg. Z. Heinrich*, KRAM-F 27986; Suian-san Mts (48), alt. *ca* 200 m, deciduous forest, on living trunk of *Castanea crenata*, 26 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53204; Kumgang-san Mts: near Kuryong Falls, alt. *ca* 700 m, deciduous forest, on living trunk of *Quercus*, 20 July 1986, *leg. W. Wojewoda*, KRAm-F 53206; near Onjong-ri (60), forest, on trunk of deciduous tree, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 27790; in Onjong-ri, park, on living old trunk of *Prunus*, 21 July 1986, *leg. W. Wojewoda*, KRAM-F 53203.

DISTRIBUTION IN ASIA. China, India, Indonesia (Sumatra), Iran, Japan, Kazakhstan, Korea, Pakistan, Russia (e.g. West Siberia and Primorski Krai), Sri Lanka, Taiwan and Vietnam.

NOTES. Cosmopolitan species except in the extreme north.

REFERENCES. Anonymous (1978: 154; 1983a: 107); Azbukina *et al*. (1984: 36); Breitenbach & Kränzlin (1986: 316, Pl. 402); Hallenberg (1981: 494); Hattori & Zang (1995: 97); Jahn (1979: 124, Pl. 96); Kotlaba (1984: 163); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 341); Pilát (1934: 256; 1940: 69); Ryvarden & Gilbertson (1993: 373, Fig. 179); Sharma (2000: 82); Shvartsman (1964: 319, Figs 140–142); Suhirman & Núñez (1998: 283); Teng (1996: 381); Vasilyeva (1978: 184, Pl. 222); Vasudeva (1962: 54); Zhao *et al*. (1983: 99).

Lentinus lepideus (Fr.: Fr.) Fr.

Syst. Orb. Veg. 78. 1825.

Agaricus lepideus Fr., Obs. Mycol. **1**: 21. 1815. – *A. lepideus* Fr. : Fr., Syst. Mycol. **1**: 176. 1821. – *Neolentinus lepideus* (Fr.: Fr.) Redhead et Ginns. For further synonyms see Pegler (1983: 182).

Pileus up to 60 mm in diam., almost hemispherical when young, then convex to plane or depressed. Upper surface cream-coloured to light brownish, with appressed brown scales. Margin involute, sometimes with veil remnants. Flesh whitish, softe then tough. Anisc smell very distinct. Taste mild. Hymenophore lamellate. Lamellae whitish to yellowish, broad, broadly adnate, with crenate-serrate edges. Stipe 30–50 × 10–15 mm, cylindric to conic, squamose, with whit surface and white veil.

Hyphae of pileipellis 3–6 μm wide, smooth, hyaline, thin-walled, with clamps. Cystida absent. Basidia 27.0–45.0 × 5.5–7.0 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 7.0–11.5 × 2.5–4.0 μm, cylindric to cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: E slope of Paekdu-san Mt. peak (1), *ca* 25 km NW of Samji-yon town (8), alt. *ca* 1900 m, scattered forest of *Larix olgensis*, slightly below upper forest line, on lying dead trunk of *Larix*, 30 June 1986, *leg. W. Wojewoda*, KRAM-F 27991; S of Samji-yon town, alt. *ca* 1200 m, taiga with *Larix olgensis*, on stump of coniferous tree, 26 June 1985, *leg. B. Zarzycka*, KRAM-F 27776; near Taehongdan (6), alt. *ca* 1400 m, taiga, on wood, 6 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29182; alt. *ca* 1500 m, taiga with *Larix* and *Picea*, on coniferous stump, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28543; on

shore of Samji-yon Lake (7), near Samji-yon Hotel, taiga, on stump of coniferous tree, *ca* 20 km NE of Samji-yon town (8), alt *ca* 1330 m, taiga, on decayed trunk of *Larix olgensis*, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 29184; taiga with *Larix* and *Picea*, on coniferous stump, 29 June 1986, *leg. H. Komorowska*, KRAM-F 28589; near Chongbong Mt. (9) and near Rimyongsu (10), alt. *ca* 1460 m, taiga, on fallen decayed trunks of coniferous trees, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 29183; Kumgang-san Mts: in pine Chanto Forest (61), alt. *ca* 50 m, on stump of *Pinus densiflora*, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29165; shore of Samil-po Lake (62), forest with *Pinus densiflora*, on stump of *Pinus densiflora*, 3 July 1985, *leg. B. Zarzycka*, KRAM-F 29185; 27 June 1985, *leg. B. Zarzycka*, KRAM-F 29187.

DISTRIBUTION IN ASIA. China, India, Japan, Korea, Mongolia, Pakistan, and Russia (e.g. North Altai, Primorski Krai and Siberia).

REFERENCES. Anonymous (1978: 32; 1983a: 112); Azbukina *et al*. (1984: 42); Breitenbach & Kränzlin (1991: 208, Pl. 238); Dähncke & Dähncke (1980: 22); Gorbunova (1997: 15); Hansen & Knudsen (1992: 47); Imazeki & Hongo (1975, **1**: 32, Pl. 13: 67); Jahn (1979: 186, Pl. 161); Mukhin (1993: Tab. 1); Pegler (1983: 182, Fig. 50); Syarzhanina (1994: 67); Teng (1996: 427); Uranchimehg *et al*. (1983: 375); Vasilyeva (1973: 88); Vasudeva (1962: 49); Zhao *et al*. (1983: 122, Pl. 21: 8–9).

Lentinus torulosus (Pers.: Fr.) Lloyd

Mycol. Writ. **4**, Lett. **47**: 13. 1913.

Agaricus torulosus Pers., Syn. Meth. Fung. 475. 1801. – *A. torulosus* Pers.: Fr., Syst. Mycol. **1**: 181. 1821. – *Lentinus conchatus* (Bull.: Fr.) J. Schröt., *in* Cohn, Pilze Schles. **1**: 554. 1889. – *Panus torulosus* (Pers.: Fr.) Fr., Epicr. Syst. Mycol. 397. 1838. – *P. conchatus* (Bull.: Fr.) Fr., Epicr. Syst. Mycol. 398. 1838. For further synonyms see Pegler (1986: 27).

Pileus 20–100 mm in diam., conchate to infundibuliform. Upper surface radially fibrillose to finely squamose, pink-lilac when young, later ochraceous. Flesh whitish, thin. Smell unpleasant, like *Clitocybe nebularis*. Taste mild. Hymeno-

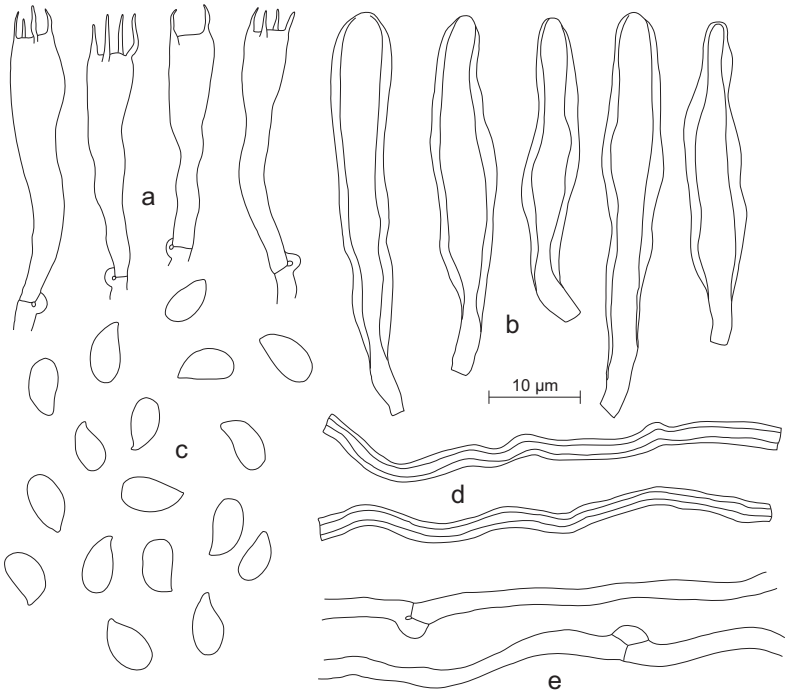


Fig. 138. *Lentinus torulosus* (Pers.: Fr.) Lloyd: a – basidia, b – basidiospores, c – pleurocystidia, d – skeletal hyphae, e – generative hyphae (KRAM-F 32201).

phore lamellate. Lamellae whitish creme with lilac tint when young, later ochraceous, decurrent, with smooth edges. Stipe 10–20 × 5–10 mm, excentric to almost lateral, floccose, pink-lilac when young, later ochraceous, solid.

Hyhal system dimitic. Generative hyphae hyaline, smooth, thin-walled, with clamps. Skeletal hyphae 2.0–5.5 μm wide, sinuous, smooth, hyaline, thick-walled. Cheilocystidia 20.0–45.0 × 7.5–12.0 μm, clavate, smooth, hyaline, thick-walled. Pleurocystidia 24.0–44.0 × 7.2–8.4 μm, slenderly clavate to subfusoid, smooth, hyaline, thick-walled (except apex). Basidia 24.0–30.0 × 4.8–5.4 μm, slenderly clavate to subcylindric, with 4 (rarely 2) sterigmata and basal clamp. Basidiospores 4.8–6.6 × 2.4–3.0 μm, elliptic to short-cylindric, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops. Spore-print pale cream-coloured (Fig. 138).

SPECIMEN EXAMINED. Myohyang-san Mts: Hyangsan-gang River Valley, near Myohyang-san Hotel (20), alt. *ca* 100 m, on bank of stream, on living trunk of *Prunus maackii*, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 32201.

DISTRIBUTION IN ASIA. China, India, Japan, Korea, Mongolia, Philippines, Russia (e.g. Siberia, Far East, Primorski Krai) and Sri Lanka.

REFERENCES. Anonymous (1978: 29; 1983a: 112); Azbukina *et al*. (1984: 42); Breitenbach & Kränzlin (1991: 210, Pl. 241); Dähncke & Dähncke (1980: 20); Hansen & Knudsen (1992: 47, Fig. 2); Imazeki & Hongo (1975, **1**: 31, Pl. 12: 63); Mukhin (1993: Tab. 1); Pegler (1983: 134, Fig. 137; 1986: 27, Fig. 4); Syarzhanina (1994: 66); Teng (1996: 425); Uranchimehg *et al*. (1983: 375); Vasilyeva (1973: 87); Ying *et al*. (1983: 125).

Lenzites betulinus (L.: Fr.) Fr.

Epicr. Syst. Mycol. 405. 1838.

Agaricus betulinus L., Spec. Plant. 1176. 1753. – *Daedalea betulina* (L.): Fr., Syst. Mycol. **1**: 333. 1821.

Basidiocarp pileate, sessile, attached laterally. Pileus 20–50 mm broad, semicircular, flabellate. Upper surface tomentose, with concentric zones, grey-ochraceous, light brown, often tinted greenish by algae. Margin sharp. Trama whitish. Hymenophore lamellate, 11–15 per 10 mm, cream-coloured, ochraceous to grey-brown.

Hyphal system trimitic. Generative hyphae 1–3 μm wide, hyaline, thin-walled, with clamps. Skeletal hyphae 3.5–6.0 μm wide, thick-walled. Binding hyphae 6–8 μm wide, thick-walled, branched. Cystidia absent. Basidia 15–20 × 3–5 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 4–6 × 2–3 μm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: near Mupo (4), alt. *ca* 1400 m, mixed taiga, on stump of deciduous tree, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53212; near Taehong-dan (6), alt. *ca* 1500 m, taiga with *Larix olgensis*, *Picea ajanensis*, *P. koraiensis* and *Betula platyphylla*, on fallen dead trunk and stump of *B. platyphylla*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28991, 53217; shore of Samji-yon Lake (7), mixed taiga, on stump of deciduous tree, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53215; Myohyang-san Mts: near Sangwon-am Monastery, alt. *ca* 600 m, deciduous forest, on stump of deciduous tree, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53221; near Myohyang-san Hotel (20), alt. *ca* 100 m, Hyangsan-gang River Valley, deciduous forest, on stump of deciduous tree, *leg. W. Wojewoda*, KRAM-F 53219, 53220; between Habiro Temple (27) and Chontae Falls (28), alt. *ca* 300 m, deciduous forest, on deciduous stump, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28989; near Isonnam Falls (29), alt. *ca* 500 m, deciduous forest, on deciduous tree, 13 July 1986, *leg. H. Komorowska*, KRAM-F 28488; Taesong-san Mts: Chujak Mt. (35), mixed forest, on stump of deciduous tree, 29 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53214; Suian-san Mts (48), alt. *ca* 200 m, deciduous forest, on stump of deciduous tree, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53213; alt. *ca* 290 m, deciduous forest, on stump of deciduous tree, 15 June 1985, *leg. B. Zarzycka*, KRA-F 53210; alt. *ca* 200 m, mixed forest, on stump of deciduous tree, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 29053; Wonsan town (50), Botanical Garden, on stump of deciduous tree (?*Quercus*), 20 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53218; Kumgang-san Mts: below Onjong-ryong Pass (54), alt. 800 m, mixed forest, on stump of deciduous tree, 16 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53209; between Onjong-ryong Pass and Onjong-ri village (60), alt. *ca* 400 m, Onjong-gang Stream Valley, mixed forest, on dead fallen branches of *Quercus*, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53222; Manmulsang Rocks (55), alt. *ca* 800 m, mixed forest, on stump of deciduous tre, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53224; Okryu-dong Valley (59),

below Kuryong Falls, alt. *ca* 600 m, mixed forest, on deciduous stump, 5 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28990; 20 July 1986, *leg. W. Wojewoda*, KRAM-F 53216; near Onjong-ri (60), alt. *ca* 50–100 m, mixed forest, on stump of deciduous tree, 19 Aug 1983, *leg. W. Wojewoda*, KRAM-F 53211; shore of Samil-po Lake, mixed forest with *Pinus densiflora*, *Quercus mongolica* and *Acer*, on stump of *Acer*, 13 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53223; near Pagyon Falls, alt. *ca* 300 m, deciduous forest, on stump of deciduous tree, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28194.

DISTRIBUTION IN ASIA. China (e.g. Tibet), Korea, India, Iran, Japan, Kazakhstan, Mongolia, Pakistan, Russia (e.g. West Siberia and Primorski Krai) and Turkey.

NOTES. Cosmopolitan species, but much rarer in the tropical than in temperate-boreal areas.

REFERENCES. Anonymous (1978: 152; 1983a: 107); Azbukina *et al*. (1984: 36); Breitenbach & Kränzlin (1986: 284, Pl. 352); Enderle & Laux (1980: 34); Hallenberg (1981: 494); Hattori & Zang (1995: 99); Jahn (1979: 138, Pl. 111); Kotlaba (1984: 144, Pl. 22: 53); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 37); Núñez & Ryvarden (2001: 344); Pilát (1940: 72); Ryvarden & Gilbertson (1993: 377, Fig. 181); Sharma (2000: 83); Shvartsman (1964: 616, Fig. 274); Vasudeva (1962: 53); Zhang (1999: 374); Zhao *et al*. (1983: 89).

Phaeolus schweinitzii (Fr.) Pat.

Ess. Taxon. Hym. 86. 1900.

Coltricia schweinitzii (Fr.) Cunn., Dep. Sci. Ind. Res. Pl. Dis. Bull. **77**: 7. 1948. – *Polyporus schwenitzii* Fr., Syst. Mycol. **1**: 351. 1821.

Basidiocarp consisting of pileus and stipe. Pileus 100–200 mm in diam., turbinate to plate-shaped. Upper surface orange at first, then yellowish brown, dark reddish brown with age, tomentose to hirsute, zonate. Flesh yellowish brown to dark rusty brown, soft. Hymenophore with labyrinthine pores, orange at first, then yellowish brown to rusty brown. Pores 1–2 per mm, angular. Stipe up to 30 mm in diam., central or lateral.

Hyphal system monomitic. Hyphae 3.5–14.5 µm wide, smooth, hyaline, yellowish, light- to dark brown, thin- to thick-walled, without clamps. Cystidia 18.0–85.0 × 5.5–13.5 µm, clavate, smooth, thin-walled, with yellowish contents, projecting in hymenium. Basidia 18.0–25.0 × 4.0–7.5 µm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 5.5–7.5 × 3.5–4.0 µm, ovoid to elliptic, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed taiga, on roots of *Larix olgensis*, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29253; near Samji-yon Hotel, on roots of *Larix* sp., 1 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52998; Chonbong Hill (9), 1 July 1986, mixed taiga, on roots of *Larix olgenis*, *leg. W. Wojewoda*, KRAM-F 29254; Myohyang-san Mts: Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on roots of living *Larix* sp., 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52997.

DISTRIBUTION IN ASIA. China, India, Japan, Kazakhstan, Korea, Pakistan, Russia (West Siberia and Primorski Krai), Taiwan, Turkey and Vietnam

NOTES. Cosmopolitan species.

REFERENCES. Anonymous (1983a: 110); Azbukina *et al*. (1984: 37); Bondartsev (1953: 316, Figs 18, 61: 7; Pls. II: 2; LXXXII: 3; CLXXXVIII: 2); Breitenbach & Kränzlin (1986: 318, Pl. 403); Hansen & Knudsen (1997: 234, Fig. 454); Jahn (1979: 152, Pl. 125); Kotlaba (1984: 109); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 34); Núñez & Ryvarden (2001: 406); Park & Cho (1985: 107); Ryvarden & Gilbertson (1994: 467, Figs 237–238); Sharma (2000: 100); Shvartsman (1964: 389, Fig. 169); Teng (1996: 349); Zhao *et al*. (1983: 82).

Polyporus alveolaris (DC.: Fr.) Bondartsev & Singer

Ann. Mycol. **39**: 58. 1941.

Merulius alveolaris DC., Flore Fr. **6**: 43. 1815. – *Cantharellus alveolaris* (DC.): Fr., Syst. Mycol. **1**: 322. 1821. – *Polyporus mori* Pollini, Hort. Veron. Pl. Nov. 35. 1816. – *Favolus alveolaris* (DC.: Fr.) Quél., Elench. Fung. 185. 1886. For further synonyms see Nuñez & Ryvarden (1995: 38).

Basidiocarp divided into pileus and stipe. Pileus 10–25 mm in diam., circular to reniform. Upper surface appressed-squamose, orange-yellow, pale straw-coloured to ochraceous, with somewhat darker scales. Margin inrolled. Flesh whitish, elastic. Smell weak, pleasant. Taste mild. Hymenophore porose, whitish to cream-coloured.

Pores elongated and polygonal, 1–5 × 1.0–1.5 mm. Stipe lateral, short.

Hyphal system dimitic. Generative hyphae 2–3 μm wide, smooth, hyaline, thin- to thick-walled, with clamps. Binding hyphae 3.0–4.5 μm wide, smooth, hyaline, thick-walled, sinuous. Cystidia absent. Basidia 20.0–30.0 × 5.0–7.5 μm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 7.0–10.0 × 3.0–3.5 μm, cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid, some with oil-drops.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 25 km N of Samji-yon town (8), alt. *ca* 1500 m, mixed forest, on decayed stump of tree, 30 June 1986, *leg. W. Wojewoda*, KRAM-F 53111.

DISTRIBUTION IN ASIA. Caucasus, China, India, Japan, Korea, Russia (Siberia and Far East, Primorski Krai) and Taiwan.

NOTES. Warm-temperate species, widespread through Southern Europe, Asia and North America.

REFERENCES. Anonymous (1978: 165; 1983a: 105); Bondartsev (1953: 445, Fig. 112); Breitenbach & Kränzlin (1986: 328, Pl. 419); Imazeki & Hongo (1975, **1**: 111, Pl. 52: 289); Kotlaba (1984: 172, Pl. 26: 63); Núñez & Ryvarden (1995: 38, Fig. 8; 2001: 412); Ryvarden & Gilbertson (1994: 559, Fig. 290); Sharma (2000: 115); Teng (1996: 387).

Polyporus arcularius (Batsch): Fr.

Syst. Mycol. **1**: 342. 1821.

Boletus arcularius Batsch, Elench. Fung. 97. 1783. – *Favolus arcularius* (Batsch: Fr.) Ames, Ann. Mycol. **11**: 241. 1913.

Basidiocarp divided into pileus and stipe. Pileus 20–45 mm in diam., circular. Upper surface of young specimen finely squamose, glabrous with age, pale straw-coloured to ochraceous brown. Margin rather sharp, slightly involute. Flesh whitish, elastic. Smell weak, pleasant. Taste mild. Hymenophore porose, whitish to cream-coloured. Pores elongated and polygonal. Stipe 15–35 × 3–6 mm, central to somewhat excentric, cylindric, finely squamose, light brown, solid, somewhat thickened near base.

Hyphal system dimitic. Generative hyphae 1.5–9.0 μm wide, smooth, hyaline, thin- to thick-walled, with clamps. Binding hyphae 2.0–4.5 μm wide, smooth, hyaline, thick-walled. Cystidia absent. Basidia 14–20 × 4–5 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5.0–7.5 × 2.0–3.0 μm, cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: near Naegok (13), alt. *ca* 1000 m, mixed forest, on fallen dead twigs of deciduous trees, 27 June 1986, *leg. W. Wojewoda*, KRAM-F 53110; Myohyang-san Mts: near Myohyang Hotel (20), mixed forest, on fallen dead twigs of deciduous trees, 12 July 1986, *leg. H. Komorowska*, KRAM-F 28471; Kumgang-san Mts: Onjong-ri village (60), near Onjong-ri Hotel, on wooden slat on asphalt, 18 July 1986, *leg. H. Komorowska*, KRAM-F 28335.

DISTRIBUTION IN ASIA. China, India, Japan, Kazakhstan, Korea, Pakistan, Philippines, Russia (Siberia, Primorski Krai and Sakhalin), Taiwan, Thailand, Turkey and Vietnam.

NOTES. Cosmopolitan, widespread species found throughout the temperate zone and the tropics, common except for boreal regions.

REFERENCES. Anonymous (1983a: 105); Azbukina *et al.* (1984: 37); Bondartsev (1953: 467, Figs 119–120); Bondartsev & Liubarskiy (1964: 179); Breitenbach & Kränzlin (1986: 324, Pl. 414); Hattori & Zang (1995: 101); Imazeki & Hongo (1975, **1**: 138, Pl. 44: 263); Kotlaba (1984: 172, Pl. 26: 63); Morris (1990: 333); Mukhin (1993: Tab. 1); Núñez & Ryvarden (1995: 39, Fig. 8; 2001: 418); Pilát (1936: 352); Ryvarden & Gilbertson (1994: 559, Fig. 291); Sharma (2000: 115); Shvartsman (1964: 516, Figs 228–229); Teng (1996: 387); Vasudeva (1962: 53); Zhang (1999: 374); Zhao *et al.* (1983: 84).

Polyporus badius (Pers.) Schwein.

Trans. Am. Phil. Soc.II, **4**: 155. 1832.

Boletus badius Pers., Syn. Meth. Fung. 523. 1801. – *Polyporus picipes* Fr., Epicr. 440. 1838. – *Melanopus picipes* (Fr.) Pat., Ess. Tax. Hym. 80. 1900.

Basidiocarp divided into pileus and stipe. Pileus 80 mm in diam., infundibuliform. Upper surface smooth to slightly radially wrinkled, smooth, purple-brown. Trama thin, white, corky. Smell

pleasant. Taste mild. Margin sharp, undulating. Hymenophore porose, cream-coloured. Pores rounded to angular, 4–8 per mm. Stipe 40 × 5 mm, almost central, cylindric, rugose, dark chestnut brown, tomentose.

Hyphal system dimitic. Generative hyphae 2–3 μm wide, smooth, hyaline, thin-walled, without clamps. Skeletal hyphae 2–5 μm wide, smooth, hyaline, thick-walled. Cystidia absent. Basidia 18.0–20.0 × 5.5–6.5 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores 6.0–8.0 × 2.5–4.0 μm, cylindric-elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon town (8), mixed taiga, on dead fallen trunk of *Betula platyphylla*, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 52109.

DISTRIBUTION IN ASIA. China, India, Japan, Korea, Mongolia, Russia (North Altai and Primorski Krai) and Vietnam.

NOTES. Circumglobal, temperate species known from Europe, Asia, North America and also from East Africa (Malawi).

REFERENCES. Anonymous (1983a: 108, as *Polyporellus picipes*); Azbukina *et al*. (1984: 37); Breitenbach & Kränzlin (1986: 326, Pl. 415); Domański *et al*. (1967: 64, Fig. 15; 1973: 139, Fig. 57); Gilbertson & Ryvarden (1987: 648, Fig. 332); Gorbunova (1997: 15); Jahn (1979: 182, Pl. 157); Morris (1990: 333); Núñez & Ryvarden (2001: 419); Ryvarden & Gilbertson (1994: 561, Fig. 292); Sharma (2000: 101); Teng (1996: 372).

Pycnoporus sanguineus (L.: Fr.) Murrill

Bull. Torrey Bot. Club **31**: 421. 1904.

Boletus sanguineus L., Sp. Pl. 2 ed. 1646. 1762. – *Polyporus sanguineus* L.: Fr., Syst. Mycol. **1**: 371. 1821. – *Trametes sanguinea* (L.: Fr.) Imazeki, Bull. Tokyo Sci. Mus. **6**: 73. 1943.

Basidiocarp up to 70 × 50 mm, dimidiate to flabelliform, narrowly attached to stem-like base, thin and applanate. Upper surface of pileus orange-red to red-cinnabar, velvety to warted, then smooth. Trama up to 3 mm thick. Consistency coriaceous when fresh. Margin acute. Hymenophore porose. Pores 4–6 per mm, circular.

Hyphal system trimitic. Generative hyphae 1–3 μm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 2–6 μm wide, smooth, thick-walled, unbranched, without septa. Binding hyphae2–4 μm wide, thick-walled to solid, with short branches. Cystidia absent. Basidia 10–16 × 5–6 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 4.0–4.5 × 2.0–2.5 μm, cylindric to ovate, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Tuman-gang River (5) and Taehong-dan (6), mixed taiga, on deciduous stump, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28360; Myohyang-san Mts: near Myohyang-san Hotel (20), on fallen branches of deciduous tree, 12 July 1986, *leg. Z. Heinrich*, KRAM-F 27951; near Kuchung Falls (26), alt. *ca* 300–400 m, deciduous forest, on lying dead trunk of deciduous tree, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 25471; alt. *ca* 850 m, mixed forest, on dead lying trunks and twigs, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53004; above Habiro Temple (27), alt. *ca* 500 m, deciduous forest, on living trunk of *Fraxinus rhynchophylla*, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28958; near Habiro Temple (27), alt. *ca* 200 m, deciduous forest, on dead deciduous wood, 6 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53000; shore of Soham-ho Lake (32), alt. *ca* 100–200 m, mixed forest, on fallen dead deciduous branches, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30628; Kumgang-san Mts: Kuryong Falls (59), alt. *ca* 700 m, mixed forest, on dead trunk of deciduous tree, 14 Aug.1983, *leg. W. Wojewoda*, KRAM-F 53002; deciduous forest, on trunk of deciduous tree, 17 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 53003; Okryu-dong Valley (59), 20 July 1986, *leg. Z. Heinrich*, KRAM-F 28022; near Onjong-ri village (60), alt. *ca* 100 m, mixed forest, on fallen twigs, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 52999; pine Chanto Forest (61), alt. *ca* 150 m, on fallen twig, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53001; Pagyon Ravine (65), near Pagyon Falls, alt. *ca* 300 m, deciduous forest, on fallen dead trunk of deciduous tree, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28959.

DISTRIBUTION IN ASIA. China, India, Japan, Korea, Malaysia, Russia (e.g. Primorski Krai), Thailand, Turkey and Vietnam.

NOTES. Pantropical, widely distributed species, also common in subtropical and some warm tem-

perate areas. It occurs abundantly in almost all tropical countries.

REFERENCES. Anonymous (1978: 151; 1983a: 109); Bondartsev (1953: 475); Gilbertson & Ryvarden (1987: 689, Fig. 352); Hattori & Zang (1995: 101); Hjortstam *et al*. (1990: 308); Imazeki & Hongo (1975, **1**: 138, Pl. 64: 374); Kotlaba (1984: 146); Lloyd (1912: 144, as *Petaloides sanguinues*); Morris (1990: 334); Núñez & Ryvarden (2001: 439); Ryvarden & Johansen (1980: 527, Fig. 182b); Sharma (2000: 120); Shvartsman (1964: 52, 523); Teng (1996: 378); Wojewoda *et al*. (1993: 125, 128); Zhang (1999: 375).

Skeletocutis amorpha (Fr.) Kotl. & Pouzar

Česká Mykol. **12**: 103. 1958.

Gloeoporus amorphous (Fr.) Clem. & Shear, Genera Fungi. 347. 1931. – *Polyporus amorphus* Fr., Syst. Mycol. **1**: 364. 1821.

Basidiocarp pileate, 10–30 mm broad, conchate, sessile. Upper surface zonate, whitish-grey, tomentose. Margin sharp, whitish. Hymenophore porose, yellow-pink-orange. Pores 3–5 per mm.

Hyphal system dimitic. Generative hyphae 1.5–2.5 μm wide, smooth, or some hyphal ends strongly encrusted, hyaline, thin-walled, with clamps. Skeletal hyphae 2.5–5.5 μm wide, smooth, thick-walled. Typical cystidia absent. Cystidioles 11.0–17.5 × 3.0–4.5 μm, smooth, hyaline, thin-walled, with basal clamp. Basidia 9.0–14.0 × 3.5–4.5 μm, clavate or subcylindric, with 4 sterigmata and basal clamp. Basidiospores 3.0–4.0 × 1.0–1.5 μm, allantoid, smooth, hyaline, thin-walled, with 2 oil-drops, non-amyloid.

SPECIMEN EXAMINED. Kumgang-san Mts: near Onjong-ri (60), alt. *ca* 100 m, pine forest, on stump of *Pinus densiflora*, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52991.

DISTRIBUTION IN ASIA. Caucasus, China, India, Japan, Kazakhstan, Russia (Siberia and Far East) and Turkey.

NOTES. New to North Korea. Cosmopolitan species in the cold temperate zone.

REFERENCES. Azbukina *et al*. (1984: 38); Bondartsev (1953: 250, Figs 51: 1; 57, 60: 3; Pls. LXVIII, LXXVI: 3, CLXV: 4); Breitenbach & Kränzlin (1986: 290, Pl. 362); Hansen & Knudsen (1997: 215, Fig. 400); Imazeki & Hongo (1975, **2**: 146, Pl.47: 283); Kotlaba (1984: 118); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 455); Ryvarden & Gilbertson (1994: 621, Fig. 331); Sharma (2000: 126); Shvartsman (1964: 345); Teng (1996: 397).

Trametes gibbosa (Pers.: Fr.) Fr.

Epicr. Syst. Mycol. 492. 1838.

Daedalea gibbosa Pers., Syn. Meth. Fung. 501. 1801. – *D. gibbosa* Pers.: Fr., Syst. Mycol. **1**: 338. 1821. – *Pseudotrametes gibbosa* (Pers.: Fr.) Bondartsev & Singer, Ann. Mycol. **39**: 60. 1941.

Basidiocarp 50–150 mm wide. Upper surface zonate, sometimes green from algae. Hymenophore porose, whitish, cream-coloured to grey-ochraceous. Pores 1–2 per mm, some elongated.

Hyphal system trimitic. Generative hyphae 1.5–3.0 μm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 2.0–4.8 μm wide, smooth, hyaline, thick-walled, sinuous. Binding hyphae 1–2 μm wide, smooth, hyaline, thick-walled, branched. Basidia 10.0–14.0 × 3.5–4.5 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 3.5–5.0 × 2.0–2.5 μm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: valley of stream near Naegok (13), alt. *ca* 1000 m, mixed forest, on stump of deciduous tree, 27 June 1986, *leg. H. Komorowska*, KRAM-F 28442, 28439; Kumgang-san Mts: Okryu-dong Valley (59), near Kuryong Falls, alt. *ca* 700 m, deciduous forest, on dead trunk of deciduous tree, 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52990.

DISTRIBUTION IN ASIA. Caucasus, China, India, Iran, Japan, Kazakhstan, Korea, Russia (Siberia and Primorski Krai), Taiwan, Turkey and Vietnam.

NOTES. Species known from Asia and Europe.

REFERENCES. Anonymous (1983a: 108); Azbukina *et al*. (1984: 38); Bondartsev (1953: 521, Fig. 138, Pl. CL: 1–4); Breitenbach & Kränzlin (1986: 284, Pl. 354); Hallenberg (1981: 496); Hansen & Knudsen (1997: 229, Fig. 442); Imazeki & Hongo (1975, **1**: 139, Pl. 65: 379–380); Jahn (1979: 136, Pl. 109); Kotlaba (1984: 138, Fig. 49); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 38); Núñez & Ryvarden (2001: 470); Ryvarden

& Gilbertson (1994: 656, Fig. 355); Sharma (2000: 129); Shvartsman (1964: 566, Figs 250–251); Teng (1996: 392); Vasudeva (1962: 55); Zhang (1999: 375).

Trametes hirsuta (Fr.) Pilát

Atl. Champ. Eur. **3**: 265. 1939.

Boletus hirsutus Wulfen, *in* Jacquin, Coll. **2**: 149. 1788 (*nom. invalid.*), (non *B. hirsutus* Scop. 1772). – *Polyporus hirsutus* Fr., Syst. Mycol. **1**: 367. 1821. – *Coriolus hirsutus* (Fr.) Quél., Fl. Myc. 389. 1888.

Basidiocarp pileate, semicircular, flabellate, broadly attached. Pileus 30–50 mm broad. Upper surface zonate, strongly hispid-hirsute, whitish, cream-coloured, ochraceous, yellow-brownish, often green from algae. Margin sharp. Flesh whitish to cream-coloured, corky, elastic, tough. Smell slightly anise-like. Taste somewhat bitter. Hymenophore porose, whitish or cream-coloured, then greyish to brownish. Pores (1–)2–4 per mm, rounded-angular.

Hyphal system trimitic. Generative hyphae 1.5–4.0 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 1.5–6.5 µm wide, smooth, hyaline, thick-walled, sinuous. Binding hyphae 2.5–4.5 µm wide, smooth, hyaline, thick-walled, branched. Cystidia absent. Basidia 12.0–18.0 × 3.5–4.5 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5.8–6.7(–7.7) × 1.5–2.0 µm, cylindric, some somewhat curved, smooth, hyaline, thin-walled, non-amyloid (Fig. 139).

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount between Tuman-gang River (5) and Taehong-dan village (6), alt. *ca* 1300–1500 m, mixed taiga, on fallen trunk of deciduous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28960; Myohyang-san Mts: near Habiro Temple (27), alt. *ca* 200 m, at road in mixed forest, on dead trunk of deciduous tree, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28961; deciduous forest, on dead fallen branches of deciduous tree, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53008; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, on stump, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 53045; Kumgang-san Mts: Manmulsang Rocks peak (55), alt. *ca* 1000 m, mixed forest, on stump of deciduous tree, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53010; between Samson-am Rocks (56) and Chonson-dae Rock (57), alt. *ca* 750 m, mixed forest, on stump of deciduous tree, 3 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28963; Chonson-dae Rock (57), alt. *ca* 900 m, deciduous forest, on dead fallen trunk of deciduous tree, 18 July 1986, *leg. W. Wojewoda*, KRAM-F 53009; above Onjong-ri village (60), Onjonggang Stream Valley, alt. *ca* 100 m, deciduous forest, on stump of deciduous tree, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28962.

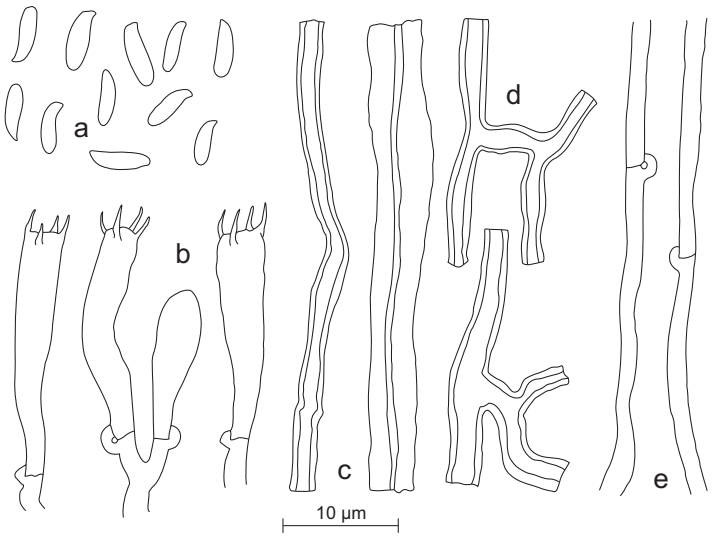


Fig. 139. *Trametes hirsuta* (Fr.) Pilát: a – basidiospores, b – basidia, c – skeletal hyphae, d – binding hyphae, e – generative hyphae (KRAM-F 53045).

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Korea, Mongolia, Pakistan, Russia (Siberia and Primorski Krai), Taiwan, Thailand, Turkey and Vietnam.

NOTES. Circumpolar in the boreal-temperate zone, known from Asia, Europe and North America.

REFERENCES. Anonymous (1983a: 105); Azbukina *et al*. (1984: 35); Bondartsev (1953: 487, Pls. CXXXV: 1; CXXXVII: 1–4); Breitenbach & Kränzlin (1986: 286, Pl. 355); Hallenberg (1981: 496); Hattori & Zang (1995: 102); Imazeki & Hongo (1975, **1**: 138, Pl. 64: 372); Jahn (1979: 138, Pl. 110); Kotlaba (1984: 140); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 38); Núñez & Ryvarden (2001: 471); Pilát (1936: 365; 1940: 74); Ryvarden & Gilbertson (1994: 657, Fig. 356); Sharma (2000: 130); Shvartsman (1964: 543, Figs 239–241); Teng (1996: 376); Uranchimehg *et al*. (1983: 375); Vasudeva (1962: 54); Zhang (1999: 375); Zhao *et al*. (1983: 97).

Trametes ochracea (Pers.) Gilb. & Ryvarden

North Am. Polypores **2**: 752. 1987.

Boletus ochraceus Pers., Ann. Bot. (Usteri) **11**: 29. 1794. – *Polyporus zonatus* Nees: Fr., Syst. Mycol. **1**: 368. 1821, non *Trametes zonata* Wettst. 1885. – *Coriolus zonatus* (Nees: Fr.) Quél., Fl. Myc. 390. 1888. – *Trametes zonatella* Ryvarden, Polyporaceae North Eur. **2**: 436. 1978. For further synonyms see Bondartsev (1953: 485).

Basidiocarp 20–40 mm broad, sessile, dimidiate, semicircular, almost triangular in cross section. Upper surface tomentose to glabrous, ochraceous to light brown, with ferruginous to orange-brown (never blackish or bluish) zones. Context up to 5 mm thick. Flesh of trama whitish. Smell acidic. Taste mild. Hymenophore porose, cream-coloured to ochraceous. Pores 3–4(–5) per mm, rounded-angular.

Hyphal system trimitic. Generative hyphae 1.5–3.0 μm wide, smooth, hyaline, thin-walled, hyaline, with clamps. Skeletal hyphae 2.5–7.0 μm wide, smooth, hyaline, thick-walled, without septa. Binding hyphae 1.5–4.5 μm wide, smooth, hyaline, thick-walled, branched, without septa. Cystidia lacking. Basidia 10–18 × 4–5 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5.5–7.0 × 2.0–2.5 μm, cylindric, some slightly curved, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake, near Samji-yon Hotel (7), mixed taiga, on stump of *Betula platyphylla*, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53046, 53048; on dead trunk of deciduous tree, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53047.

DISTRIBUTION IN ASIA. Caucasus, China, India, Iran, Japan, Kazakhstan, Korea, Mongolia, Pakistan and Russia (e.g. West Siberia and Far East).

NOTES. Cosmopolitan, circumpolar species.

REFERENCES. Anonymous (1983a: 105); Bondartsev (1953: 485, Fig. 26, Pls. LXXVI: 1–3; CXXXIV: 3; CLVII: 2); Breitenbach & Kränzlin [1986: 286, Pl. 356, as *T. multicolor* (Schaeff.) Jülich.]; Hallenberg (1981: 496); Hansen & Knudsen (1997: 230, Fig. 444); Jahn (1979: 136, Pl. 108); Kotlaba (1984: 141, Pl. 21: 51); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 475); Petrov & Belova (1999: 26); Ryvarden (1978: 436, Fig. 171d–e); Ryvarden & Gilbertson (1994: 663, Fig. 359); Sharma (2000: 131); Shvartsman (1964: 541, fig. 238).

Trametes pubescens (Schum.: Fr.) Pilát

Atl. Champ. Eur. **3**: 268. 1939.

Boletus pubescens Schum., Enum. Plant. **2**: 384. 1803. – *Polyporus pubescens* (Schum.): Fr., Syst. Mycol. **1**: 367. 1821. – *Coriolus pubescens* (Schum.: Fr.) Quél., Fl. Myc. 391. 1888.

Basidiocarp pileate, applanate, sessile. Upper surface velutinous to glabrous with age, white to cream-coloured when fresh, yellow to ochraceous yellow with age, with concentric zones. Trama whitish. Hymenophore porose, whitish to ochraceous. Pores 2–4(–5) per mm, rounded-angular.

Hyphal system trimitic. Generative hyphae 2–3 μm wide, smooth, hyaline, thin- to thick-walled, with clamps. Skeletal hyphae 2–5 μm wide, smooth, hyaline, thick-walled. Binding hyphae 1.5–2.0 μm wide, smooth, hyaline, thick-walled, branched. Cystidia absent. Basidia 10.0–15.0 × 3.5–5.0 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5.0–6.0 × 1.5–2.5 μm, cy-

lindric, slightly allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 500 m, forest with *Quercus mongolica*, on trunk of deciduous tree, 8 June 1985, *leg*. *B. Zarzycka*, KRAM-F 27787.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Kazakhstan, Korea, Mongolia, Pakistan, Russia (e.g. Siberia and Primorski Krai), Taiwan and Turkey.

NOTES. Circumpolar in the boreal-temperate zone. Known from Asia, Europe and North America.

REFERENCES. Anonymous (1983a: 105); Azbukina *et al*. (1984: 35); Bondartsev (1953: 483, Pl. CV: 2); Breitenbach & Kränzlin (1986: 286, Pl. 357); Hallenberg (1981: 496); Hansen & Knudsen (1997: 230, Fig. 445); Hattori & Zang (1995: 102); Kotlaba (1984: 137, Pl. 10: 48); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 476); Pilát (1934: 262; 1936: 364; 1940: 75); Ryvarden & Gilbertson (1994: 664, Fig. 361); Sharma (2000: 131); Shvartsman (1964: 539, fig. 237); Teng (1996: 377); Zhao *et al*. (1983: 98).

Trametes versicolor (L.: Fr.) Pilát

Atl. Champ. Eur. **3**: 261. 1936.

Boletus versicolor L., Sp. Pl. 1176. 1753. – *Polyporus versicolor* (L.): Fr., Syst. Mycol. **1**: 368. 1821. – *Polystictus versicolor* (L.: Fr.) Fr., Nov. Symb. Myc. 70. 1851. – *Coriolus versicolor* (L.: Fr.) Quél., Ench. Fung. 175. 1886.

Basidiocarp pileate, applanate, dimidiate. Pileus semicircular to flabellate, 1–5 mm thick. Consistency leathery and tough. Upper surface velutinous, concentrically zonate, variable in color: greyish, blackish, bluish, brownish, reddish, yellowish to ochraceous. Hymenophore porose, whitish cream-coloured or yellow-ochraceous. Pores 2–5 per mm, rounded-angular.

Hyphal system trimitic. Generative hyphae 1.5–3.0 μm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 2–5 μm wide, smooth, hyaline, thick-walled. Binding hyphae 2.0–4.5 μm wide, smooth, hyaline, thick-walled, strongly branched. Cystida absent. Basidia 13.0–18.0 × 4.5–5.0 μm, clavate, with 4 sterigmata, and basal clamp. Basidiospores 4.5–6.0 × 1.5–2.0 μm, cylindric to allantoid, smooth, hyaline, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Paekdu-san Mt. peak (1) and Samji-yon town (8), alt. *ca* 1700 m, taiga forest with *Larix olgensis*, *Abies nephrolepis*, *Picea ajanensis*, *P. koraiensis*, and *Betula platyphylla*, on fallen trunk of dead *Betula platyphylla*, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28973; Mupo on Tuman-gang River (4), alt. *ca* 1400 m, taiga, on fallen twigs of deciduous tree, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53063; near basalt mount between Tuman-gang River (5) and Taehong-dan village (6), alt. *ca* 1300–1500 m, mixed taiga, on stump of deciduous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28972; basalt mount near Taehong-dan (6), alt. *ca* 1400 m, mixed taiga, on trunk of deciduous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53103; shore of Samji-yon Lake (7), taiga, on fallen dead trunk of *Betula platyphylla*, 28 June 1986, *leg*. *W. Wojewoda*, KRAM-F 53076; Chongbong Mt. (9), alt. *ca* 1450 m, mixed taiga, on fallen twig of deciduous tree, 31 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53065; valley of stream near Naegok (13), alt. *ca* 1000 m, mixed forest, on dead trunks and branches of deciduous trees, 27 June 1986, *leg*. *W. Wojewoda*, KRAM-F 27992; *leg*. *H. Komorowska* KRAM-F 28443; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, on fallen trunk of dead deciduous tree, 5 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53074, on fallen trunk, 13 July 1986, *leg*. *W. Wojewoda*, KRAM-F 53066; near Myohyang-san Hotel (20), alt. *ca* 100 m, mixed forest, on fallen trunks, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53058, 53062; on fallen twigs, 4 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53064; deciduous forest, on fallen trunks, 6 June 1985, *leg. B. Zarzycka*, KRAM-F 53087, 53088, near Habiro Temple (27), alt. *ca* 200 m, mixed forest, on fallen trunk of *Magnolia sieboldiana*, 6 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53069; between Habiro Temple (27) and Isonnam Falls (29), alt. *ca* 200 m, forest, on fallen trunk, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53081; 9 June 1985, *leg. B. Zarzycka*, KRAM-F 53089; shore of Soham-ho Lake (32), mixed forest with *Pinus densiflora* and *Quercus mongolica*, on stump of deciduous tree, 14 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28968; Taesong-san Mts: (33–35), in mixed forest, on trunk, 29 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53102; Pyongyang town: Central Botanical Garden (36), on living branches of living *Syringa dilatata*, 12 Sept.1984, *leg*. *W. Wojewoda*, KRAM-F 28967; on twigs of living *Prunus yedoen-*

sis, 12 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28966; on trunk of *Paulownia tomentosa*, 3 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53068; Central Zoological Garden (37), on living trunk of *Salix babylonica*, 13 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28964; Taedong-gang Pleasure Park (40), right bank of Taedong-gang River, near Pyongyang Hotel, on trunk of *Salix babylonica*, 11 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28965; Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest, on trunk, 3 Sept. 1982, *leg. K. Zarzycki*, KRAM-F53101; 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53093; in *Quercus* forest, on trunk, 20 June 1985, *leg. B. Zarzycka*, KRAM-F 53101; Haeju town (46), park, on stump of deciduous tree, 26 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28971; Suian-san Mts (48), alt. *ca* 200 m, mixed forest with *Acer ginnala*, *A. mono*, *A. pseudosieboldianum*, *Aralia elata*, *Carpinus cordata*, *C. laxiflora*, *Magnolia sieboldiana*, *Quercus aliena*, *Q. glandulifera*, *Ulmus davidiana* and *Viburnum pubinerve*, on dead branches of deciduous tree, 14 June 1985, *leg. B. Zarzycka*, KRAM-F 27770; alt. *ca* 150–200 m, mixed forest, on fallen trunk of deciduous tree, 5 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 53056; deciduous forest, on fallen trunk of deciduous tree, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53072, 53075, 53078; alt. *ca* 200–300 m, mixed forest, on fallen branch, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53092; alt. *ca* 200–300 m, in deciduous forest, on fallen trunk of deciduous tree, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 53073, 53080, 53083; Wonsan town (50), Botanical Garden, on trunk of *Persica vulgaris*, 22 July 1986, *leg. W. Wojewoda*, KRAM-F 53070; Kumgang-san Mts: near Onjong-ryong Pass (54), alt. *ca* 800 m, mixed forest, on trunk, 16 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53090; between Onjong-ryong Pass (54) and Onjong-ri village (60), alt. *ca* 220 m, mixed forest, on fallen trunk, 16 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 53084; *ca* 5 km W of Onjong-ri village (60), near Manmulsang Rocks peak (55), in mixed forest, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 53100, 53106; 18 July 1986, *leg. Z. Heinrich*, KRAM-F 28002; Manmulsang Rocks peak (55), alt. *ca* 1000 m, mixed forest, on fallen trunk of deciduous tree, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53059; Myonggyong-dae Ravine (58), alt. *ca* 800 m, deciduous forest, on fallen trunk of deciduous tree, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53067; on fallen trunk of *Fraxinus rhynchophylla*, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53057, 53061; Okryu-dong Valley (59), alt. *ca* 500 m, on fallen twigs of deciduous tree, 20 July 1986, *leg. H. Komorowska*, KRAM-F 28240; Kuryong Falls on Okryu-dong Stream (59), alt. *ca* 700 m, mixed forest, on fallen trunk of deciduous tree, 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53071, 53094, 53095, 53096; 5 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 53082; 20 July 1986, *leg. W. Wojewoda*, KRAM-F 53079; over Onjong-ri village (60), Onjong-gang Stream Valley, alt. *ca* 100 m, deciduous forest, on trunk and twigs of deciduous tree, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 28974; near Onjong-ri village (60), alt. *ca* 100 m, mixed forest, on trunk of deciduous tree, 19 Sept. 1982, *leg. K. Zarzycki*, KRAM-F 53097; park, on trunk of deciduous tree, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53060; pine forest near the hotel, 21 July 1986, *leg. Z. Heinrich*, KRAM-F 28043; *leg. H. Komorowska*, KRAM-F 28382; shore of Samil-po Lake (62), mixed forest with *Pinus densiflora* and *Quercus* sp., on stump of *Quercus* sp., 19 Sept. 1986, *leg. W. Wojewoda*, KRAM-F 27988; on trunk of *Quercus mongolica*, 13 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53077; Kaesong town (63), park, on living trunk of *Salix babylonica*, 21 Sept.1984, *leg. W. Wojewoda*, KRAM-F 28970; Pagyon Ravine (65), near Pagyon Falls, deciduous forest, on stump of deciduous tree, 22 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28969; 26 July 1986, *leg. W. Wojewoda*, KRAM-F 53104; alt. *ca* 300 m, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28192.

DISTRIBUTION IN ASIA. China, India, Iran, Iraq, Japan, Korea, Kazakhstan, Malaysia, Mongolia, Pakistan, Russia (Siberia and Primorski Krai) and Turkey.

NOTES. Cosmopolitan, circumglobal species, most common in temperate regions, known also from tropics, e.g. from South-Eastern Africa.

REFERENCES. Anonymous (1978: 153; 1983a: 105); Azbukina *et al*. (1984: 35); Bondartsev (1953: 480, Fig. 123, Pls. CXXV: 3; CXXX: 2–4; CXXXIV: 1; CXLVII: 5); Breitenbach & Kränzlin (1986: 288, Pl. 359); Gilbertson & Ryvarden (1994: 761, Fig. 393); Hallenberg (1981: 496); Hansen & Knudsen (1997: 230, Fig. 447); Hattori & Zang (1995: 102); Hjortstam *et al*. (1990: 308); Imazeki & Hongo (1975, **1**: 137); Jahn (1979: 136, Pls. 108, 111); Kotlaba (1976: 164; 1984: 140); Morris (1990: 335); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 38); Núñez & Ryvarden (2001: 477); Pilát (1936: 365; 1940: 77); Rattan *et al*. (1978: 770, Fig. 3a–c); Ryvarden & Gilbertson (1994: 667, Fig. 363); Ryvarden & Johansen (1980: 588); Sharma (2000: 132); Shvartsman (1964: 532, Figs 235–236); Teng (1996: 356); Zhang (1999: 376); Zhao *et al*. (1983: 94).

Trichaptum abietinum (Dicks.: Fr.) Ryvarden

Norw. J. Bot. **19**: 237. 1972.

Boletus abietinus Dicks., Plant Crypt. Brit., fasc. **3**: 21. 1793. – *Hirschioporus abietinus* (Dicks.: Fr.) Donk, Med. Bot. Mus. Univ. Utrecht **9**: 168. 1933. – *Polyporus abietinus* (Dicks.): Fr., Syst. Mycol. **1**: 370. 1821. – *Trametes abietina* (Dicks.: Fr.) Pilát, Atl. Champ. Eur. **3**: 273. 1936.

Basidiocarp pileate, semipileate, effused-reflexed to resupinate. Upper surface grey-whitish to brownish or greenish from algae, hispid-tomentose to hirsute, azonate or zonate, smooth with age. Margin sharp. Context *ca* 10 mm thick, duplex. Hymenophore reticulate-poroid to irpicoid, violaceous, bright purplish to ochraceous. Pores 3–6 per mm, angular.

Hyphal system domitic. Generative hyphae 2–4 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 2–5 µm, smooth, hyaline, thick-walled, without septa. Cystidia 17–25 × 3–6 µm, clavate or fusoid, hyaline, thick-walled, some apically encrusted with crystals. Basidia 12–18 × 4–5 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5.5–7.0 × 2.0–2.5 µm, cylindric, hyaline, smooth, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 25 km N of Samji-yon town (8), alt. *ca* 1700 m, taiga with *Larix* and *Picea*, 30 June 1986, *leg. Z. Heinrich*, KRAM-F 28074, 28086; Mubong (3), near upper border of forest, taiga with *Larix olgensis*, on fallen dead trunks of *Larix olgensis*, 30 June 1986, *leg. W. Wojewoda*, KRAM-F 53141, 53148; shore of Samji-yon Lake, near Samji-yon Hotel (7), mixed taiga, on trunk of coniferous tree, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53147; *ca* 10 km S of Samji-yon town (8), taiga, on trunk of coniferous tree, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53150; *ca* 25 km NW of Samji-yon town, alt. *ca* 1740 m, taiga with *Larix*, *Abies*, *Linnaea borealis*, *Entodon schreberi* and *Hylocomium*, on trunk of coniferous tree, 28 June 1985, *leg. B. Zarzycka*, KRAM-F 53154; Onsupyong near Naegok village (13), alt. *ca* 800 m, mixed forest, 27 June 1986, *leg. Z. Heinrich*, KRAM-F 27888; Myohyang-san Mts: near Sangwon-am Monastery (19), mixed forest, on dead, fallen trunk of *Pinus densiflora*, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53158; near Myohyang-san Hotel (20), mixed forest, on wood of coniferous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F53152; on fallen dead trunk of *Pinus densiflora*, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53151; Manpok Valley, near Yuson Falls (24), mixed forest, on dead trunk of *Pinus densiflora*, 14 July 1986, *leg. W. Wojewoda*, KRAM-F 53140; Manpok Valley, Pison Falls (25), alt. *ca* 700 m, mixed forest, on dead trunk of *Pinus densiflora*, 14 July 1986, *leg. W. Wojewoda*, KRAM-F 53139; Manpok Valley (23–25), mixed forest, on dead trunk of *Pinus densiflora*, 14 July 1986, *leg. W. Wojewoda*, KRAM-F 53157; near Kuchung Falls (26), mixed forest, on dead trunks of *Pinus densiflora*, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53160, 53162; near Habiro Temple (27), mixed forest, on trunk, 9 June 1985, *leg. B. Zarzycka & K. Zarzycki*, KRAM-F 53155; shore of Soham-ho Lake (32), mixed forest, on fallen trunk of *Pinus densiflora*, 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53149; Taesong-san Hills: Somun Mt. (34), mixed forest, on trunk of *Pinus densiflora*, 29 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53144; Ryongak-san Mt. (42), alt. *ca* 200 m, mixed forest with *Castanea*, *Juglans rhynchophylla*, *Picea densiflora* and *Quercus mongolica*, on stump of *Pinus densiflora*, 24 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28995; Sokdamgukok village (47), pine forest, on dead trunk of *Pinus densiflora*, 7 July 1986, *leg. W. Wojewoda*, KRAM-F 53143; Suian-san Mts (48), mixed forest, on stump and dead trunk of *Pinus densiflora*, 25 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53138; 6 July 1986, *leg. W. Wojewoda*, KRAM-F 53146; forest with *Pinus densiflora*, on dead trunk of *Pinus densiflora*, 15 June 1985, *leg. B. Zarzycka*, KRAM-F 53136; at road, on wooden pole of coniferous tree, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 53153; Kumgang-san Mts: below Onjong-ryong Pass (54), alt. *ca* 800 m, mixed forest, on lying trunk of *Pinus koraiensis*, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 53163; near Manmulsang Rocks peak (55), mixed forest, on lying trunk of *Pinus densiflora*, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53145; Myonggyong-dae Ravine (58), deciduous forest, on trunk of *Pinus densiflora*, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53156; near Onjong-ri village (60), mixed forest, on trunk of *Pinus densiflora*, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53159; in pine forest near hotel, 21 July 1986, *leg. H. Komorowska*, KRAM-F 28390; shore of Samil-po Lake (62), mixed forest, on trunk, 19 July 1986, *leg. W. Wojewoda*, KRAM-F 53161; Tomb of King Kongmin (64), on trunks of *Pinus densiflora*, 21 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53137; 26 July 1986, *leg. W. Wojewoda*, KRAM-F 53142.

DISTRIBUTION IN ASIA. China, India, Iraq, Japan, Kazakhstan, Korea, Pakistan, Russia (e.g.

Siberia and Primorski Krai), Taiwan, Turkey and Vietnam.

NOTES. Circumpolar throughout coniferous forest regions.

REFERENCES. Anonymous (1983a: 103); Azbukina *et al*. (1984: 38); Bondartsev (1953: 558, Figs 150–151: 6; Pls. CLXIV: 1; CLXV: 1); Breitenbach & Kränzlin (1986: 288, Pl. 360); Hansen & Knudsen (1997: 219, Fig. 409); Hattori & Zang (1995: 102); Imazeki & Hongo (1975, **2**; 144, Pl. 47: 280); Jahn (1979: 128, Pl. 101); Kotlaba (1984: 116); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 483); Pilát (1936: 361; 1940: 73); Rattan *et al*. (1978: 771, Fig. 8a); Ryvarden & Gilbertson (1994: 676, Figs 368–369); Sharma (2000: 134); Shvartsman (1964: 593, Figs 262–263); Teng (1996: 58); Vasudeva (1962: 54); Zhang (1999: 376); Zhao *et al*. (1983: 95).

Trichaptum biforme (Fr.) Ryvarden

Norw. J. Bot. **19**: 237. 1972.

Polyporus biformis Fr., *in* Klotzsch, Linnaea **8**: 486. 1833. – *P. pargamenus* (‘*pergamenus*’) Fr., Epicr. Syst. Mycol. 480. 1836–1838. – *Polystictus pargamenus* (Fr.) Fr., Nov. Symb. Myc. 69. 1851. – *Trametes biformis* (Fr.) Pilát, Atl. Polyp. 277. 1939. – *Hirschioporus pargamenus* (‘*pergamenus*’) (Fr.) Bondartsev & Singer, Ann. Mycol. **39**: 63. 1941.

Basidiocarp pileate, sessile, dimidiate, petaloides or flabelliform. Upper surface white, grey to ochraceous, hirsute or glabrous, zonate. Margin sharp. Hymenophore poroid to irpicoid, purple, violaceous to pale brown. Pores 3–5 per mm. Context up to 1.5 mm thick.

Hyphal system dimitic. Generative hyphae 2.5–6.0 μm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 3–5 μm wide, smooth, hyaline, thick-walled. Cystidia 18.0–30.0 × 3.0–4.5 μm, fusoid, hyaline, thick-walled, apically encrusted, with basal clamp. Basidia 10.0–20.0 × 3.5–5.0 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5.0–6.5 × 2.0–2.5 μm, cylindric, slightly curved, smooth, hyaline, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Mubong (3) and Taehong-dan village (6), alt. *ca* 1450 m, taiga with *Larix olgensis* and *Betula*, on dead fallen trunk of *Betula platyphylla*, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29300; shore of Samji-yon Lake (**7**), taiga, on fallen trunk of *Betula platyphylla*, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29301; near Samji-yon Hotel (7), mixed taiga, on fallen trunk of *Betula platyphylla*, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53165; Myohyang-san Mts: near Myohyang-san Hotel (20), forest, on dead trunk of deciduous tree, 6 June 1985, *leg. K. Zarzycki*, KRAM-F 53167; Kuchung Falls (26), alt. *ca* 850 m, deciduous forest, on dead trunk of deciduous tree, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53164; Kumgang-san Mts: Kuryong Falls (59), alt. *ca* 700 m, deciduous forest, on dead trunk of *Quercus* sp., 14 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53166.

DISTRIBUTION IN ASIA. China, India, Indonesia, Iran, Japan, Kazakhstan, Korea, Mongolia, Russia (West Siberia and Primorski Krai), Taiwan, Thailand, Turkey and Vietnam.

NOTES. Cosmopolitan, circumboreal species.

REFERENCES. Anonymous (1983a: 107); Azbukina *et al*. (1984: 38); Bondartsev (1953: 564, Fig. 151: 2, 4; Pls. CLXIII: 1; CLXXIX: 3); Hallenberg (1981: 496); Hansen & Knudsen (1997: 219, Fig. 410); Hattori & Zang (1995: 102); Imazeki & Hongo (1975, **2**: 143, Pls. 46: 276–277; 47: 278); Kotlaba (1984: 118); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 37); Núñez & Ryvarden (2001: 483); Pilát (1940: 72); Ryvarden & Gilbertson (1994: 679, Fig. 370); Sharma (2000: 134); Shvartsman (1964: 597); Suhirman & Núñez (1998: 289); Teng (1996: 58); Vasudeva (1962: 54); Wojewoda *et al*. (2002a: 119); Zhao *et al*. (1983: 89).

Trichaptum fuscoviolaceum (Ehrenb.: Fr.) Ryvarden

Norw. J. Bot. **19**: 237. 1972.

Sistotrema fuscoviolaceum Ehrenb., Sylv. Mycol. Berol. 30. 1818. – *Hydnum fuscoviolaceum* (Ehrenb.): Fr., Syst. Mycol. **1**: 421. 1821. – *Irpex fuscoviolaceus* (Ehrenb.: Fr.) Fr., Elench. 144. 1828. – *Hirschioporus fuscoviolaceus* (Ehrenb.: Fr.) Donk, Med. Bot. Mus. Univ. Utrecht **9**: 169. 1933. – *Trichaptum hollii* (J. C. Schmidt) Kreisel, Boletus **1984**(1): 30. 1984.

Basidiocarp pileate, or effused-reflexed to resupinate. Upper surface tomentose to slihtly hirsute, white to grey, zonate. Context thin, *ca* 1.0–1.5 mm thick, with gelatinous layer near tubes, whitish to ochraceous. Hymenophore hydnoid to

irpicoid, covered with small flattened teeth, sometimes poroid especially along margin, grey-violet, violaceous-brown to light brown with age.

Hyphal sytem dimitic. Generative hyphae 2–3 µm wide, smooth, hyaline, thin- to thick-walled, with clamps. Skeletal hyphae 3–5 µm wide, smooth, hyaline, thick-walled. Cystidia 20–34 × 4–5 µm, clavate to fusoid, hyaline, thick-walled, apically encrusted, embedded or projecting. Basidia 15.0–19.0 × 4.5–5.5 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 7–8 × 2–3 µm, cylindric, allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 10 km SE of Paekdu-san Mt. peak (1), alt. *ca* 1900 m, taiga, on fallen trunk of *Larix olgensis*, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53171; *ca* 20 km SE of Paekdu-san Mt. peak, alt. *ca* 1900 m, taiga with *Ledum palustre* and *Vaccinium uliginosum*, on dead trunk of coniferous tree, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53169; *ca* 30 km SE of Paekdu-san Mt. peak, alt. *ca* 1900 m, taiga, on fallen trunk of coniferous tree, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53168; Mupo on Tuman-gang River (4), alt. *ca* 1400 m, taiga, on fallen dead trunk of coniferous tree, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53170; basalt mount, *ca* 2 km N of Taehongdan (6), alt. *ca* 1400 m, mixed taiga with *Larix*, on trunk of coniferous tree, 29 June 1986, *leg. W. Wojewoda*, KRAM-F 53180; 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53176; on shore of Samji-yon Lake (7), mixed taiga with *Larix*, on fallen trunk of *Larix* sp., 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53177; on dead trunk of coniferous tree, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 53181; alt. *ca* 1500 m, mixed taiga, on fallen trunk of *Abies nephrolepis*, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 53185; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1400 m, taiga, on wood of coniferous tree, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53172;. *ca* 10 km S of Samji-yon town (8), taiga, on dead fallen trunk of coniferous tree, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 53174; Chongbong Mt. (9), alt. *ca* 1450 m, in mixed taiga, on dead decayed trunks of coniferous tree, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 53178, 53184; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 500 m, mixed forest, on dead trunk, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 53183; between Habiro Temple (27) and Wonman Mt. (31), alt. *ca* 800 m, mixed forest, on dead trunk of coniferous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53179; Wonman Mt. (31), alt. *ca* 1000–1200 m, in coniferous forest, on fallen trunk of coniferous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53182; on shore of Taesong-ho Lake (43), forest, on dead fallen trunk of *Pinus densiflora*, 23 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53173; Kumgang-san Mts: *ca* 5 km NW of Onjong-ri village (60), near Manmulsang Rocks peak (55), alt. *ca* 900 m, pine forest, on trunk of *Pinus densiflora*, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 53175; pine Chanto Forest (61), alt. *ca* 100 m, on bark of dead trunk of *Pinus densiflora*, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 53054.

DISTRIBUTION IN ASIA. China, India, Japan, Mongolia and Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea. Circumpolar in the temperate zone. Known from Asia, Europe and North America.

REFERENCES. Azbukina *et al*. (1984: 38); Bondartsev (1953: 563, Fig. 151: 3, 5; Pl. CLXI); Breitenbach & Kränzlin (1986: 290, Pl. 361); Gilbertson & Ryvarden (1987: 773, Fig. 400); Hansen & Knusen (1997: 219); Komarova (1964: 151); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 486); Petrov & Belova (1999: 26); Ryvarden (1978: 175, Fig. 175); Ryvarden & Gilbertson (1994: 680, Fig. 371); Sharma (2000: 135); Zhao *et al*. (1983: 89).

Trichaptum laricinum (P. Karst.) Ryvarden

Norw. J. Bot. **19**: 237. 1972.

Hirschioporus laricinus (P. Karst.) Teramoto, Bull. Tokyo Univ. Forests **43**: 31. 1952. – *Lenzites laricinus* P. Karst., Acta Soc. Fl. Fauna Fenn. **27**: 4. 1905.

Basidiocarp pileate, sessile, effused-reflexed to resupinate. Upper surface hirsute, grey, zonate. Context pale purplish brown, coriaceous, *ca* 1 mm thick. Hymenophore lamellate, sometimes poroid near margin, purplish to brown.

Hyphal sytem dimitic. Generative hyphae 2–4 µm wide, smooth, hyaline, thin- to thick-walled, with clamps. Skeletal hyphae 3–5 µm wide, smooth, hyaline, thick-walled, non-septate. Cystidia 25.0–40.0 × 4.5–8.0 µm, broadly fusoid, hyaline, thick-walled, apically encrusted, embedded or projecting. Basidia 15.0–19.0 × 4.5–5.5 µm, clavate, with 4 sterigmata, and basal clamp. Basidiospores

5.0–7.5 × 2.0–2.5 μm, cylindric, allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: below Paekdu-san Mt. peak (1), alt. *ca* 1900 m, taiga, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28993; *ca* 10 km SE of Paekdu-san Mt. peak, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 53186; *ca* 30 km E of Paekdu-san Mt. peak, alt. *ca* 1800–1900 m, taiga with *Larix*, 3 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 27069, 53188; shore of Samji-yon Lake (7), taiga, 30 June 1986, *leg*. *W. Wojewoda*, KRAM-F 53187. – Taiga, on dead standing and fallen trunks of *L. olgensis*.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (e.g. Primorski Krai).

NOTES. Widely distributed species in boreal coniferous forests, known from Asia, Europe and North America.

REFERENCES. Anonymous (1983a: 107); Azbukina *et al*. (1984: 38); Bondartsev (1953: 566); Gilbertson & Ryvarden (1987: 775, Fig. 401); Hansen & Knusen (1997: 219); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 487); Ryvarden & Gilbertson (1994: 681, Fig. 372); Teng (1996: 58); Zhao *et al*. (1983: 89).

Sistotremataceae Jülich 1982

Sistotrema brinkmanii (Bres.) J. Erikss.

K. Fysiogr. Sallsk. Lund. Forh. **18**(8): 17. 1948.

Odontia brinkmannii Bres., Ann. Mycol. **1**: 88. 1903.

Basidiocarp corticioid, resupinate, thin, attached tightly to substrate. Margin not differentiated. Hymenophore smooth, verrucose-punctate or arachnoid-farinose, whitish, ochraceous or grey-ochraceous. Consistency soft.

Hyphal system monomitic. Hyphae 3–6 μm wide, smooth, hyaline, thin-walled, with clamps. Cystidia absent. Basidia 10–20 × 4–6 μm, urniform, with 4–8 sterigmata and basal clamp. Basidiospores 3.5–5.5 × 2.0–2.5 μm, suballantoid, elliptic, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed forest, on decayed trunk, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30361; near Naegok village (13), *ca* 10 km NE of Pochonbo city (14), alt. *ca* 1000 m, mixed forest, on fallen twig, 27 June 1986, *leg*. *W. Wojewoda*, KRAM-F 30359; Myohyang-san Mts: near Habiro Temple (27), alt. *ca* 200 m, mixed forest, on fallen twig of deciduous tree, 13 July 1986, *leg*. *W. Wojewoda*, KRAM-F 30360; Suian-san Mts (48): near ruins of castle (46), alt. *ca* 350 m, mixed forest, on fallen trunk, 6 July 1986, *leg*. *Z. Heinrich*, KRAM-F 28152; near Sokdamgukok village (47), mixed forest, on fallen twig, 7 July 1986, *leg*. *W. Wojewoda*, KRAM-F 30358; near Pagyon Falls (65), alt. *ca* 300 m, deciduous forest, on fallen twig of deciduous tree, 26 July 1986, *leg*. *W. Wojewoda*, KRAM-F 30357.

DISTRIBUTION IN ASIA. China, Iran and Japan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States). This species was described by Bresadola (1903). Type material was collected in Poland by Polish mycologist Bogumir Eichler.

REFERENCES. Breitenbach & Kränzlin (1986: 174, Pl. 188); Bresadola (1903: 88); Domański (1992: 54); Eriksson *et al*. (1984: 1317, Fig. 674); Ginns & Lefebvre (1993: 144); Hallenberg (1978: 72; 1981: 488); Hansen & Knudsen (1997: 129, Fig. 156); Jülich (1984: 135); Jülich & Stalpers (1980: 213); Maekawa (1993: 104, Fig. 71); Maekawa *et al*. (2002: 92); Maekawa & Zang (1995: 92).

Sistotrema raduloides (P. Karst.) Donk

Fungus **26**: 4. 1956.

Hydnum raduloides P. Karst., Symb. Myc. Fenn. XII, Meddn. Soc. Fauna Fl. Fenn. **9**: 110. 1883.

Basidiocarp corticioid, resupinate, thin, closely adnate. Margin indeterminate. Hymenophore odontioid or hydnoid, with cylindric or irregular teeth, 1–4 mm long, cream-coloured.

Hyphal system monomitic. Hyphae 2–3 μm wide, smooth, hyaline, thin-walled or with somewhat thickened walls, with clamps. Cystidia absent. Basidia 18–20 × 4–7 μm, urniform, with 4–8 sterigmata and with basal clamp. Basidiospores 6.0–9.0 × 2.5–3.5 μm, subcylindric or subfusiform, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Mohyang-san Hotel (20), alt. *ca* 100 m, mixed forest, on fallen twigs of deciduous tree, 4 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 30362.

DISTRIBUTION IN ASIA. Iran.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1992: 41); Eriksson *et al.* (1984: 1357, Figs 702–703); Ginns & Lefebvre (1993: 146); Hallenberg (1981: 488); Hansen & Knudsen (1997: 128); Jülich (1984: 134); Jülich & Stalpers (1980: 211).

Sistotremastrum suecicum Litsch. *ex.* J. Erikss.

Symb. Bot. Ups. **16** (1): 62. 1958.

Corticium suecicum Litsch., *in* S. Lundell & Nannf., Fungi exs. Suec. n. 464. 1937. – *Cortcicium calceum* Bourdot & Galzin, Hymenomyc. Fr. 237. 1928 (non *Thelephora calcea* Fr., Elench. Fung. **1**: 215. 1928.

Basidiocarp corticioid, resupinate, thin, ceraceous. Margin not differentiated. Hymenophore smooth, white or cream-coloured.

Hyphal system monomitic. Hyphae 2–3 μm wide, smooth, hyaline, with thin or slightly thickened walls, with clamps. Cystidia absent. Basidia 16–21 × 4–6 μm, clavate, often somewhat constricted, with 4 or 6 sterigmata and basal clamp. Basidiospores 4.5–6.0 × 1.5–2.0 μm, narrowly elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Suian-san Mts (48), near ruins of castle, alt. *ca* 150–200 m, mixed forest, on stump, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 30353.

DISTRIBUTION IN ASIA. China and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1992: 60); Eriksson *et al.* (1984: 1377, Fig. 718); Ginns & Lefebvre (1993: 147); Hansen & Knudsen (1997: 130, Fig. 170); Jülich (1984: 135); Jülich & Stalpers (1980: 213); Maekawa *et al.* (2002: 93); Mukhin (1993: Tab. 1).

Trechispora farinacea (Pers.: Fr.) Liberta

Taxon **15**: 318. 1966.

Hydnum farinaceum Pers., Syn. Meth. Fung. 562. 1801. – *H. farinaceum* Pers.: Fr., Syst. Mycol. **1**: 419. 1821. – *Grandinia farinacea* (Pers.: Fr.) Bourdot & Galzin, Bull. Soc. Mycol. Fr. **30**: 253. 1914. – *Cristella farinacea* (Pers.: Fr.) Donk, Fungus **27**(1–4): 20. 1957.

Basidiocarp corticioid, resupinate, thin. Consistency soft. Margin not differentiated. Hymenophore arachnoid-farinose when young, then verrucose to finely hydnoid, white or cream- coloured.

Hyphal system monomitic. Hyphae 2–6 μm wide, smooth, hyaline, thin-walled, with clamps, often swollen toward septa. Cystidia absent. Basidia 8–16 × 4–5 μm, cylindric-clavate, often somewhat sinuous or constricted, with 4 sterigmata and basal clamp. Basidiospores 4.5–5.0 × 3.0–3.5 μm, subglobose to broadly elliptic, smooth, hyaline, thin-walled or with slightly thickened walls, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), Hyangsan-gang River Valley, alt. *ca* 100–150 m, mixed forest on dead, fallen twig of deciduous tree, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30691.

DISTRIBUTION IN ASIA. China, India, Iran, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 124, Pl. 112); Domański (1992: 143, Pl. 301); Ginns & Lefebvre (1993: 167); Hallenberg (1978: 75); Hjortstam *et al.* (1988: 1499, Figs 794–797); Jülich & Stalpers (1980: 260); Maekawa (1993: 116, Fig. 82); Maekawa *et al.* (2002: 93; 2003: 408); Maekawa & Zang (1995: 93); Mukhin (1993: Tab. 1); Vasudeva (1962: 48).

Steccherinaceae Parmasto 1968

Irpex lacteus (Fr.: Fr.) Fr.

Elench. Fung. 145. 1828.

Sistotrema lacteum Fr., Obs. Mycol. **2**: 226. 1818. – *Hydnum lacteum* (Fr.): Fr., Syst. Mycol. **1**: 412. 1821. – *Boletus tulipiferae* Schwein., Schr. Nat. Ges. Lepzig **1**: 99. 1822. – *Polyporus tulipiferae* (Schwein.) Overh., Wash. Univ. Studies 3, **1**: 29. 1915. – *Hirschioporus lacteus* (Fr.: Fr.) Teng, Chung-kuo Ti Chen-chun. 761. 1963.

Basidiocarp stereoid-hydnoid, effuso-reflexed, semi-pileate to pileate, rarely resupinate. Upper surface of pileus tomentose-pilose, somewhat zo-

nate, cream to dingy yellow. Margin sharp. Hymenophore irpicoid but irregularly porose toward margin. Teeth up to 0.5 mm long, whitish to ochraceous. Consistency fibrous.

Hyphal system dimitic. Generative hyphae 2–3 μm wide, hyaline, smooth, thin- to thick-walled, without clamps. Skeletal hyphae 2–7 μm hyaline, smooth, thick-walled, without clamps. Skeletocystidia (like lamprocystidia) 20.0–30.0 × 3.0–6.5 μm, thick-walled, hyaline, encrusted apical part cylindric to conic. Basidia 20–25 μm, cylindric-clavate, with 4 sterigmata, without basal clamp. Basidiospores 5.0–6.0 × 2.0–2.5 μm, cylindric to elliptic, hyaline, smooth, thin-walled, non-amyloid (Fig. 140).

SPECIMENS EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga, on dead fallen branches of deciduous tree, 27 June 1986, *leg. W. Wojewoda*, KRAM-F 53236; Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100 m, deciduous forest, on dead fallen branches and twigs of deciduous tree, 4 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53232, 53233; near Habiro Temple, deciduous forest, on dead fallen branches of deciduous tree, 17 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 53234; on stumps of deciduous trees, 9 June 1985, *leg. B. Zarzycka*, KRAM-F 53235; shore of Soham-ho Lake (32), deciduous forest, on dead fallen twigs of *Robinia pseudacacia*, 14 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 53237; Taesong-san Mts: Chujak Mt. (35), mixed forest, on dead trunk of *Sorbus*, 26 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 53238; Pyongyang town: Central Botanical Garden (36), on stump of deciduous tree, 3 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53240; Central Zoological Garden (37), on dead trunk of *Prunus*, 13 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 53250; Wonsan town (50), Botanical Garden, on stump of *Albizzia*, 20 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53241; Kumgang-san Mts: below Manmulsang Rocks (55), alt. *ca* 900 m, deciduous forest, on dead fallen trunk of *Fraxinus rhynchophylla*, 17 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53244; Myonggyong-dae Ravine (56), deciduous forest, on stump of deciduous tree, 17 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52283; Okryu-dong Valley near Kuryong Falls (59), alt. *ca* 500 m, deciduous forest, 14 Aug. 1983, 5 Oct. 1984, 53245, 53246, 53247; deciduous forest, on stump of deciduous tree, 20 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28026; near Onjong-ri (60), alt. *ca* 100 m, mixed forest, on dead fallen branches and twigs of deciduous trees, 15 Aug. 1983, 4 Oct. 1984, *leg*. *W. Wojewoda*, KRAM-F 53242, 53243; near Tomb of King Kongmin (64), mixed forest with *Pinus densiflora* and *Quercus mongolica*, on dead fallen branches of deciduous tree, 21 Aug. 1984, *leg*. *W. Wojewoda*, KRAM-F 53248; Pagyon Ravine (65), in deciduous forest, on dead fallen branches of deciduous trees, 26 July, 1986, *leg. W. Wojewoda*, KRAM-F 53239.

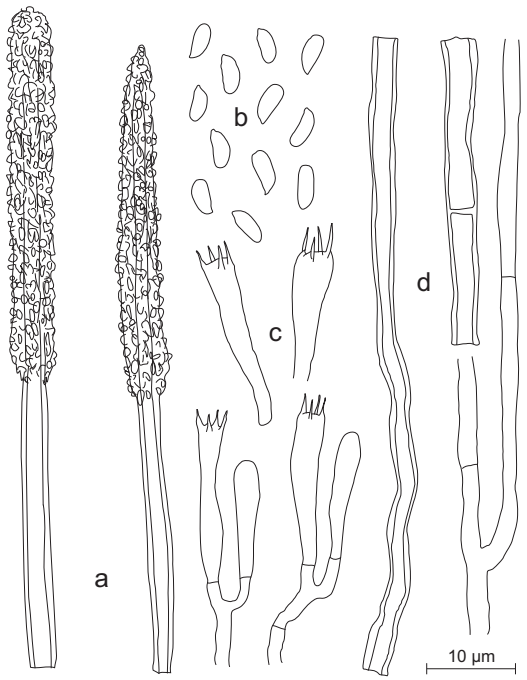


Fig. 140. *Irpex lacteus* (Fr.: Fr.) Fr.: a – cystidia, b – basidiospores, c – basidia, d – hyphae (KRAM-F 28026).

DISTRIBUTION IN ASIA. Caucasus, China, India, Japan, Kazakhstan, Korea, Russia (Far East, Kamchatka and Siberia) and Taiwan.

NOTES. Cosmopolitan species. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 107); Azbukina *et al*. (1984: 39); Bondartsev (1953: 553, Fig. 147, Pls. X: 1, LXXXVI: 5); Breitenbach & Kränzlin (1986: 176, Pl. 192); Domański (1965: 202, Fig. 67); Ginns & Lefebvre (1993: 94); Hansen & Knudsen (1997: 217); Hattori & Zang (1995: 96); Kotlaba (1984: 80); Mukhin (1993: Tab. 1); Nikolaeva (1961: Figs 118–120, Pls. XXXVI: 3; XXXVII: 1; XXXVIII); Núñez & Ryvarden

(2001: 328); Ryvarden & Gilbertson (1993: 353, Fig. 168); Sharma (2000: 79); Shvartsman (1964: 219, Figs 96–97); Teng (1996: 354); Zhang (1999: 373).

Irpex nitidus (Pers.: Fr.) Saarenoksa & Kotir.

in Kotiranta & Saarenoksa, Polish Bot. J. **47**(2): 105. 2002.

Poria nitida Pers., Observ. Mycol. **2**: 15. 1800. – *Polyporus nitidus* (Pes.): Fr., Syst. Mycol. **1**: 379. 1821. – *Poria eupora* (P. Karst.) Cooke, Grevillea **14**: 110. 1886. – *Chaetoporus euporus* (P. Karst.) Bodartsev & Singer, Ann. Mycol. **39**: 51. 1941. – *C. nitidus* (Pers.: Fr.) Donk, Persoonia **5**(1): 100. 1967. – *Junghuhnia nitida* (Pers.: Fr.) Ryvarden, Persoonia **7**: 18. 1972.

Basidiocarp effuse, resupinate, thin. Margin pale ochraceous, finely tomentose, up to 2 mm wide. Subiculum cream-coloured. Hymenophore porose, ochraceous orange. Pores 6–7(–8) per mm, angular.

Hyphal system dimitic. Generative hyphae 1.5–2.5 µm wide, smooth, hyaline, thin- to thick-walled, with clamps. Skeletal hyphae 1.0–3.5 µm wide, smooth, hyaline, thick-walled. Skeletocystidia (like lamprocystidia) 21.0–77.0 × 7.7–10.5 (–21.0) µm, thick-walled, encrusted and yellow in upper part, numerous in hymenium, embedded or projecting, numerous. Basidia 10.0–15.0 × 3.5–5.0 µm, clavate, with 4 sterigmata and basal clamp. Basidiospores 3.0–4.5 × 2.0–2.5(–3.0) µm, elliptic to ovoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga, on dead fallen trunk of deciduous tree, 27 June 1986, *leg. W. Wojewoda*, KRAM-F 53249; Myohyang-san Mts: near Habiro Temple (27), alt. *ca* 200 m, deciduous forest, on dead fallen trunk of deciduous tree, 16 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52984.

DISTRIBUTION IN ASIA. Caucasus, China, India, Japan, Korea and Russia (Siberia and Far East).

NOTES. New to North Korea. Cosmopolitan species, common throughout tropical Africa.

REFERENCES. Azbukina *et al*. (1984: 39); Bondartsev (1953: 170, Figs 23, 29: 55, 42, Pls. XL-XLI); Breitenbach & Kränzlin (1986: 304, Pl. 382); Domański (1965: 104, Fig. 34, Pls. XXVI-XXVII; 1972: 89, Figs 16E, 33); Hattori & Zang (1995: 97); Jahn (1979: 110, Pl. 81); Kotlaba (1984: 151); Morris (1990: 331); Mukhin (1993: Tab. 1); Núñez & Ryvarden (2001: 337); Ryvarden & Gilbertson (1993: 366, Fig. 175).

Irpex ochraceus (Pers.: Fr.) Kotir. & Saarenoksa

Polish Bot. J. **47**(2): 105. 2002.

Hydnum ochraceum Pers., *in* Gmelin, Syst. Nat. **2**: 1440. 1792 (non *Irpex ochraceus* Schwein.). – *Hydnum ochraceum* Pers.: Fr., Syst. Mycol. **1**: 414. 1821. – *Steccherinum ochraceum* (Pers.: Fr.) Gray, Nat. Arr. Brit. Pl. **1**: 651. 1821. – *Mycoleptodon ochraceus* (Pers.: Fr.) Pat., Essai Tax. Hyménomyc. 117. 1900.

Basidiocarp effuso-reflexed, stereoid-hydnoid, semipileate, pileate to resupinate. Pileus thickness (spines included) up to 1 mm. Upper surface of pileus ochraceous, zonate. Hymenophore hydnoid-odontoid, ochraceous. Spines cylindric, 4–5(–6) per mm.

Hyphal system dimitic. Generative hyphae 2–3 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 3.0–6.7 µm wide, smooth, hyaline, thick-walled. Skeletocystidia (like lamprocystidia) up 25–90 × 5–9 µm, thick-walled, encrusted and yellow in upper part, numerous in hymenium, embedded or projecting. Basidia 15.0–25.0 × 3.5–4.0 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 2.9–3.1 × 1.4–1.9 µm, elliptic, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed forest, on dead, fallen branches of deciduous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52902; Myohyang-san Mts: valley of Hyangsan-gang River near Myohyang-san Hotel, alt. *ca* 100 m, deciduous forest, on stump of *Robinia pseudacacia*, 12 July 1986, *leg. W. Wojewoda*, KRAM-F 53255.

DISTRIBUTION IN ASIA. Caucasus, China, Japan, Mongolia and Russia (Siberia and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States). This species may be confused with *Irpex bourdotii* (Saliba & A. David) Kotir. & Saarenoksa and with *I. lacteus*.

REFERENCES. Azbukina *et al*. (1984: 39); Breitenbach & Kränzlin (1986: 178, Pl. 194); Ginns & Lefebvre (1993: 149); Hansen & Knudsen (1997: 218, Fig. 406); Imazeki & Hongo (1975, **2**: 129, Pl. 41: 252); Kotiranta & Saarenoksa (2002: 105); Mukhin (1993: Tab. 1); Niemelä (1998: 93–97, Fig. 1); Nikolaeva (1961: 138, Fig. 88–90, Pl. XXVII); Tellería (1990: 102); Teng (1996: 316); Uranchimehg *et al*. (1983: 374).

Tubulicrinaceae Jülich 1982

Tubulicium vermiferum (Bourdot) Oberw.

Sydowia **19**(1–3): 54. 1965.

Peniophora vermifera Bourdot, Rev. Sci. Bourb. **23**: 13. 1910. – *Tubulicrinus vermiferus* (Bourdot) M. P. Christ., Dansk Bot. Ark. **19**(2): 136. 1960.

Basidiocarp corticioid, resupinate, smooth or cracked, white to cream-yellow, under lens conspicuously hispid due to protruding cystidia. Margin indeterminate or abrupt.

Hyphal system monomitic. Hyphae 2.0–2.5 μm wide, smooth, hyaline, thin-walled or slightly thick-walled, with clamps. Cystidia 70–116 μm long, 9.7–19.4 μm wide near base, narrowly conic, thick-walled, slightly amyloid, with narrow capillary lumen, strongly encrusted and also covered with narrow, dendroid hyphae 0.5–1.0 μm wide. Basidia 20–35 × 8–10 μm. Basidiospores 18–23 × 3–4 μm, sigmoid, flexuose-navicular, smooth, hyaline, thin-walled, non-amyloid (Fig. 141).

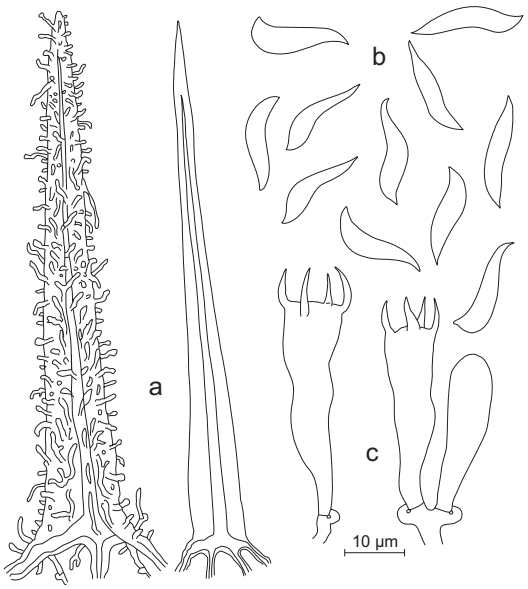


Fig. 141. *Tubulicium vermiferum* (Bourdot) Oberw.: a – cystidia, b – basidiospores, c – basidia (KRAM-F 29086).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 500 m, mixed forest, on fallen twig, 13 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29086; Suian-san Mts (48), near ruins of castle, alt. *ca* 150 m, deciduous forest, on *Acer mono*, 6 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29106.

DISTRIBUTION IN ASIA. China and Japan.

NOTES. New to North Korea. Known also from the whole area of the temperate Northern Hemisphere, e.g. from Europe and North America (Canada and United States) and from New Zealand.

REFERENCES. Cunningham (1963: 136, Fig. 84); Domański (1992: 156, Pl. 301h); Ginns & Lefebvre (1993: 172); Hansen & Knudsen (1997: 136); Hjortstam *et al*. (1988: 1521, Figs 809–810); Jülich (1984: 219); Jülich & Stalpers (1980: 262); Maekawa (1994: 23, Fig. 16; 1998: 11, Fig. 9); Tellería (1990: 115); Wu (2002: 294).

Tubulicrinis borealis J. Erikss.

Symb. Bot. Upsal. **16**(1): 79. 1958.

Basidiocarp 60–80 μm thick, corticioid, resupinate, effuse, grey-whitish, under lens with finely pubescent surface. Consistency of fresh specimem wax-like, soft.

Hyphal system monomitic. Hyphae 2–5 μm wide, hyaline, smooth, thin- or thick-walled, with clamps. Cystidia (lyocystidia) 60–70 × 4–6 μm, cylindric, wide from middle part to obtuse apex, mostly encrusted with crystals, thick-walled, with narrow capillary lumen, sometimes asymmetric, strongly amyloid. Basidia 7–15 × 4–5 μm, subclavate, thick-walled except for upper part, with 4 sterigmata and basal clamp, strongly amyloid. Basidiospores 5.0–6.0 × 2.0–2.5 μm, slightly allantoid, smooth, hyaline, thin-walled.

SPECIMEN EXAMINED. Suian-san Mts (48), near hospital in forest, alt. *ca* 200 m, mixed forest, on decayed stump of ?*Pinus densiflora*, 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 30366.

DISTRIBUTION IN ASIA. Japan and Korea.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 188, Pl. 209); Domański (1992: 170, Pl. 315b); Ginns & Lefebvre (1993: 172); Hansen & Knudsen (1997: 138); Hjortstam *et al*. (1988: 1531, Figs 814–817); Jülich (1984: 222); Jülich & Stalpers (1980: 266); Maekawa (1993: 131, Fig. 94); Oberwinkler (1965: 28, Pl. III: 13); Wojewoda (2002e: 127–129).

Tubulicrinis calothrix (Pat.) Donk

Fungus **24**(1–4): 14. 1956.

Corticium calothrix Pat., Cat. Pl. Cell. Tunisie. 59. 1897.

Basidiocarp corticioid, resupinate, under a strong lens pilose due to protruding cystidia, whitish to pale yellow or ochraceous.

Hyphal system monomitic. Hyphae 2.0–2.5 µm, smooth, hyaline, thin-walled or with slight wall thickening, nonamyloid or amyloid, with clamps. Cystidia (lyocystidia) 80–100 × 6–7 µm, cylindric, wide in middle part, narrowing to the obtuse and encrusted apex, usually very strongly amyloid. Basidia 12–14 × 4–5 µm, subclavate, basally thick-walled, with 4 sterigmata and basal clamp, strongly amyloid. Spores 6.0–7.0 × 1.5–2.0 µm, allantoid, hyaline, smooth, thin-walled.

SPECIMENS EXAMINED. Paekdu-san Mts: near Chongbong Mt. (9), alt. *ca* 1460 m, mixed taiga, on fallen decayed trunk of coniferous tree, 1 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29099; Taesong-san Mts., near Somun Mt. (34), mixed forest, on stump, 29 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 30364.

DISTRIBUTION IN ASIA. China and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1992: 169, Pl. 317: b-c); Ginns & Lefebvre (1993: 172); Hansen & Knudsen (1997: 138, Fig. 196); Hjortstam *et al*. (1988: 1537, Figs 818–819); Jülich & Stalpers (1980: 266); Maekawa *et al*. (2002: 94); Maekawa & Zang (1995: 93); Mukhin (1993: Tab. 1); Oberwinkler (1965: 33, PL. IV: 17).

Tubulicrinis gracillimus (Ell. & Everh. *ex* Rog. & Jacks.) Cunn.

Bull. New Zealand Dept. Sci. Industr. Res. **145**: 141. 1963.

Peniophora gracillima Ell. & Everh. *ex* Rog. & Jacks., Farlowia **1**: 317. 1943. – *Tubulicrinis glebulosus* (Bres.) Donk, Fungus **26**(1–4): 14. 1956 (*nom. conf*.).

Basidiocarp corticioid, resupinate, thin, whitish, cream-coloured or ochraceous, with indeterminate margin. Consistency thin-membranaceous, wax-like.

Hyphal system monomitic. Hyphae 2.0–3.5 µm wide, thin- or thick-walled, smooth, hyaline, with clamps. Cystidia (lyocystidia) 90–150 × 7–10 µm, cylindric, thick-walled, with obtuse, thin-walled, generally encrusted apex, dissolving in KOH. Basidia 16.0–21.0 × 3.5–4.5 µm, subclavate, thin- or thick-walled, nonamyloid, with 4 sterigmata and basal clamp. Spores 6.0–8.0 × 1.5–2.0 µm, allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: near Mupo (4), on bank of Tuman-gang River (5), alt. *ca* 1500 m, taiga, on decayed trunk, 4 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29096; basalt mount near Taehong-dan (6), alt. *ca* 1300–1500 m, mixed taiga, on fallen dead twigs of deciduous tree, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29076.

DISTRIBUTION IN ASIA. China, Japan, Russia (e.g. Siberia) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 188, Pl. 210); Cunningham (1963: 141, Fig. 89); Domański (1992: 176, Pl. 316: b; 320: d-f); Ginns & Lefebvre (1993: 175); Hjortstam *et al*. (1988: 1557, Figs 831–833); Jülich & Stalpers (1980: 267); Lin & Chen (1990: 108, Fig. 31); Maekawa (1993: 133, Fig. 96); Maekawa *et al*. (2002: 94); Maekawa & Zang (1995: 93); Pilát (1936: 417).

Tubulicrinis hirtellus (Bourdot & Galzin) J. Erikss.

Symb. Bot. Upsal. **16**(1): 82. 1958.

Peniophora hirtella Bourdot & Galzin. Bull., Soc. Mycol. Fr. **28**: 386. 1913.

Basidiocarp corticioid, resupinate, thin, porulose, whitish to ochraceous.

Hyphal system monomitic. Hyphae 2–4 μm, hyaline, smooth, thin-walled, with clamps, non-amyloid. Cystidia (lyocystidia) 70–90 × 3–6 μm, cylindric, somewhat flexuose, thick-walled, with thin-walled, subulate, non-encrusted apex, weakly amyloid. Basidia 12.0–16.0 × 3.5–4.0 μm, subclavate, thin-walled, with 4 sterigmata and basal clamp, non-amyloid. Spores 7.0–8.0 × 2.0–2.5 μm, cylindric, smooth, hyaline, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: near Mupo (4), bank of Tuman-gang River (5), at Chinese border, alt. *ca* 1400 m, taiga, on stump of coniferous tree, 4 Sept.1983, *leg. W. Wojewoda*, KRAM-F 30365.

DISTRIBUTION. Reported from Europe and North America (Canada).

NOTES. New to North Korea.

REFERENCES. Domański (1992: 162, Pl. 316c); Ginns & Lefebvre (1993: 174); Hjortstam *et al.* (1988: 1563, Fig. 835), Oberwinkler (1965: 36, Pl. V: 20).

Xenasmataceae Oberw. 1966

Phlebiella christiansenii (Parmasto) K. H. Larss. & Hjortstam

Mycotaxon **29**: 316. 1987.

Cristella christiansenii Parmasto, Eesti NSV Tead. Akad. Toim. Biol. Seer. **14**: 222. 1965. – *Trechispora christiansenii* (Parmasto) Liberta, 1966.

Basidiocarp corticioid, resupinate, thin, membranaceous, attached loosely to substrate. Hymenophore farinose, reticulate from rhizomorphs, cream-coloured to ochraceous. Margin whitish, filamentous, with fine, whitish rhizomorphs.

Hyphal system monomitic. Hyphae 2–4 μm wide, some swollen up to 7 μm, encrusted with crystals, slightly yellowish, thin-walled, with clamps. Cystidia absent. Basidia 13.0–18.5 × 5.5–6.0 μm, short-cylindric, pleural, with 4 sterigmata and basal clamp. Basidiospores 4.8–8.4 × 4.2–5.4(–6.6) μm inclusive of warts, elliptic, verrucose, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Mupo (4) and Taehong-dan (6), alt. *ca* 1300–1500 m, mixed taiga, on fallen dead deciduous branches, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30684; Kumgang-san Mts: Okryu-dong Valley, below Kuryong Falls (59), alt. *ca* 500 m, mixed forest, on decayed trunk, 20 July 1986, *leg. W. Wojewoda*, KRAM-F 28032, 30684.

DISTRIBUTION IN ASIA. Japan and Russia (e.g. Kamchatka).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: Pl. 110); Domański (1991: 173); Ginns & Lefebvre (1993: 125); Hjortstam *et al.* (1988: 1465, Figs 774–775); Jülich & Stalpers (1980: 261); Maekawa (1993: 125, Fig. 89).

Phlebiella sulphurea (Pers.: Fr.) Ginns & Lefebvre

Mycologia Memoir **19**: 126. 1993.

Corticium sulphureum Pers., Obs. Mycol. **1**: 28. 1796. – *Thelephora sulphurea* (Pers.): Fr., Syst.Mycol. **1**: 452. 1821. – *Phlebia vaga* Fr., Syst. Mycol. **1**: 428. 1821. – *P. vaga* (Fr.) P. Karst., Hedwigia **29**: 271. 1890. – *Cristella sulphurea* (Pers.: Fr.) Donk, Fungus **27**(1–4): 20. 1957. – *Trechispora vaga* (Fr.) Liberta, Taxon **15**(1): 319. 1966. For further synonyms see Ginns & Lefebvre 1993: 126.

Basidiocarp corticioid, resupinate, thin. Hymenophore smooth, granular, sulphur yellow, honey yellow to brownish. Margin with fine, fan-like, yellow rhizomorphs.

Hyphal system monomitic. Hyphae 2.5–4.5 μm wide, encrusted, yellowish, thin-walled, with clamps. Cystidia absent. Basidia 12.0–20.0 × 4.5–6.0 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 3.5–6.0 × 4.0–4.5 μm (including spines), elliptic, short-spined, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), Hyang-san River Valley, alt. *ca* 150 m, mixed forest, on very decayed stump, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30356; Kumgang-san Mts: Okryu-dong Valley, below Kuryong Falls (59), alt. *ca* 500 m, mixed forest, on decayed trunk, 20 July 1986, *leg. W. Wojewoda*, KRAM-F 28032.

DISTRIBUTION IN ASIA. China, Iran, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 126, Pl. 117); Domański (1991: 170); Ginns & Lefebvre (1993: 126); Hallenberg (1978: 79); Hansen & Knudsen (1997: 141, Fig. 205); Hjortstam *et al.* (1988: 1487, Figs 788–790); Jahn (1979: 90, Pl. 57); Jülich (1984: 147); Jülich & Stalpers (1980: 260); Maekawa (1993: 128, Fig. 92); Maekawa & Zang (1995: 92); Mukhin (1993: Tab. 1).

Russulales Kreisel *ex* P. M. Kirk, P. F. Cannon & J. C. David 2001

Auriscalpiaceae Maas Geesteranus 1963

Auriscalpium vulgare Gray

Nat. Arrang. Br. Pl. **1**: 650. 1821.

Basidiocarp divided into pileus and stipe. Pileus *ca* 10 mm wide, rounded. Upper surface light brown, hirsute-tomentose. Stipe 20–30 × 1–3 mm, excentric, cylindric, dark brown, solid, finely tomentose. Hymenophore hydnoid, densely covered with conic, subulate spines 10–30 mm long.

Hyphal system dimitic. Generative hyphae 2.0–3.5 µm wide, smooth, hyaline, thin-walled, with clamps. Skeletal hyphae 2–4 µm, smooth, brown, thick-walled. Cystidia (gloeocystidia) 18.0–38.0 × 4.5–5.0 µm, cylindric-fusiform, sinuous, smooth, thin-walled, with granular contents. Basidia 10–20 × 4–6 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 4.0–5.0 × 3.5–6.0 µm, broadly elliptic, somewhat thick-walled, verrucose, hyaline, amyloid.

SPECIMEN EXAMINED. Kumgang-san Mts: Chanto Forest (61), alt. *ca* 100 m, pine forest with *Quercus mongolica*, on fallen decaying cones of *Pinus densiflora*, buried in the soil, 19 Aug. 1983, *leg*. *W. Wojewoda*, specimen not preserved.

DISTRIBUTION IN ASIA. Caucasus, China, Japan, Kazakhstan, Korea, and Russia (e.g. West and East Siberia).

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 103); Breitenbach & Kränzlin (1986: 238, Pl. 283); Domański (1975: 20, Pl. XLIII); Ginns & Lefebvre (1993: 26); L. Lange (1974: 22); Nikolaeva (1961: 200, Figs 150–151, Pl. XLV: 3–5); Shvartsman (1964: 241, Fig. 108–109); Teng (1996: 317, Fig. 265); Zhang (1999: 371).

Clavicorona pyxidata (Pers.: Fr.) Doty

Lloydia **10**: 43. 1947.

Clavaria pyxidata Pers., Neues Mag. Bot. **1**: 117. 1794. – *C. pyxidata* Pers.: Fr., Syst. Mycol. **1**: 470. 1821. – *Artomyces pyxidatus* (Pers.: Fr.) Jülich, 1982.

Basidiocarp *ca* 50 mm high, clavarioid, pyxidately branched, pale ochraceous. Branches ending in small cups resembling small crowns. Hymenophore smooth.

Hyphal system monomitic. Hyphae 3–12 µm wide, thin- to somewhat thick-walled, hyaline, smooth, with clamps, some inflated. Leptocystidia 15.0–40.0 × 3.5–6.5 µm, acute, smooth, hyaline, fusoid, subcylindric or subventricose, thin-walled, in hymenium, projecting. Gloeocystidia (hyphal ends) very long, 15.0–40.0 × 3.8–7.7 µm, subcylindric to subventricose, sinuous, thin-walled, in subhymenium and hymenium. Basidia 20.0–28.0 × 2.5–4.5 µm, clavate, with 4 sterigmata. Basidiospores 3.0–4.8 × 3.0 µm, elliptic, thin-walled, smooth, hyaline, with oil-drops, amyloid (Fig. 142).

SPECIMEN EXAMINED. Myohyang-san Mts: near Habiro Temple (27), alt. *ca* 200 m, mixed forest, on rotten trunk of deciduous tree, 13 July 1986, *leg*. *W. Wojewoda*, KRAM-F 52940.

DISTRIBUTION IN ASIA. Caucasus, China, Kazakhstan, Korea, Russia (e.g. north of Altai, Siberia and Far East), and Turkey.

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 98); Azbukina *et al.* (1984: 39); Corner (1950: 292); Domański (1975: 41); Ginns & Lefebvre (1993: 40); Gorbunova (1997: 15); Hansen & Knudsen (1997: 282, Fig. 584); Jahn (1979: 76, Pl. 41); Jülich (1984: 97); Michael *et al.* (1986: 302, Pl. 122); Parmasto (1965: 151, Fig. 111); Shvartsman (1964: 92, Fig. 23); Teng (1996: 298, Fig. 296).

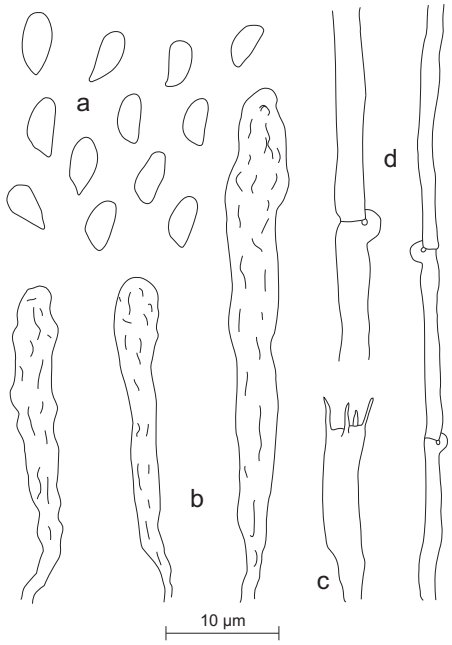


Fig. 142. *Clavicorona pyxidata* (Pers.: Fr.) Doty: a – basidiospores, b – gloeocystidia, c – basidium, d – hyphae (KRAM-F 52940).

Lentinellus cochleatus (Pers.: Fr.) P. Karst.

Ryssl. Finl. Skand. Halföns Hattsvamp. **1**: 247. 1879.

Agaricus cochleatus Pers., Disp. Meth. 22. 1797. – *A. cochleatus* Pers.: Fr., Syst. Mycol. **1**: 177. 1821. – *Lentinus cochleatus* (Pers.: Fr.) Fr., Syst. Orb. Veg. 78. 1825.

Basidiocarp consisting of pileus and stipe. Pileus up to 30–80 mm in diam., narrowly infundibuliform, irregular, fulvous to brown. Stipe 20–60 × 5–7 mm, brown, central or excentric. Lamellae deeply decurrent, pale. Smell of fruits or anis-like, strong.

Hyphal system monomitic. Hyphae 3–4 µm in diam., thin-walled, hyaline. Cystia absent. Basidia 20.0–24.0 × 4.5–6.0 µm, subclavate, 4-spored, hyaline. Basidiospores 4–5 × 4 µm, subglobose or globose, thin-walled, hyaline, amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), taiga, on stump, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29181.

DISTRIBUTION IN ASIA. Japan and Russia (e.g. Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 41); Hansen & Knudsen (1997: 287); Jahn (1979: 210, Pl. 186); Michael *et al*. (1987: 270, Pl. 102); Moser (1983: 461); Pegler (1983: 226); Pilát (1946: 25, Fig. 7, Pls. 4b, 16–18); Syarzhanina (1994: 74); Vasilyeva (1973: 93).

Lentinellus ursinus (Fr.) Kühner

Botaniste **17**: 99. 1926.

Agaricus ursinus Fr., Syst. Mycol. **1**: 185. 1821. – *Lentinus ursinus* (Fr.) Fr., Syst. Orb. Veg. 78. 1825. – *Panellus ursinus* (Fr.) Murrill, N. Amer. Fl. **9**: 246. 1915. – *Lentinellus castoreus* (Fr.) Konrad & Maubl., Icon. Sel. Fung. **6**: 383. 1936.

Basidiocarp 18–32 × 11–21 mm, reniform-conchate, nearly plane, sessile, velvety tomentose, brown. Gills reddish brown, broad, crowded, torn into teeth.

Hyphal system monomitic. Hyphae of trama 3.6–4.8 µm in diam., thick-walled, sinuous, in KOH hyaline or yellowish, in Melzer's reagent amyloid. Generative hyphae 4.2–7.2 µm in diam., with clamps, non-amyloid. Pleurocystidia 16.0–45.0 × 4.8–6.0 µm, fusoid. Basidia 13.0–22.0 × 4.2–6.0 µm, clavate, with 4 sterigmata, hyaline. Basidiospores 3.6–4.2 × 2.4–3.0 µm, subglobose or very short-elliptic, thin-walled, in KOH hyaline to light yellowish, in Melzer's reagent with minute amyloid echinulation (Fig. 143).

SPECIMEN EXAMINED. Paekdu-san Mts: near basalt mount near Taehong-dan (6), alt. *ca* 1500 m, mixed taiga with *Betula*, *Larix olgensis*, *Populus* and *Quercus*, on stump, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 32265.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Russia (e.g. Primorski Krai and Siberia).

NOTES. New to North Korea. *Lentinellus castoreus* (Fr.) Konrad & Maubl., is not a good species but a later synonym for *L. ursinus*. *Lentinellus ursinus* is an extremely variable fungus.

REFERENCES. Azbukina *et al*. (1984: 42); Melik-Khachatrian (1980: 265); Moser (1983: 462); Pegler (1983: 262); Syarzhanina (1994: 75); Teng (1996: 425); Vasilyeva (1973: 93).

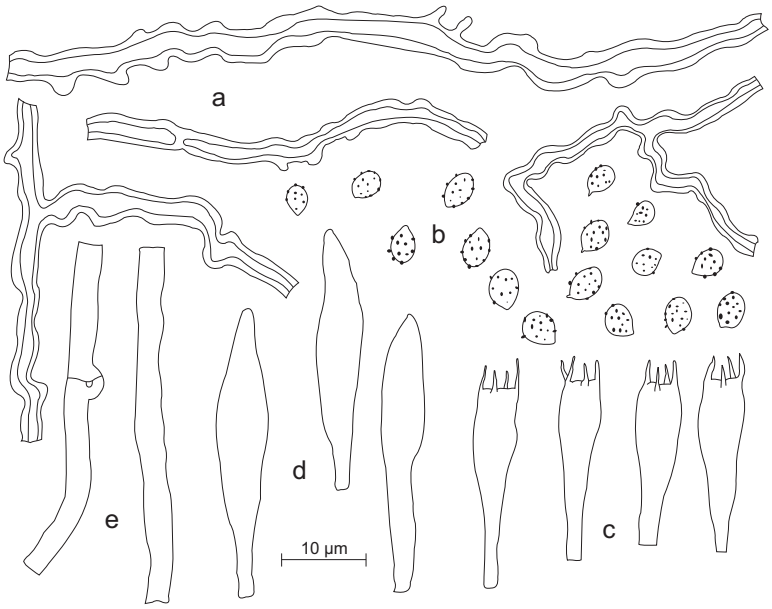


Fig. 143. *Lentinellus ursinus* (Fr.) Kühner: a – tramal hyphae, b – generative hyphae, c – pleurocystidia, d – basidiospores, e – basidia (KRAM-F 32265).

Echinodontiaceae Donk 1961

Laurilia sulcata (Burt) Pouzar

Česká Mykol. **13**(1): 14.1959.

Stereum sulcatum Burt *in* Peck, N. Y. State Mus. Ann. Rpt. **54**: 1901 – *Lloydiella sulcata* (Burt) Lloyd, Myc. Writ. **5**: 619, Figs 878–879. 1916. – *Echinodontium sulcatum* (Burt) Gross, Mycopath. Mycol. Appl. **24**: 8. 1964.

Basidiocarp corticioid, resupinate to pileate. Upper surface of old specimens dark brown to blackish. Hymenophore in young specimens smooth, then tuberculate or concentrically sulcate, at first pale yellowish with salmon tint, then pale ochraceous.

Hyphal system trimitic. Hyphae 2–4 µm wide, thin- to thick-walled, with clamps. Cystidia 35–60 × 7–9 µm, conical and encrusted in apical part, hyaline, thick-walled, yellowish to pale ochraceous. Basidia 25.0–32.0 × 3.5–4.5 µm, clavate, with 4 sterigmata. Basidiospores 5.0–6.0 × 4.5–5.0 µm, globose to subglobose, echinulate, hyaline, with somewhat thickened walls, amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: Chonbong Mt. (9), alt. *ca* 1460 m, mixed taiga, on fallen trunk of coniferous tree, 1 July 1986, *leg. W. Wojewoda*, KRAM-F 29082, 29108.

DISTRIBUTION IN ASIA. China, and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Davydkina (1980: 98, Figs 25, 28; Pl. V: 28); Domański (1991: 29, Pl. 289: 1–2); Eriksson & Ryvarden (1976: 789, Figs 394–397); Ginns & Lefebvre (1993: 96); Hansen & Knudsen (1997: 281, Fig. 583); Jahn (1971: 112, Figs 2: 8; 15; 16); Jülich (1984: 124); Mukhin (1993: Tab. 1); Pilát (1934: 325); Teng (1996: 283, as *Lloydiella sulcata*).

Gloeocystidiellaceae (Parmasto) Jülich 1982

Boidinia furfuracea (Bres.) Stalpers & Hjortstam

Mycotaxon **14**: 77. 1982.

Hypochnus furfuraceus Bres., Fungi Trident. **2**: 97, Pl. CCVII, fig. 2. 1900 (non *Corticium furfuraceum* Bres., Mycologia **17**: 69. 1925). – *Gloeocystidiellum furfuraceum* (Bres.) Donk, Fungus **26**: 9. 1956.

Basidiocarp up to 0.2 mm thick, corticioid, resupinate, attached loosely to substrate, thin, floccose. Hymenophore farinose-porose or furfuraceous, whitish to greyish white. Margin indistinct. Consistency soft.

Hyphal system monomitic. Hyphae 1.5–3.0 μm wide, smooth, hyaline, thin-walled, with clamps at all septa. Gloeocystidia (pseudocystidia) 36.0–80.0 × 7.0–10.8 μm, subcylindric, somewhat sinuous, thin-walled, smooth, with oily yellowish granular contents, with basal clamp. Basidia 20–30 × 4–5 μm, cylindric or subclavate, with 4 sterigmata and basal clamp. Basidiospores 4.8–7.2 μm in diam. (including aculei), subglobose or globose, hyaline, thin-walled, echinulate, amyloid (Fig. 144).

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100–150 m, mixed forest, on very decayed stump, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28182; Kumgang-san Mts: pine Chanto Forest (61) with *Quercus mongolica*, on fallen dead trunk of *Pinus densiflora*, 19 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30661.

DISTRIBUTION IN ASIA. China and Japan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States). *Gloeocystidiellum sibiricum* Parmasto, has similar spores but has thicker fruitbodies, larger gloeocystidia, and lacks clamps.

REFERENCES. Breitenbach & Kränzlin (1986: 118, Pl. 103); Domański (1988: 116, Pl. 231: 1); Eriksson & Ryvarden (1975: 417, Figs 176–177); Ginns & Freeman (1994: 19, Fig. 2); Ginns & Lefebvre (1993: 27); Hansen & Knudsen (1997: 278, Fig. 573); Jülich (1984: 120); Jülich & Stalpers (1980: 105); Maekawa (1994: 25, Fig. 17); Maekawa *et al*. (2002: 84).

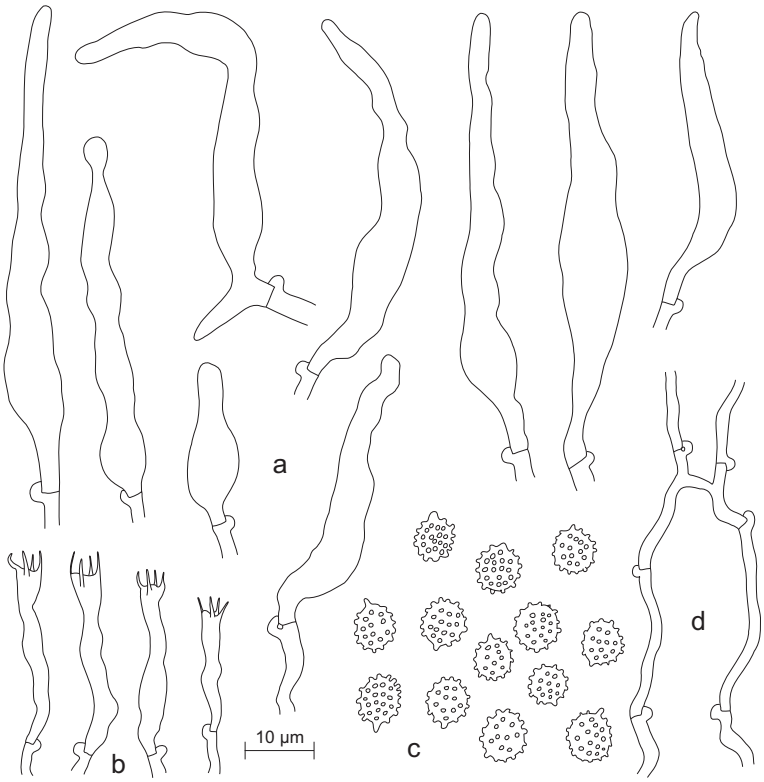


Fig. 144. *Boidinia furfuracea* (Bres.) Stalpers & Hjortstam: a – gloeocystidia, b – basidia, c – basidiospores, d – hyphae (KRAM-F 28182).

Gloeocystidiellum lactescens (Berk.) Boidin

Compt. Rend. Hebd. Seances Acad. Sci. 233: 1668. 1951.

Thelephora lactescens Berk., *in* Smith, Engl. Fl. **5**(2): 169. 1836. – *Vesiculomyces lactescens* (Berk.) Boidin & Lanquetin, Mycotaxon **16**(2): 493. 1983. – *Gloiothele lactescens* (Berk.) Hjortstam, Windahlia **17**: 58. 1987. – *Megalocystidium lactescens* (Berk.) Jülich, Persoonia **10**: 140. 1978.

Basidiocarp corticioid, resupinate, adnate, thin, membranaceous, cream-coloured when fresh, yellowish when dry. Margin filamentous to distinctly bounded. Hymenophore smooth.

Hyphal system monomitic, All hyphae without clamps, 2–4 μm, thin-walled, smooth, hyaline. Gloeocystidia (pseudocystidia) 42.0–168.0 × 6.6–10.8(–14.4) μm, cylindric, sinuous, with granular, oily yellowish contents. Paraphysoid hyphidia between basidia present, cylindric, 50–60 × 2–3 μm, hyaline, thin-walled. Basidia 45–50 × 5–7 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Spores 5.0–7.2 × 4.2–5.4 μm, broadly elliptic to subglobose, smooth, hyaline, thin-walled, amyloid.

SPECIMEN EXAMINED. Kaesong town centre (63), near Buddhist monastery and Buddhist school-museum, on stump, 26 July 1986, *leg. Z. Heinrich*, KRAM-F 28121.

DISTRIBUTION IN ASIA. India (North Western Himalayas), Iran, Japan and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 120, Pl. 107); Domański (1992: 190); Eriksson & Ryvarden (1975: 423, Figs 181–182); Ginns & Freeman (1994: 61, Fig. 14); Ginns & Lefebvre (1993: 70); Hallenberg (1978: 56; 1981: 484); Lin & Chen (1990: 71, Fig. 2); Maekawa (1994: 33, Fig. 22); Rattan (1977: 105, Figs A-B, p. 106, Pl. 2A).

Gloeocystidiellum ochraceum (Fr.: Fr.) Donk

Fungus **26**: 9. 1956.

Thelephora ochracea Fr., Obs. Mycol. **1**: 151. 1815. – *T. ochracea* Fr.: Fr., Syst. Mycol. **1**: 446. 1821. – *Conferticium ochraceum* (Fr.: Fr.) Hallenb., Mycotaxon **11**: 448. 1980. For further synonyms see Ginns & Freeman (1994: 28).

Basidiocarp resupinate, corticioid, consistency ceraceous. Hymenophore at first smooth and pale creamish, then tuberculate to rimose and ochraceous to ochraceous brown.

Hyphal system monomitic. Hyphae 2.0–3.5 μm, thin- to thick-walled, without clamps. Gloeocystidia (pseudocystidia) 35.0–65.0 × 3.5–5.0 μm, cylindric to clavate, with oil granular, yellowish contents (in KOH). Basidia 15.0–25.0 × 3.5–4.5 μm, cylindric to subclavate or clavate, thin-walled, with 4 sterigmata and without basal clamp. Basidiospores 3.5–5.5 × 2.5–3.0 μm, ellipsoid to subovate, smooth, hyaline, thin-walled, amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 10 km S of Samji-yon town (8), alt. *ca* 1500 m, coniferous forest with *Abies*, *Larix* and *Picea*, on fallen trunk of ?coniferous tree, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 30327.

DISTRIBUTION IN ASIA. Iran, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Domański (1988: 172); Eriksson & Ryvarden (1975: 435, Figs 189–191); Ginns & Freeman (1994: 28, Fig. 5); Ginns & Lefebvre (1993: 70); Hallenberg (1981: 483); Maekawa (1994: 28, Fig. 19); Mukhin (1993: Tab. 1).

Gloeocystidiellum porosum (Berk. & M. A. Curtis) Donk

Meded. Ned. Mycol. Vereen. **18–20**: 156. 1931.

Corticium porosum Berk. & M. A. Curtis, *in* Berk. & Broome, Ann. Mag. Nat. Hist. Ser. 5, **3**: 211. 1879.

Basidiocarp corticioid, resupinate, adnate, thin, membranaceous, whitish to cream-coloured when fresh, light-ochre when dry. Margin filamentous to distinctly bounded. Consistency waxy, soft. Hymenophore smooth to sparsely tuberculate.

Hyphal system monomitic. All hyphae with clamps, 2–3 μm, thin-walled, smooth, hyaline. Gloeocystidia (pseudocystidia) up to 55–70 × 8–

18 μm, cylindric to fusiform, with granular, oily yellowish contents. Basidia 18.0–25.0 × 3.5–4.0 μm, slenderly clavate, with 4 sterigmata and basal clamp. Spores 4.5–5.0 × 2.5–3.0 μm, elliptic, finely verrucose in Melzer's reagent, hyaline, thin-walled, amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100–150 m, mixed forest, on fallen, deciduous twigs, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30681.

DISTRIBUTION IN ASIA. China, Iran, Japan and Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 118, Pl. 105); Domański (1988: 280, Pl. 242: 1–2); Cunningham (1963: 64, Fig. 57); Eriksson & Ryvarden (1975: 439, Figs 192–194); Ginns & Freeman (1994: 45, Fig. 10); Ginns & Lefebvre (1993: 71); Hallenberg (1978: 56; 1981: 484); Maekawa (1994: 29); Maekawa *et al*. (2002: 86); Mukhin (1993: Tab. 1).

Gloiothele citrina (Pers.) Ginns & G. W. Freeman

Bibl. Mycol. **157**: 55, Fig. 13. 1994.

Thelephora citrina Pers., Mycol. Eur. **1**: 136. 1822. – *Gloeocystidiellum citrinum* (Pers.) Donk, Fungus **26**: 9. 1956. – *Vesiculomyces citrinus* (Pers.) Hagstr., Bot. Not. **130**: 53. 1977.

Basidiocarp corticioid, effused, resupinate, adnate, thin, ceraceous when fresh, membranaceous when dry. Hymenophore smooth or tuberculate, lemon yellow or ochre yellow. Margin whitish and fringed-filamentous. Consistency waxy, soft.

Hyphal system monomitic. All hyphae without clamps, 1.5–3.0 μm wide, thin-walled, smooth, hyaline. Gloeocystidia up to 35.0–65.0 × 12.5–18.0 μm, vesicular, clavate to fusiform, thin-walled, hyaline, without granular contents. Basidia 30.0–40.0 × 5.0–6.5 μm, slenderly clavate, with 4 sterigmata and without basal clamp. Spores 4.0–5.5 μm, subglobose or globose, smooth, hyaline, thin-walled, with prominent apiculus, with one or more oil-drops, amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), taiga with *Larix olgensis*, on fallen decayed trunk of deciduous tree, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 29087.

DISTRIBUTION IN ASIA. China, India (North Western Himalayas), Japan, Russia (e.g. West Siberia) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 122, Pl. 109); Domański (1992: 187); Eriksson & Ryvarden (1975: 407, Figs 169–171); Ginns & Freeman (1994: 55, Fig. 13); Ginns & Lefebvre 1993: 180); Hansen & Knudsen (1997: 281, Fig. 582); Maekawa (1994: 32); Maekawa *et al*. (2002: 86); Mukhin (1993: Tab. 1); Rattan (1977: 110, Figs C-D, p. 104, Pl. 2B); Wu (1990: 64, Fig. 2).

Hericiaceae Donk 1964

Creolophus cirratus (Pers.: Fr.) P. Karst.

Meddn. Soc. Fauna Fl. Fenn. **6**: 19. 1881.

Hydnum cirratum Pers., Syn. Meth. Fung. 558. 1801. – *H. cirratum* Pers.: Fr., Syst. Mycol. **1**: 411. 1821. – *Hericium cirratum* (Pers.: Fr.) Nikolaeva, Trudy. Bot. Inst. AN SSSR, II, **5**: 343, Figs 11–12. 1950. – *Stecchérinum cirratum* (Pers.: Fr.) Teng, Chung-kuo Ti Chen-chun. 763. 1963.

Basidiocarp 50–100 mm in diam., pileate, reflexed, dimidiate, shell-shaped, imbricate, white-cream, upper surface with sterile spines, sessile. Margin fimbriate. Hymenophore hydnoid. Spines 10–15 mm long, subulate, cream.

Hyphal system monomitic. Hyphae 1.0–15 μm wide, thin- or thick-walled, with clamps. Gloeocystidia (schizocystidia) 90.0–120.0 × 6.0–10.8 μm wide, cylindric, smooth, hyaline, thin-walled. Basidia 18–24 × 4–6 μm, clavate, with 4 sterigmata and basal clamp. Spores 3.6–4.2 × 2.4–3.0 μm, subglobose, hyaline, thin-walled, in KOH hyaline to light yellowish, some 1-guttulate, in Melzer's reagent with minute amyloid echinulation (Fig. 145).

SPECIMEN EXAMINED. Paekdu-san Mts: near Mupo (4), bank of Tuman-gang River (5), alt. *ca* 1400 m, mixed taiga, on fallen trunk of deciduous tree (?*Betula*), 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29189.

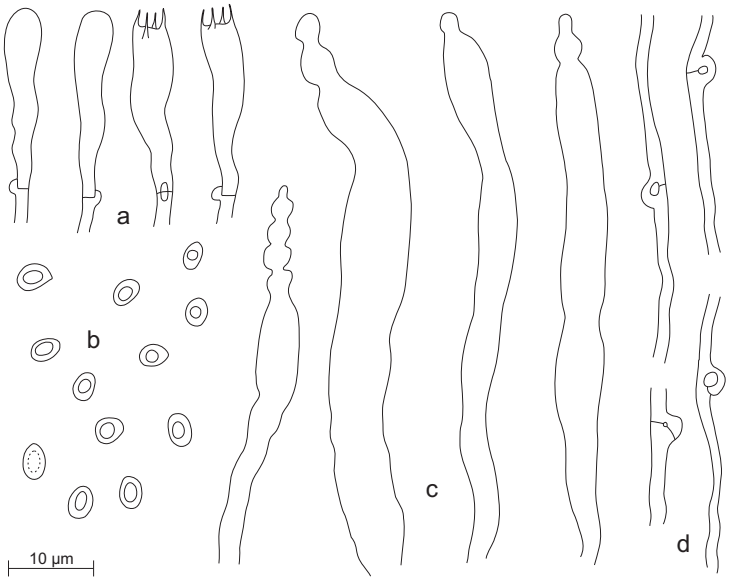


Fig. 145. *Creolophus cirratus* (Pers.: Fr.) P. Karst.: a – basidia, b – basidiospores, c – gloeocystidia, d – hyphae (KRAM-F 29189).

DISTRIBUTION IN ASIA. China, Japan, Mongolia and Russia (e.g. Siberia).

NOTES. New to North Korea. Known also from Europe and North America.

REFERENCES. Breitenbach & Kränzlin (1986: 238, Pl. 284); Cetto (1980b: 605, Pl. 768); Domański (1975: 71); Ginns & Lefebvre (1993: 45); Jahn (1979: 80, Pl. 45); Jülich (1984: 114); Mukhin (1993: Tab. 1); Nikolaeva (1961: 222, Figs 164–165; Pl. L: 2); Pilát (1934: 313; 1936: 408); Teng (1996: 316); Uranchimehg *et al*. (1983: 375).

Dentipellis fragilis (Pers.: Fr.) Donk

Persoonia **2**: 223. 1962.

Hydnum fragile Pers., Syn. Meth. Fung. 561. 1801. – *H. fragile* Pers.: Fr., Syst. Mycol. **1**: 417. 1821. – *Hericium fragile* (Pers.: Fr.) Nikolaeva, Flora Spor. Rast. SSSR **6**: 234. 1961.

Basidiocarp corticioid, resupinate. Hymenophore hydnoid, densely covered with spines. Spines 5–10 mm long, up to 0.3 mm thick, subulate, fragile, whitish to ochraceous.

Hyphal system monomitic. Hyphae 1.5–4.0 µm wide, thin- to thick-walled, hyaline, smooth, with clamps. Cystidia (gloeocystidia) 80–120 × 9–12 µm, fusiform, sinuous, thin-walled. Basidia 25–30 × 4–6 µm, clavate, with 4 sterigmata. Basidiospores 3.8–6.7 × 4.0–5.8 um, subglobose, thin-walled, smooth, hyaline, with oil-drops, amyloid.

SPECIMEN EXAMINED. Pagyon Ravine, near Pagyon Falls (65), alt. *ca* 300 m, deciduous forest, on decayed stump of deciduous tree, 22 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 52934.

DISTRIBUTION IN ASIA. Caucasus, Kazakhstan, and Russia (e.g. Siberia and Far East).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 40); Breitenbach & Kränzlin (1986: 238, Pl. 285); Domański (1975: 72); Ginns & Lefebvre (1993: 58); Jahn (1979: 248, Fig. 132); Michael *et al*. (1988: 165, Fig. 19); Nikolaeva (1961: 234, Fig. 179–180, Pl. LI); Shvartsman (1964: 252).

Hericium erinaceus (Bull.: Fr.) Pers.

Mycol. Eur. **2**: 153. 1825.

Hydnum erinaceus Bull., Herb. Fr. Pl. 34. 1780. – *H. erinaceus* Bull.: Fr., Syst. Mycol. **1**: 407. 1821.

Basidiocarp hydnaceous, 50–100 mm wide, fleshy, entirely white when fresh, brownish when dry. Upper surface covered with short, thin, sinuous sterile spines. Stipe very short. Hymenophore with spines 10–40 × 1–2 mm, straight, terete, tapering, acute. Flesh whitish, soft. Smell and taste somewhat fruity.

Hyphal system monomitic. Hyphae 4–17 μm wide, hyaline, thin-walled, with clamps. Gloeocystidia 3–12 μm wide. Basidia 20–33 × 5–7 μm, clavate, with 4 sterigmata and basal clamp. Basidiospores 5–6 × 4–6 μm, broadly elliptic, globose or subglobose, smooth, hyaline, thin-walled, amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Kuchung Falls (26), alt. *ca* 700 m, deciduous forest, on trunk of *Quercus* sp., 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29188.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Japan, Korea, Mongolia, and Russia (Siberia and Far East).

NOTES. Parasitizing old living trees. Known also from Europe and North America (United States).

REFERENCES. Anonymous (1978: 147; 1983a: 103); Azbukina *et al.* (1984: 40); Domański (1975: 75, Pl. LXI); Ginns & Lefebvre (1993: 75); Hansen & Knudsen (1997: 284, Fig. 590); Imazeki & Hongo (1975, **2**: 130, Pls. 41: 253, 62: 372); Jahn (1979: 78, Pl. 42); Nikolaeva (1961: 229, Figs 173–175, Pls. XLVIII, XLIX: 1); Pilát (1940: 68); Teng (1996: 314, Fig. 264); Vasilyeva (1978: 178, Pl. 201); Vasudeva (1962: 48); Zhao *et al.* (1983: 78).

Mucronella calva (Alb. & Schwein.: Fr.) Fr.

Hymenomyc. Eur. 629. 1874.

Hydnum calvum Alb. & Schwein., Consp. Fung. 271. 1805. – *Isaria calva* (Alb. & Schwein.): Fr., Syst. Mycol. **3**: 277. 1832.

Basidiocarp consisting of densely caespitose, subulate whitish, smooth to slightly farinose spines 1–3 mm long and up to 0.2 mm thick. Subiculum absent. Consistency soft, wax-like.

Hyphal system monomitic. Hyphae 3–6 μm wide, smooth, hyaline, thin-walled, with clamps. Cystidia absent. Basidia 12–18 × 4–5 μm, subclavate, with 4 sterigmata and basal clamp. Basidiospores 4.0–6.0 × 2.5–3.5 μm, elliptic to ovoid, smooth, hyaline, thin-walled, amyloid.

SPECIMEN EXAMINED. Suian-san Mts (48), alt. *ca* 150 m, mixed forest, on decayed stump (together with *Botryobasidium* sp.), 6 July 1986, *leg. W. Wojewoda*, KRAM-F 29100.

DISTRIBUTION IN ASIA. India, Kazakhstan and Russia (e.g. Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 240, Pl. 288); Corner (1950: 452); Domański (1984: 311, Pl. CCXXIII); Ginns & Lefebvre (1993: 105); Hansen & Knudsen (1997: 285, Fig. 592); Jülich (1984: 113); Nikolaeva (1961: 209, Figs 156–157); Parmasto (1965: 26, Fig. 14); Pilát (1936: 408); Shvartsman (1964: 126, Fig. 42).

Lachnocladiaceae D. A. Reid 1965

Asterostroma ochroleucum Bres.

in Torrend, Brotéria, Sér. Bot. **11**: 82. 1913.

Basidiocarp corticioid, resupinate, membranous, pale ochraceous, thin. Margin whitish, without rhizomorph. Hymenophore smooth to slightly tuberculate.

Hyphal system monomitic. Hyphae 1–3 μm wide, smooth, hyaline, thin-walled, without clamps. Gloeocystidia 25–55 × 5–7 μm, fusoid. Asterosetae with 5–8 rays, 30.0–70.0 × 2.0–3.5 μm, hyaline to brown, thick-walled, some dichotomously branched. Basidia 18–30 × 4–6 μm. Basidiospores 5–6 μm in diam., broad elliptic to subglobose, with warts, hyaline, amyloid.

SPECIMEN EXAMINED. Kumgang-san Mts: near Manmulsang Rocks (55), alt. *ca* 900 m, mixed forest, on stump, 18 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29186.

DISTRIBUTION IN ASIA. Reported from Russia (e.g. West Siberia).

NOTES. New to North Korea. According to some authors *Asterostroma ochroleucum* Bres. is

a synonym of *A. cervicolor* (Berk. & M. A. Curtis) Massee. *A. cervicolor* is known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 242, Pl. 291); Ginns & Lefebvre (1993: 22); Mukhin (1993: Tab. 1); Parmasto (1970: 112; Figs 75, 103); Tellería (1990: 28)

Vararia borealis Pouzar

Česká Mykol. **36**(2): 72. 1982.

V. granulosa (Fr.) Laurila, ss. Parmasto, Lachnocladiaceae Soviet Union. 83. 1970 – *Asterostromella granulosa* sensu Bourdot & Galzin. 396. 1928. – *Thelephora granulosa* Fr., Syst. Mycol. **1**: 446. 1821.

Basidiocarp resupinate, thin. Upper surface at first almost smooth, then verrucose to papillate, pale cream, yellow-cream to ochraceous cream.

Hyphal system dimitic. Generative hyphae 1–3 µm wide, hyaline, with clamps. Gloeocystidia 10.0–45.0 × 3.5–5.5 µm, cylindric to fusoid. Basidia 12.0–24.5 × 3.0–4.5 µm, cylindric-clavate, with 4 sterigmata and basal clamp. Basidiospores 4.0–6.5 × 3.0–4.5 µm, ellipsoid, ovoid to subglobose to almost globose, hyaline, verrucose, thin-walled, strongly amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: Chongbong Mt. (9), near Rimyongsu, alt. *ca* 1450 m, mixed taiga, on fallen decayed trunk of coniferous tree, 1 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29101, 29102.

DISTRIBUTION IN ASIA. Caucasus, Russia (e.g. Siberia, Far East) and Turkey.

NOTES. New to North Korea. Known also from Europe (European part of Russia) and North America (Canada and United States).

REFERENCES. Parmasto (1970: 83, Figs 42–43, 49, 102); Pilát (1934: 329).

Peniophoraceae Lotsy 1907

Peniophora cinerea (Pers.: Fr.) Cooke

Grevillea **8**: 20. 1879.

Corticium cinereum Pers., Neues Mag. Bot. **1**: 111. 1794. – *Thelephora cinerea* (Pers.): Fr., Syst. Mycol. **1**: 453. 1821.

Basidiocarp corticioid, resupinate, effuse, closely adnate. Hymenophore smooth, verrucose to slightly tuberculate, pruinose, pale grey to violaceous grey, becoming cracked in small polygons upon drying. Subiculum absent.

Hyphal system monomitic. Hyphae 2–5 µm wide, smooth, hyaline or brownish, thin- to thick-walled, with clamps. Lamprocystidia 14–18 × 5–9 µm, subfusiform, with conic, encrusted apex, protruding up to 10 µm. Gloeocystidia not seen. Basidia 35.0–45.0 × 4.5–5.5 µm, cylindric to slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores (6–)7.2–8.4(–10.8) × 2.5–3.6 µm, cylindric, allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: between Potae (11) and Poso-ri (12), alt. *ca* 1200 m, mixed taiga, on fallen dead twig of deciduous tree, 28 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 30634; Kumgang-san Mts: near Onjong-ryong Pass (52), alt. *ca* 850 m, mixed forest, on fallen dead deciduous twig, 16 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 30635.

DISTRIBUTION IN ASIA. China, India (e.g. North Western Himalayas), Iran, Japan, Russia (e.g. West Siberia and near Yakutsk) and Taiwan.

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 152, Pl. 156); Cunningham (1963: 109, Fig. 60); Domański (1991: 110, Pl. 278); Eriksson *et al*. (1978: 935, Figs 468–469); Ginns & Lefebvre (1993: 109); Hallenberg (1978: 59; 1981: 486); Hansen & Knudsen (1997: 188, Fig. 317); Karpova-Benois (1972: 142); Lin & Chen (1990: 93, Fig. 20); Maekawa (1994: 101, Fig. 72); Maekawa *et al*. (2002: 90); Mukhin (1993: Tab. 1); Pilát (1936: 419; 1940: 63); Rattan (1977: 308, Figs E-G, p. 310); Teng (1996: 293).

Peniophora polygonia (Pers.: Fr.) Bourdot & Galzin

Hymenomyc. Fr. 320. 1928.

Corticium polygonium Pers., Tentamen dispositionis Meth. Fung.. 30. 1797. – *Thelephora polygonia* (Pers.): Fr., Syst. Mycol. **1**: 444. 1821.

Basidiocarp corticioid, resupinate, effuse, closely adnate. Hymenophore smooth to slightly

tuberculate, pruinose, pink to pale reddish, whitish pruinose. Consistency crustose and hard.

Hyphal system monomitic. Hyphae 2.5–3.0 µm wide, smooth, hyaline, thin- to thick-walled, with clamps. Lamprocystidia absent. Gloeocystidia 60–85 × 9–21 µm, bladder-like, elliptic to clavate, embedded in hymenium. Dendrohyphidia in hymenium, strongly branched. Basidia 35.0–40.0 × 4.5–7.5 µm, cylindric to slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 8.5–10 × 3–4 µm, cylindric to allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount between Mubong (3), Tuman-gang River (5) and Taehong-dan (6), alt. *ca* 1500 m, in mixed taiga, on fallen twigs of *Populus davidiana*, 20 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29093; between Potae (11) and Poso-ri (12), alt. *ca* 1200 m, in mixed taiga, on fallen dead twig of *Populus* sp., 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30742; Kumgang-san Mts: near Onjong-ri (60), alt. *ca* 150–200 m, mixed forest, on fallen deciduous tree, 4 Oct. 1984, *leg. W. Wojewoda*, KRAM-F 30355.

DISTRIBUTION IN ASIA. Russia (e.g. West Siberia and near Yakutsk).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 150, Pl. 152); Domański (1991: 91); Eriksson *et al.* (1978: 965, Figs 485–486, 530a); Ginns & Lefebvre (1993: 112); Hansen & Knudsen (1997: 187, Fig. 327); Karpova-Benois (1972: 144); Mukhin (1993: Tab. 1).

Peniophora quercina (Pers.: Fr.) Cooke

Grevillea **8**: 20. 1879.

Thelephora quercina Pers., Syn, Meth. Fung. 573. 1801. – *T. quercina* Pers.: Fr., Syst. Mycol. **1**: 442. 1821.

Basidiocarp corticioid, resupinate. Hymenophore smooth, tuberculate to rugose, greyish red, blue lilac to violaceous. Margin, loosening and somewhat rolled upward, with darker, black-brown underside.

Hyphal system monomitic. Hyphae 2.5–3.5 µm wide, smooth, hyaline to brown, thin- to thick-walled, with clamps. Lamprocystidia 35.0–45.0 × 9.0–14.5 µm, incrusted part of apex conic. Gloeocystidia absent. Basidia 27.0–45.0 × 4.5–5.5 µm, cylindric clavate, with 4 sterigmata and basal clamp. Basidiospores 8.0–11.5 × 2.5–4.0 µm, cylindric to allantoid, smooth, hyaline, thin-walled, non-amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Isonnam Falls (29), alt. *ca* 200 m, deciduous forest, 16 Sept.1984, *leg. W. Wojewoda*, KRAM-F 29058; shore of Soham-ho Lake (32), mixed forest (*Pinus densiflora*, *Quercus mongolica*), 14 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29083. – On fallen, dead twigs of *Quercus*.

DISTRIBUTION IN ASIA. India (North Western Himalayas) and Iran.

NOTES. New to North Korea. Known also from Europe and North America (United States).

REFERENCES. Breitenbach & Kränzlin (1986: 150, Pl. 153); Domański (1991: 104, Pl. 278: 7–8); Ginns & Lefebvre (1993: 113); Hallenberg (1978: 60; 1981: 486); Hansen & Knudsen (1997: 188, Fig. 328); Rattan (1977: 309, Figs J-L, p. 322).

Russulaceae Lotsy 1907

Lactarius camphoratus (Bull.: Fr.) Fr.

Epicr. Syst. Mycol. 346. 1838.

Agaricus camphoratus Bull., Herb. Fr. 493. 1809. – *A. subdulcis* ß *camphoratus* (Bull.): Fr., Syst. Mycol. **1**: 70. 1821.

Pileus 30–60 mm in diam., umbonate, minutely papillate. Upper surface red-brown to wine reddish, darker at centre. Margin striate. Flesh pale reddish brown. Smell strong, sweetish aromatic, of curry (coumarin), chicory, pleasant. Taste mild. Milk white, watery. Lamellae narrow, crowded, pale flesh-coloured, then dark rusty brown. Stipe 30–60 × 5–8 mm, cylindric to fusoid, paler than pileus.

Cheilocystidia slenderly fusoid, few. Basidia with 4 sterigmata. Basidiospores 7–8 × 6–7 µm, subglobose to globose, verrucose.

SPECIMEN EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest, on stump of ?*Pinus densiflora*, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29282.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Japan, Kazakhstan, Korea and Russia (e.g. North Altai and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 57); Basso (1999: 587); Gorbunova (1997: 19); Hansen & Knudsen (1992: 373, Fig. 899); Imazeki & Hongo (1975, **1**: 96, Pl. 45: 253); Melik-Khachatrian (1980: 468); Michael *et al*. (1983b: 198, Pl. 43); Park *et al*. (1986: 248, Pls. I: 7; II: 7); Teng (1996: 416); Vasilyeva (1973: 299).

Lactarius pubescens (Schrad.: Fr.) Fr.

Epicr. Syst. Mycol. 335. 1838.

Agaricus pubescens Schrad., Spicilegium Fl. German. **1**: 122. 1794. – *A. pubescens* Schrad.: Fr., Epicr. Syst. Mycol. 335. 1838.

Pileus 45–80 mm in diam. Upper surface whitish with pink or yellowish tint to pale brownish pink, tomentose, azonate. Margin strongly incurved, pubescent, shaggy. Flesh white, thin. Smell of *Geranium*. Milk white, very acrid. Lamellae very crowded, shortly decurrent, white, with flesh tinge. Stipe white.

Basidia with 4 sterigmata. Basidiospores 6–8 × 5–6 µm. Spore-print with a flesh tinge.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 15 km N of Samji-yon town (8), alt. *ca* 1600 m, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29283; shore of Samji-yon Lake (7), 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29284. – Mixed taiga with *Larix olgensis* and *Betula*, on ground, under *Betula platyphylla*.

DISTRIBUTION IN ASIA. China (e.g. Tibet), Kazakhstan, Russia (Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Basso (1999: 380); Hansen & Knudsen (1992: 365); Michael *et al*. (1983b: 138, Pl. 7); Syarzhanina (1994: 489); Vasilyeva (1973: 303); Ying *et al*. (1983: 115).

Lactarius quietus (Fr.) Fr.

Epicr. Syst. Mycol. 343. 1838.

Agaricus quietus Fr., Syst. Mycol. **1**: 69. 1821.

Pileus 25–80 mm in diam. Upper surface reddish brown to pinkish red-brown, distinctly to indistinctly zonate. Smell of bugs when young. Milk mild, with slightly bitter aftertaste, whitish with slight yellowish tinge to pale yellowish. Lamellae whitish, grey-reddish white to pale reddish brown, thin, crowded, with decurrent tooth. Stipe 30–55 × 5–10 mm, pale reddish, hollow.

Basidiospores 7.0–8.5 × 6.0–7.0 µm, short-elliptic, with short warts interconnected by irregular net, pale yellowish, amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: near Myohyang-san Hotel, (20), *ca* 10 km E of Hyang-san, alt. *ca* 150 m, mixed forest with *Pinus densiflora* and *Quercus mongolica*, under *Quercus*, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29285; Ryongak-san Mt. (42), mixed forest with *Castanea*, *Pinus densiflora* and *Quercus*, under *Quercus*, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29286. – On ground.

DISTRIBUTION IN ASIA. Armenia, Georgia and Russia (Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 58); Basso (1999: 500); Hansen & Knudsen (1992: 374); Melik-Khachatrian (1980: 473); Michael *et al*. (1983b: 194, Pl. 38); Skirgiełło (1998: 95, Fig. 23C, Pl. IX: 4–9); Syarzhanina (1994: 484).

Lactarius rufus (Scop.: Fr.) Fr.

Epicr. Syst. Mycol. 347. 1838.

Agaricus rufus Scop. Fl. Carniol. 451. 1772. – *A. rufus* Scop.: Fr., Syst. Mycol. **1**: 71. 1821.

Pileus 30–80 mm in diam., convex then plane, with distinct papilla. Upper surface dark reddish brown to wine-reddish. Flesh pale reddish brown. Taste very acrid. Milk white, very sharp taste. Lamellae pale cream with reddish tint, pale yellow-brown to ochraceous flesh-red. Stipe paler, than pileus to reddish brown, with a whitish base, hollow.

Cystidia (cheilo- and pleurocystidia) slenderly fusoid. Basidiospores 8.0–10.0 × 6.0–6.5 µm, white, with short warts. Spore-print white.

SPECIMENS EXAMINED. Paekdu-san Mts: on bank of Tuman-gang River, near Mupo (5), alt. *ca* 1400 m, mixed taiga with *Larix olgensis*, *Picea koraiensis*, *P. jezoensis*, and *Betula* sp., under *Betula*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29289; *ca* 15 km N of

Samji-yon town (8), alt. *ca* 1600 m, taiga with *Larix olgensis*, *Abies*, *Pinus* and *Picea*, under *Pinus*, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29288; *ca* 5 km S of Samji-yon town, alt. *ca* 1400 m, taiga with *Larix olgensis*, *Abies nephrolepis*, *Picea jezoenzis* and *Pinus koraiensis*, under *P. koraiensis*, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29287. – On ground.

DISTRIBUTION IN ASIA. Armenia, Georgia, Kazakhstan and Russia (Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Basso (1999: 487); Hansen & Knudsen (1992: 373); Melik-Khachatrian (1980: 474); Michael *et al*. (1983b: 226, Pl. 63); Syarzhanina (1994: 490); Vasilyeva (1973: 304; 1978: 173, Pl. 187).

Lactarius subdulcis (Bull.: Fr.) Gray

Nat. Arr. Brit. Pl. **1**: 625. 1821.

Agaricus subdulcis Bull., Herb. Pl. 224. 1784. – *A. subdulcis* Bull.: Fr., Syst. Mycol. **1**: 70. 1821.

Pileus 40–90 mm in diam., with papilla. Upper surface red-brown, pink-brownish, to brown, azonate. Flesh whitish, pinkish to brownish, rufescent. Milk white to watery white, mild taste. Smell of leaf bugs. Taste mild with bitter aftertaste. Lamellae adnate to decurrent, narrow, white, pale or cinnamon-reddish, ochraceous to rufescent. Stipe 25–60 × 4–10 mm, almost the same colour as pileus or paler, pale pinkish to pale ochraceous, hollow, somewhat pruinose.

Cheilocystidia and pleurocystidia 45–55 × 7–9 μm, slenderly fusoid, subulate. Basidiospores 7–8 × 6 μm, globose to subglobose, echinulate, with little warts, pale ochraceous or pale yellowish, amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest with *Pinus densiflora*, *Fraxinus* and *Quercus*, on ground, under *Quercus*, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29290.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Kazakhstan, Korea, Mongolia and Russia (North Altai, Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 125); Azbukina *et al*. (1984: 58); Basso (1999: 510); Gorbunova (1997: 19); Hansen & Knudsen (1992: 374); Melik-Khachatrian (1980: 475); Michael *et al*. (1983b: 194, Pl. 39); Skirgiełło (1998: 96, Pl. VII: 4–5); Syarzhanina (1994: 486); Teng (1996: 415); Uranchimehg *et al*. (1983: 377); Vasilyeva (1973: 304); Ying *et al*. (1983: 117).

Lactarius torminosus (Schaeff.: Fr.) Gray

Nat. Arr. Brit. Pl. **1**: 623. 1821.

Agaricus torminosus Schaeff., Fung. I c. 4, Pl. 12. 1774. – *A. torminosus* Schaeff.: Fr., Syst. Mycol. **1**: 63. 1821.

Pileus 30–60 mm in diam., somewhat depressed with age. Upper surface hispid and shaggy, red-brown to wine-reddish. Flesh pink with darker zones. Margin shaggy, strongly inovolute when young. Milk abundant, white, very sharp taste. Lamellae crowded, decurrent, whitish, pale pink to ochraceous flesh-red. Stipe rather short, hollow, pale pink-brown to reddish brown.

Basidiospores 7.0–9.5 × 5.5–7.5 μm. Sporeprint white to pale yellowish.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake, near Samji-yon Hotel (7), under *Betula* sp., 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29291.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Kazakhstan, Kirghizia, Korea, Mongolia and Russia (North Altai, Siberia and Primorski Krai).

REFERENCES. Anonymous (1978: 120; 1983a: 125); Azbukina *et al*. (1984: 58); Basso (1999: 400); Gorbunova (1997: 19); Hansen & Knudsen (1992: 365); Melik-Khachatrian (1980: 476); Michael *et al*. (1983b: 134, Pl. 5); Skirgiełło (1998: 41, Fig. 4C, Pl. I: 6); Syarzhanina (1994: 491); Teng (1996: 415); Uranchimehg *et al*. (1983: 377); Vasilyeva (1973: 305; 1978: 172, Pl. 181); Ying *et al*. (1983: 117).

Lactarius vellereus (Fr.) Fr.

Epicr. Syst. Mycol. 340. 1838.

Agaricus vellereus Fr., Syst. Mycol. **1**: 76. 1821.

Pileus 100–160 mm in diam., convex-umbilicate, then expanded depressed, infundibuliform. Upper surface white, azonate, pruinose to velutinous. Margin involute. Flesh white, turning bright yellowish to brownish. Taste of flesh acrid. Milk white, mild. Lamellae rather distant, adnate to slightly decurrent, whitish, yellowish to ochraceous, sometimes spotting flesh-coloured. Stipe

10–50 × 15–45 mm, rather short, cylindric, white, sometimes with lemon tint, tomentose like the pileus.

Cheilo- and pleurocystidia 60.0–90.0 × 4.5–6.5 µm, fusoid, lanceolate. Basidiospores 8.5–11.0 × 6.5–7.5 µm, globose, subglobose to broadly elliptic, nearly smooth, with small warts, hyaline.

SPECIMENS EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest with *Castanea*, *Pinus* and *Quercus*, 10 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29292; Kumgang-san Mts: near Onjong-ri village (60), alt. *ca* 100 m, mixed forest with *Pinus densiflora* 15 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29293. – On ground.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Japan, Kazakhstan, Korea and Russia (e.g. North of Altai, Siberia and Primorski Krai).

REFERENCES. Anonymous (1978: 121; 1983a: 125); Azbukina *et al*. (1984: 58); Basso (1999: 713); Gorbunova (1997: 19); Hansen & Knudsen (1992: 361); Imazeki & Hongo (1975, **2**: 110, Pl. 35: 204); Melik-Khachatrian (1980: 477); Michael *et al*. (1983b: 130, Pl. 3); Skirgiełło (1998: 34, Fig. 3A, Pl. I: 1); Syarzhanina (1994: 473); Teng (1996: 414); Vasilyeva (1973: 305; 1978: 169, Pl. 174); Ying *et al*. (1983: 117).

Lactarius volemus (Fr.) Fr.

Epicr. Syst. Mycol. 344. 1838.

Agaricus volemus Fr., Syst. Mycol. **1**: 69. 1821.

Pileus 80–130 mm in diam., convex umbilicate, sometimes somewhat depressed. Upper surface yellowish, orange to red-brown, pruinose to velvety, azonate. Flesh whitish, but red-brown when cut. Milk white to somewhat greyish, abundant, mild taste. Smell of herring. Lamellae adnate-decurrent, whitish to yellowish, rusty brown when bruised. Stipe 60–90 × 10–20 mm, cylindric, solid, same colour as pileus or somewhat paler.

Cheilo- and pleurocystida slenderly 70.0–80.0 × 6.5–9.5 µm, fusoid, thick-walled. Basidiospores 7.5–10.0 µm in diam., globose to subglobose, reticulate and verrucose, hyaline, amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: above Myohyang-san Hotel (20), alt. *ca* 200 m, mixed forests with *Pinus densiflora* and *Quercus*, 4 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29294; near Kuchung Falls (26), alt. *ca* 600 m, mixed forest, 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29296; Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest with *Castanea*, *Pinus densiflora* and *Quercus*, 10 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29295; Kumgang-san Mts: near Myongyong-dae Rock (58), alt. *ca* 800 m, mixed forest with *Pinus densiflora* and *Quercus*, 17.08.1983, *leg*. *W. Wojewoda*, KRAM-F 29297. – On ground.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (Siberia and Primorski Krai).

REFERENCES. Anonymous (1978: 123; 1983a: 125); Azbukina *et al*. (1984: 58); Basso (1999: 702); Hansen & Knudsen (1992: 372, Fig. 905); Imazeki & Hongo (1975, **1**: 95, Pl. 44: 248); Michael *et al*. (1983b: 210, Pl. 54); Skirgiełło (1998: 84, Fig. 19, Pls. VII: 1–3; X: 2); Syarzhanina (1994: 477); Teng (1996: 415); Vasilyeva (1973: 306; 1978: 174, Pl. 188); Ying *et al*. (1983: 117).

Russula aeruginea Lindbl.

in Fr., Monogr. Hymenomyc. Suec. 198. 1863.

Pileus 40–90 mm in diam. Upper surface yellowish green, green, grey green, sometimes with rusty spots. Margin smooth or somewhat striate. Flesh whitish. Taste mild or sometimes very slightly sharp. Smell absent. Lamellae whitish with ochraceous tint. Stipe white, sometimes with rusty spots at base.

Cheilo- and pleurocystidia 45–75 × 7–10 µm, lanceolate, abundant. Basidiospores 6.0–9.5 × 5.0–7.5 µm, almost globose to subglobose, verrucose, with warts partly connected, hyaline. Sporeprint whitish to cream.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 10 km S of Samji-yon town (8), alt. *ca* 1400 m, mixed taiga, on ground, under *Betula platyphylla*, 5 Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 29317.

DISTRIBUTION IN ASIA. China and Russia (North Altai, Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 58); Gorbunova (1997: 18); Hansen & Knudsen (1992: 383, Fig. 908); Michael *et al*. (1983b: 260, Pl. 85); Skirgiełło (1991: 77, Fig. 17B–C, Pl. IX: 5–6, 8); Shyarzhanina (1994: 450); Vasilyeva (1973: 289; 1978: Pl. 158); Ying *et al*. (1983: 118).

Russula albonigra (Krombh.) Fr.

Hymenomyc. Eur. 440. 1874.1874.

Agaricus alboniger Krombh., Naturg. Abb. **9**: 27. 1845.

Pileus 50–80 mm in diam. Upper surface whitish only on young basidiocarp, rapidly greying and soon browning and blackening, viscid. Flesh at first white but soon greying and blackening. Smell weak. Taste slightly bitter. Lamellae whitish then blackening. Stipe 30–60 × 10–20 mm, white but soon blackening,

Basidiospores 5.5–8.5 × 5.5–6.5 μm in diam., globose to subglobose, verrucose with connections, hyaline, amyloid.

SPECIMEN EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest, on ground, 10 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 52989.

DISTRIBUTION IN ASIA. Caucasus and Russia (East Siberia and Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Azbukina *et al*. (1984: 58); Hansen & Knudsen (1992: 377, Fig. 909); Michael *et al*. (1983b: 236, Pl. 70); Skirgiełło (1991: 37, Fig. 6B, Pl. III: 3); Syarzhanina (1994: 444); Vasilyeva (1973: 289).

Russula cyanoxantha (Schaeff.) Fr.

Monogr. Hymenomyc. Suec. **2**: 194. 1863.

Agaricus cyanoxanthus Schaeff., Ic. Fung. Bavar. **4**: Pl. 93: 1–6. 1774.

Pileus 50–120 mm in diam., convex, then expanded to depressed. Upper surface dark vinaceous, violet, violet blue with green or olivaceous tint, glabrous, viscid. Margin smooth, very slightly striate. Flesh white, under cuticle of pileus violet-purple. Smell absent. Taste mild. Lamellae white, close to crowded, attenuate-adnate. Stipe 50–80 × 15 –20 mm, white.

Cystidia 50–90 × 2–6 μm, fusoid to subclavate, slender. Basidiospores 5.8–9.7 × 5.8–7.7 μm, subglobose to broadly elliptic, echinulate, hyaline, amyloid. Spore-print white.

SPECIMENS EXAMINED. Kumgang-san Mts: near Manmulsang Rocks (55), alt. *ca* 800 m, 18 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53348; near Onjong-ri village (60), alt. *ca* 150 m, 4 Oct. 1984, *leg*. *W. Wojewoda*, KRAM-F 29318. – Mixed forests, on ground.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China, Georgia, Japan, Kazakhstan, Korea and Russia (Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 125); Azbukina *et al*. (1984: 59); Hansen & Knudsen (1992: 389, Fig. 930); Imazeki & Hongo (1975, **1**: 94, Pl. 43: 244; 1975, **2**: 108, Pl. 34: 200); Melik-Khachatrian (1980: 450); Michael *et al*. (1983b: 272, Pl. 92); Skirgiełło (1991: 63, Fig. 12A, Pls. VI; VII: 34; XXII: 3); Syarzhanina (1994: 451); Teng (1996: 420); Vasilyeva (1973: 290; 1978: 163, Pl. 154); Ying *et al*. (1983: 118).

Russula delica Fr.

Epicr. Syst. Mycol. 350. 1838.

Pileus 70–150 mm in diam., depressed in centre, then broadly infundibuliform. Upper surface white with yellow-brown patches. Flesh white. Smell fruity, then fishy, herring-like. Taste mild to slowly acrid. Lamellae rather distant, broad, decurrent, whitish. Stipe 360 × 15–20 mm, solid, white.

Cheilo- and pleurocystidia 90–120 × 8–10 μm, slenderly fusoid. Basidiospores 7.5–11.0 × 6.0–8.0 μm, with short spines. Spore-print white to cream.

SPECIMENS EXAMINED. Shore of Soham-ho Lake (32), mixed forest with *Pinus densiflora* and *Quercus mongolica*, 14 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 29319; Kumgang-san Mts: on bank of Onjong-gang Stream near Onjong-ri village, (60), *ca* 5 km SW of Kosong, alt. *ca* 150 m, mixed forest with *Pinus densiflora* and *Quercus*, 16 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29320. – On ground.

DISTRIBUTION IN ASIA. Armenia, China, Georgia, Japan, Kazakhstan, Kirghizia, Korea and Russia (North Altai, Siberia and Primorski Krai).

REFERENCES. Anonymous (1983a: 125); Azbukina *et al*. (1984: 59); Gorbunova (1997: 18); Hansen & Knudsen (1992: 376, Fig. 933); Imazeki & Hongo (1975, **1**: 92, Pl. 41: 232); Melik-Khachatrian (1980: 452); Park & Cho (1985: 107); Skirgiełło (1991: 31, Fig. 4, Pl. I: 1–3); Teng (1996: 418); Vasilyeva (1973: 290); Ying *et al*. (1983: 119).

Russula emetica (Schaeff.) Pers.: Fr.

Epicr. Syst. Mycol. 357. 1838.

Agaricus emeticus Schaeff., Fung. Bavar. **4**: Ind. 9, Pl. 15. 1774.

Basidiocarp fragile. Pileus 40–90 mm in diam., hemispheric, then convex, becoming plane, with age depressed. Upper surface blood or scarlet red, glabrous, viscid. Flesh thin, white, reddish under cuticle. Taste very acrid. Lamellae white to cream, distant. Stipe 40–70 × 10–15 mm, white.

Cystidia 60.0–90.0 × 9.0–13.5 µm, fusoid, lanceolate. Basidiospores 7–10 × 6–9 µm, subglobose to elliptic, echinulate, with long amyloid warts, hyaline, thin-walled. Spore-print white.

SPECIMENS EXAMINED. Myohyang-san Mts: near Kuchung Falls (26), alt. *ca* 700 m, mixed forest with *Pinus densiflora*, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29298; Kumgang-san Mts: near Onjong-ri (60), alt. *ca* 50 m, coniferous forest, 4 July 1985, *leg. B. Zarzycka*, KRAM-F 29299. – On ground, under *Pinus densiflora*.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (North Altai, Siberia and Primorski Krai).

REFERENCES. Anonymous (1978: 107; 1983a: 125); Azbukina *et al*. (1984: 59); Gorbunova (1997: 18); Hansen & Knudsen (1992: 395, Fig. 937); Imazeki & Hongo (1975, **2**: Pl. 34: 199); Skirgiełło (1991: 85, Fig. 19A, Pls. X; XXIV: 3); Syarzhanina (1994: 465); Teng (1996: 421); Vasilyeva (1973: 291; 1978: 165, Pl. 161); Ying *et al*. (1983: 119).

Russula foetens (Pers.: Fr.) Fr.

Epicr. Syst. Mycol. 359. 1838.

Agaricus foetens Pers., Obs. Mycol. **1**: 102. 1796. – *A. foetens* Pers.: Fr., Syst. Mycol. **1**: 59. 1821.

Pileus 80–110 mm in diam., applanate-convex. Upper surface brownish, ochraceous, ochraceous yellow to honey, very viscid to glutinous. Flesh whitish, browning when cut. Margin strongly tuberculate-sulcate. Smell very strong, foetid. Taste acrid. Lamellae whitish, cream to pale straw, then with brown spots. Stipe 60–80 × 15–20 mm, cylindric to ventricose, whitish to pale yellowish, browning when cut.

Cheilocystidia and pleurocystidia abundant. Basidiospores 7.0–9.5 × 6.5–8.5 µm, echinulate, almost without connections, hyaline. Spore-print cream.

SPECIMEN EXAMINED. Kumgang-san Mts: Myongyong-dae Ravine, near Myongyong-dae Rock (58), alt. *ca* 800 m, mixed forest, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29321.

DISTRIBUTION IN ASIA. Armenia, Azerbaijan, China (e.g. Tibet), Georgia, Japan, Kazakhstan, Korea and Russia (North Altai, Siberia and Primorski Krai).

REFERENCES. Anonymous (1978: 108; 1983a: 125); Azbukina *et al*. (1984: 59); Gorbunova (1997: 18); Hansen & Knudsen (1992: 380, Fig. 942); Imazeki & Hongo (1975, **1**: 93, Pl. 42: 237); Melik-Khachatrian (1980: 453); Michael *et al*. (1983b: 248, Pl. 78); Skirgiełło (1991: 45, Fig. 9A, Pl. IV: 5–6); Syarzhanina (1994: 446); Vasilyeva (1973: 291; 1978: 167, Pl. 167); Wen & Sun (1999: 367); Ying *et al*. (1983: 119).

Russula grata Britz.

Hymenomyc. Südbay. 229. 1893.

Russula laurocerasi Melz., Čas. Českosl. Houb. **2**: 243. 1921.

Pileus 50–70 mm in diam. Upper surface ochraceous, olive-ochraceous to pale brown, slightly viscid. Margin tuberculate-sulcate. Flesh whitish, spotted brown. Strong smell of bitter almonds. Taste mild to acrid. Lamellae whitish to pale cream, spotted brown. Stipe 40–60 × 10–20 mm, cylindric, cavernose, whitish, then spotted brown.

Basidiospores 5.8–8.5 × 4.8–8.0 µm, with conspicuous crests, up to 2 µm, amyloid. Spore-print cream.

SPECIMEN EXAMINED. Myohyang-san Mts: near Murung Falls (22), alt. *ca* 500 m, mixed forest, on ground, 14 July 1986, *leg. W. Wojewoda*, KRAM-F 53280.

DISTRIBUTION IN ASIA. Japan and Russia (e.g. Primorski Krai).

NOTES. New to North Korea.

REFERENCES. Hansen & Knudsen (1992: 380, Fig. 947); Imazeki & Hongo (1975, **2**: 106, Pl. 33: 196); Michael *et al*. (1983b: 250, Pl. 79); Skirgiełło (1991: 48, Fig. 9B–C, Pl. IV: 1–4); Vasilyeva (1973: 292, Fig. 66A).

Russula nigricans (Bull.) Fr.

Epicr. Syst. Mycol. 350. 1838.

Agaricus nigricans Bull., Champ. Fr. Pl. 212, 579. Fig. 2. 1784.

Pileus 60–150 mm in diam., at first convex, then depressed. Upper surface at first whitish, then brown and blackish. Flesh thick, hard, at first white but soon dull red when bruised, then grey to black. Taste mild but unpleasant. Stipe 40–60 × 10–20 mm, cylindric, brown.

Basidiospores 5.5–7.5 × 5.5–6.5 μm, verrucose, with partial reticulum, amyloid.

SPECIMEN EXAMINED. Wonsan town (50), Botanical Garden, on ground, under trees, 22 July 1986, *leg. H. Komorowska*, KRAM-F 28564.

DISTRIBUTION IN ASIA. Armenia, Georgia, Kazakhstan and Russia (e.g. Primorski Krai).

NOTES. Eurasian-American species. New to North Korea.

REFERENCES. Hansen & Knudsen (1992: 376, Fig. 965); Melik-Khachatrian (1980: 458); Michael *et al*. (1983b: 236, Pl. 69); Skirgiełło (1991: 35, Fig. 6A, Pl. II); Vasilyeva (1973: 293).

Russula paludosa Britz.

Hymenomyc. Südbay. **8**: 11, Fig. 60. 1891.

Pileus 60–120 mm in diam., convex to slightly depressed. Upper surface pink reddish to bright red. Flesh white. Taste mild. Smell absent. Lamellae cream, then pale ochraceous. Stipe rather long, 60–100 × 15–20 mm, cylindric, white with pinkish tint.

Cheilocystidia and pleurocystidia 45.0–90.0 × 7.5–12.5 μm, fusoid. Basidiospores 7.5–11.0 × 6.5–8.0 μm, elliptic, verrucose to echinulate. Warts with irregular connections. Spore-print cream to pale ochraceous.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 10 km S of Samji-yon town (8), alt. *ca* 1300 m, coniferous taiga, wet place, on ground, among mosses, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29322.

DISTRIBUTION IN ASIA. Armenia and Russia.

NOTES. New to North Korea.

REFERENCES. Hansen & Knudsen (1992: 385, Fig. 973); Melik-Khachatrian (1980: 59); Michael *et al*. (1983b: 332, Pl. 127); Skirgiełło (1991: 163, Fig. 43B, Pl. XVIII: 4–6).

Russula rhodopoda Zvára

in Melz. & Zvára, Arch. Přírod. Výzk. Čech **17**(4): 108. 1927.

Pileus 50–80 mm in diam. Upper surface red. Flesh white. Smell fruity. Taste very acrid. Lamellae pale cream, almost free to subdecurrent. Stipe 40–60 × 10–20 mm, red.

Cheilocystidia and pleurocystidia 50.0–85.0 × 5.5–10.0 μm, subcylindric to slenderly fusoid. Basidiospores 6.5–8.5 × 6.5–7.0 μm, subglobose to broadly ovoid, verrucose. Warts amyloid. Spore-print pale ochraceous.

SPECIMENS EXAMINED. Paekdu-san Mts: below Paekdu-san Mt. peak (1), scattered forest with *Abies nephrolepis*, *Larix olgensis*, *Picea ajanensis* (= *P. jezoensis*), *P. koraiensis*, and *Pinus koraiensis*, below upper forest line, alt. *ca* 1800–1900 m, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29325; Mupo (4) on bank of Tuman-gang River (5), alt. *ca* 1500 m, taiga with *Larix* and *Picea*, 4 Sept.1983, *leg. W. Wojewoda*, KRAM-F 29323; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1400 m, taiga with *Abies*, *Picea* and *Larix*, 5 Sept.1983, *leg. W. Wojewoda*, KRAM-F 29324. – On ground, among mosses.

DISTRIBUTION IN ASIA. Israel and Russia (e.g. North Altai).

NOTES. New to North Korea.

REFERENCES. Binyamini (1977: 764); Gorbunova (1997: 19); Hansen & Knudsen (1992: 395, Fig. 982); Michael *et al*. (1983b: 368, Pl. 150); Skirgiełło (1991: 99, Fig. 23A–B, Pl. XIII: 4).

Stereaceae Pilát 1930

Aleurocystidiellum subcruentatum (Berk. & M. A. Curtis) Lemke

Canad. J. Bot. **42**: 277. 1964.

Stereum subcruentatum Berk. & M. A. Curtis, Proc. Amer. Acad. Arts. **4**: 123. 1858. – *Aleurodiscus stereoides* Yasuda, *in* Lloyd, 1921. – *A. scutellatus* Litsch. 1926. – *A. subcruentatus* (Berk. & M. A. Curtis) Burt 1920.

Basidiocarp discoid to subpileate (substereoid), up to 20–25 × 20 mm when dried. Hymenophore surface smooth, cream-buff.

Skeletal hyphae 4.8–6.6 µm wide, thick-walled, hyaline to yellowish in KOH. Generative hyphae thin-walled, with clamps. Skeletocystidia (pseudocystidia) cylindric, thick-walled, most often irregularly encrusted, with encrustation dissolving in KOH, thick-walled. Basidia up to 84.0 × 16.8 µm, flexuous-cylindric to subclavate or clavate, with 4 sterigmata up to 12 µm long. Basidiospores 10.8–20.4 × 8.4–16.8 µm, ovoid to broadly elliptic, thick-walled, wall up to 2 µm thick, minutely warted in Melzer's reagent, smooth in KOH, amyloid (Fig. 146).

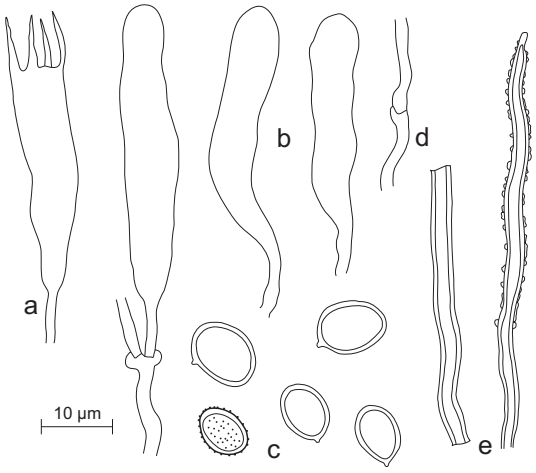


Fig. 146. *Aleurocystidiellum subcruentatum* (Berk. & M. A. Curtis) Lemke: a – mature basidia, b – young basidia, c – basidiospores, d – hyphae, e – skeletocystidia (KRAM-F 30642).

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 25 km N of Samji-yon town (8), alt. *ca* 1500 m, taiga, on dead fallen trunk of *Picea* sp., 30 June 1986, *leg. W. Wojewoda*, KRAM-F 30642.

DISTRIBUTION IN ASIA. China, Japan and Korea.

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 101); Domański (1988: 64); Ginns & Lefebvre (1993: 17); Jülich & Stalpers (1980: 31); Lemke (1964: 278, Fig. 23); Maekawa (1993: 5, 6, Fig. 94); Maekawa *et al.* (2002: 83); Núñez & Ryvarden (1997: 131, Fig. 61).

Aleurodiscus amorphus (Pers.: Fr.) J. Schröt.

in Cohn, Krypt. Fl. Schles., Pilze. **3**: 429. 1888.

Peziza amorpha Pers., Syn. Meth. Fung. 657. 1801. – *Thelephora amorpha* (Pers.): Fr., Elench. Fung. **1**: 183. 1828. Further synonyms see Lemke (1964: 227).

Basidiocarp 1–6 × 1–4 mm in diam., discoid, disc- or cup-shaped to pulvinate. Hymenophore smooth, farinose, orange to pink-grey, ochraceous when dried. Margin narrow, distinctly determinate, whitish. Consistency firm, subcoriaceous.

Hyphal system monomitic. Hyphae 1.8–4.8 µm wide, thin-walled, smooth, hyaline, without clamps. Cystidia absent. Cystidia-like paraphysoid hyphae 90.0–120.0 × 3.6–7.2 µm, moniliform, hyaline, situated between the basidia, not projecting. Basidia 70–120 × 24–27 µm, clavate or subclavate, hyaline, thin-walled, with 4 sterigmata, without basal clamp. Spores 15.5–21.5 × 15.0–20.0 µm, subglobose to broadly elliptic, in KOH smooth, in Melzer's reagent with fine blunt spines, hyaline, thin-walled, amyloid, with distinct apiculus up to 3.0 × 2.2–2.5 µm (Fig. 147).

SPECIMEN EXAMINED. Paekdu-san Mts: Chongbong Mt. (9), near Rimyongsu (10), alt. *ca* 1460 m, mixed

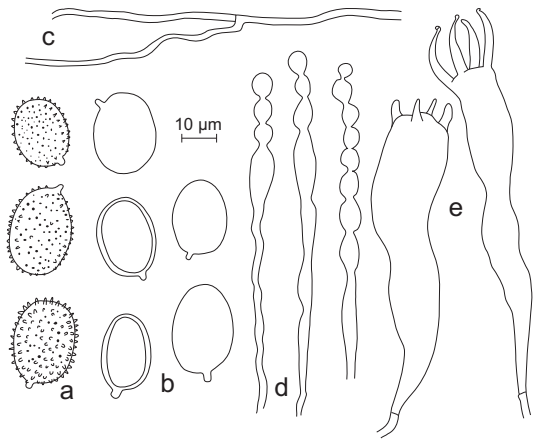


Fig. 147. *Aleurodiscus amorphus* (Pers.: Fr.) J. Schröt.: a – mature basidiospores, b – young basidiospores, c – hyphae, d – cystidia, e – basidia (KRAM-F 29333).

taiga, on standing dead trunk of coniferous tree (?*Abies nephrolepis*), 1 July 1986, *leg. W. Wojewoda*, KRAM-F 29333.

DISTRIBUTION IN ASIA. China, Japan, Korea, and Russia (e.g. West Siberia).

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 101); Breitenbach & Kränzlin (1986: 78, Pl. 45); Domański (1988: 67, Pl. 228: 1); Ginns & Lefebvre (1993: 17); Hjortstam *et al.* (1988: 63, Fig. 21, Pls. 1A, 4A–B); Imazeki & Hongo (1975, **2**: 118, Pl. 37: 219); Jahn (1979: 94, Pl. 60); Lemke (1964: 227); Mukhin (1993: Tab. 1); Núñez & Ryvarden (1997: 39, Fig. 5); Pilát (1934: 328; 1936: 364; 1940: 75); Teng (1996: 291).

Aleurodiscus cerussatus (Bres.) Höhn. & Litsch.

K. Akad. Wiss. Wien Math.-Nat. Kl. Sitzb. **116**: 807. 1907.

Corticium cerussatum Bres., Fung. Trid. **2**: 37. 1892. – *Aleurodiscus lapponicus* Litsch., Ann. Mycol. **42**: 11. 1944. – *Acanthophysium cerussatum* (Bres.) Boidin, Bull. Soc. Mycol. Fr. **101**: 340. 1986. – *A. minor* (Pilát) Tellería, Nova Hedw. **53**: 231. 1991. For further synonyms see Lindsey (2001: 145).

Basidiocarp 130 × 15–20 mm, corticioid, resupinate, effuse, thin. Margin indistinct. Hymenophore smooth, whitish when fresh, cream-coloured to pale ochraceous when dry. Consistency subcoriaceous.

Hyphal system monomitic. Hyphae 2–4 μm wide, thin-walled, smooth, with clamps at all septa. In hymenium cystidia (pseudocystidia) 30.0–40.0 × 5.8–7.7 μm, subclavate or subfusoid, some moniliform, thin-walled, smooth, with slightly yellowish and finely granulate protoplasm. Acanthophyses 40–60 × 4–5 μm, numerous, branched, with numerous apical protuberances, hyaline, thin-walled, not projecting. Basidia 40–50 × 7–8 μm, clavate or subclavate, hyaline, thin-walled, with 4 sterigmata and basal clamp. Basidiospores 8.0–10.0 × 4.5–5.6 μm, elliptic to subcylindric, hyaline, thin-walled, smooth, amyloid, few.

SPECIMEN EXAMINED. Kumgang-san Mts: Myonggyong-dae Ravine (58), alt. *ca* 700 m, mixed forest, on fallen twig, 17 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 30288.

DISTRIBUTION. Reported from Asia, North America (Canada and United States) and South America (e.g. Argentina).

NOTES. New to North Korea.

REFERENCES. Domański (1988: 58); Eriksson & Ryvarden (1973: 67, Fig. 23); Ginns & Lefebvre (1993: 15); Hansen & Knudsen (1997: 181, Fig. 181); Jülich (1984: 117); Jülich & Stalpers (1980: 35); Lindsey (2001: 145); Núñez & Ryvarden (1997: 59, Fig. 17).

Amylostereum chailletii (Pers.: Fr.) Boidin

Rev. Mycol. **23**: 345. 1958.

Thelephora chailletii Pers., Mycol. Eur. **1**: 125. 1822. – *T. chailletii* Pers.: Fr., Elench. Fung. **1**: 188. 1828. – *Stereum chailletii* (Pers.: Fr.) Fr., Epicr. Syst. Mycol. 551. 1838. – *Lloydella chailletii* (Pers.: Fr.) Bres., *in* Lloyd, Myc. Writ. **1**: 51. 1901.

Basidiocarp 0.3–1.8 μm, resupinate, corticioid or effused-reflexed, stereoid. Hymenophore even or tuberculate, ochraceous, cracked when dry. Margin somewhat thickened and finely tomentose.

Hyphal system dimitic. Generative hyphae thin-walled, with numerous clamps. Skeletal hyphae thick-walled, light brownish, with few clamps. Cystidia up to 6 μm wide, cylindric to subclavate, yellowish-brown, thick-walled, encrusted. Basidia 18.0–23.0 × 4.0–5.4 μm, subclavate, with 4 sterigmata. Basidospores 5.4–7.2 × 2.4–3.0 μm, cylindric, subcylindric or narrowly elliptic, amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed forest, on fallen trunk of coniferous tree, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 30287.

DISTRIBUTION IN ASIA. China, India, Nepal (Western Himalayas) and Russia (e.g. Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 180, Pl. 196); Eriksson & Ryvarden (1973: 91, Fig. 33, Pl. 9A); Jahn (1971: 100, Fig. 10); Mukhin (1993: Tab. 1);

Pilát (1934: 322; 1936: 411; 1940: 64); Rattan (1977: 168, Figs A-B, p. 169); Teng (1996: 284, as *Lloydella chailletii*); Thomsen (1998: 419, Tables 1, 2; Figs 1, 2).

Stereum gausapatum (Fr.) Fr.

Hym. Eur. 638. 1874.

Thelephora gausapata Fr., Elench. Fung. **1**: 171. 1828.

Basidiocarp effused-reflexed, stereoid, sessile. Upper surface tomentose-hirsute, zonate, brownish orange to greyish orange. Margin white to cream-coloured when fresh. Hymenophore even to tuberculate, brownish orange to greyish orange, bleeding when cut.

Hyphal system monomitic. Hyphae thin- to thick-walled, hyaline to yellow-brown, without clamps. Cystidia of 2 kinds: (1) pseudocystidia up to 120 µm long, 5–8 µm wide, subcylindric, thick-walled with thin-walled apex, hyaline to yellowish, smooth, (2) acutocystidia (hyphidia), 20.0–30.0 × 2.0–3.5 µm, cylindric with acute apex, thin-walled, hyaline, smooth. Basidia 25.0–40.0 × 4.0–5.5 µm, narrowly clavate, with 4 sterigmata, without basal clamp. Basidiospores 6.0–8.5 × 2.5–3.5 µm, elliptic to subcylindric, hyaline, smooth, thin-walled, amyloid.

SPECIMENS EXAMINED. Suian-san Mts (48): alt. *ca* 150 m, deciduous forest, on fallen twigs of *Quercus* sp., 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29017; Kumgang-san Mts: Okryu-dong Stream Valley (59), below Kuryong Falls, mixed forest, alt. *ca* 600 m, on stump of *Quercus* ?*mongolica*, 20 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29105.

DISTRIBUTION IN ASIA. China, India, Iran, Japan, Korea, Nepal (N Western Himalayas), Russia (Siberia and Far East) and Turkey.

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 102); Azbukina *et al*. (1984: 33); Breitenbach & Kränzlin (1986: 182, Pl. 199); Chamuris (1985: 5, Fig. 1b; 1988: 101, Figs 36, 37A); Davydkina (1980: 74, Fig. 15, Pl. III: 15); Domański (1992: 98); Eriksson *et al*. (1984: 1419, Figs 746–747); Ginns & Lefebvre (1993: 151); Hallenberg (1981: 489); Imazeki & Hongo (1975, **1**: 133, Pl. 62: 353); Jahn (1979: 100, Pl. 68); Niemelä & Uotila (1977: 34); Rattan (1977: 161, Figs A-B, p. 165); Teng (1996: 287).

Stereum hirsutum (Willd.: Fr.) Gray

Nat. Arrang. Brit. Pl. **1**: 653. 1821.

Thelephora hirsuta Willd., Fl. Berolin. Prodr. 397. 1787. – *T. hirsuta* Willd.: Fr., Syst. Mycol. **1**: 439. 1821.

Basidiocarp effused-reflexed to distinctly pileate. Upper surface tomentose-hirsute-hispid, zonate, greyish to brownish. Hymenophore smooth to tuberculate, greyish, yellowish, orange to brown.

Hyphal system dimitic. Hyphae 4–7 µm wide, thin- to thick-walled, hyaline to yellowish brown, smooth, without clamps. Cystidia of 2 kinds: (1) pseudocystidia 80–100 × 4–6 µm, cylindric or subcylindric, thick-walled, smooth, in subhymenium and hymenium, (2) acutocystidia (hyphidia) 20–30 × 2–4 µm, thin-walled, hyaline, smooth, with acute apex, in hymenium, projecting slightly above basidia. Basidia 24.0–45.0 × 3.5–5.0 µm, clavate, with 4 sterigmata, without basal clamp. Basidiospores 4.5–7.5 × 2.0–3.5 µm, elliptic to subcylindric, hyaline, smooth, thin-walled, amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount between Tuman-gang River (5) and Taehong-dan (6), alt. *ca* 1300–1500 m, taiga, on fallen twigs of deciduous tree (?*Quercus*), 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28987; *ca* 5 km S of Samji-yon town (8), alt. *ca* 1500 m, mixed taiga with *Abies*, *Betula*, *Larix olgensis*, and *Picea*, on decayed stump of *Betula*, 5 Sept.1983, *leg*. *W. Wojewoda*, KRAM-F 29020; Chongbong Mt. (9), alt. *ca* 1460 m, mixed taiga, on dead trunk of *Betula platyphylla*, 1 July 1986, *leg*. *W. Wojewoda*, KRAM-F 30695; Ryongak-san Mt. (42), alt. *ca* 200 m, mixed forest, on trunk of *Quercus aliena*, 10 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29021; alt. *ca* 250 m, mixed forest with C*astanea*, *Pinus densiflora*, and *Quercus mongolica*, 16 July 1986, *leg*. *H. Komorowska*, KRAM-F 28331; Suian-san Mts (48), alt. *ca* 200 m, deciduous forest, on fallen twig of deciduous tree, 26 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29018; Kumgang-san Mts: Okryu-dong Valley (59), below Kuryong Falls, Okryu-dong Stream Valley, alt. *ca* 300 m, near Onjong-ri, forest, on trunk of deciduous tree, 5 July 1985, leg. *B. Zarzycka*, KRAM-F 27783; shore of Samil-po Lake (62), alt. *ca* 100 m, mixed forest with *Quercus mongolica* and *Pinus densiflora*, on stump of *Quercus mongolica*, 13 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29019; 19 July 1986, *leg*. *W. Wojewoda*, KRAM-F 30692.

DISTRIBUTION IN ASIA. China (e.g. Tibet), India, Iran, Japan, Korea, Mongolia, Nepal, Philippines, Russia (Siberia and Far East), and Turkey.

NOTES. Cosmopolitan species. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 102); Breitenbach & Kränzlin (1986: 182, Pl. 200); Chamuris (1985: 5, Fig. 1a); Davydkina (1980: 65, Pl. I: 13); Domański (1992: 104); Eriksson *et al*. (1984: 1423, Figs 748–753); Ginns & Lefebvre (1993: 152); Hallenberg (1981: 489); Imazeki & Hongo (1975, **2**: 120, Pl. 38: 228); Jahn (1979: 98, Pl. 66); Kotlaba (1976: 158); Morris (1990: 327); Mukhin (1993: Tab. 1); Niemelä & Uotila (1977: 34); Pilát (1936: 323; 1940: 64); Rattan (1977: 163, Figs E-F, p. 169); Teng (1996: 290); Uranchimehg *et al*. (1983: 374); Vasudeva (1962: 44); Zhang (1999: 375); Zhao *et al*. (1983: 67).

Stereum rugosum (Pers.: Fr.) Fr.

Epicr. Syst. Mycol. 552. 1838.

Thelephora rugosa Pers., Neues Mag. Bot. **1**: 10. 1794. – *T. rugosa* Pers.: Fr., Syst. Mycol. **1**: 439. 1821.

Basidiocarp corticioid, resupinate. Margin whitish. Hymenophore smooth, tuberculate, grey-pink to brown-ochraceous, protusely bleeding when cut fresh.

Hyphal system dimitic. All hyphae hyaline, smooth, without clamps. Generative hyphae 1.5–3.0 μm wide, thin- to thick-walled; skeletal hyphae up to 7 μm wide, thick-walled. Typical cystidia absent. Pseudocystidia (cystidia-like ends of hyphae) up to 200 μm long and 5–6 μm wide, cylindric, smooth, hyaline or reddish brown, thick-walled. Acanthohyphidia (cystidiols) 30–40 × 2–4 μm, with pointed outgrowths, thin-walled. Basidia 20–40 × 5–6 μm, slenderly clavate, with 4 sterigmata, without basal clamp. Spores 6.0–8.5 × 3.0–4.5 μm, elliptic-cylindric, smooth, hyaline, thin-walled, amyloid.

SPECIMEN EXAMINED. Taesong-san Mts: Chujak Mt. (35), mixed forest with *Quercus mongolica* and *Pinus densiflora*, on stump of deciduous tree, 29 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29022.

DISTRIBUTION IN ASIA. China, India (North Western Himalayas), Iraq, Japan and Russia (East and West Siberia, Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 183, Pl. 202); Davydkina (1980: 76, Fig. 16a, Pl. III: 16a); Domański (1992: 118); Ginns & Lefebvre (1993: 153); Imazeki & Hongo (1975, **2**: 121, Pl. 38: 232); Jahn (1979: 96, Pl. 64); Pilát (1940: 65); Mukhin (1993: Tab. 1); Rattan (1977: 157, Figs F-G, p. 154, Pl. 7D); Rattan *et al*. (1978: 773, Fig. 6a–e).

Stereum sanguinolentum (Alb. & Schwein.: Fr.) Fr.

Epicr. Syst. Mycol. 549. 1838.

Thelephora sanguinolenta Alb. & Schwein., Consp. Fung. 274–275. 1805. – *T. sanguinolenta* Alb. & Schwein.: Fr., Syst. Mycol. **1**: 440. 1821.

Basidiocarp stereoid, semipileate, effused-reflexed, rarely resupinate, corticioid. Upper surface tomentose, hirsute to glabrous, concentrically zonate, undulating, greyish to brownish, thin. Margin whitish. Underside (hymenophore) smooth, undulate to slightly tuberculate-wrinkled, grey-yellowish, pink to brown-ochraceous, sometimes with violet tint, protusely bleeding when cut fresh.

Hyphal system dimitic. All hyphae hyaline, smooth, without clamps. Generative hyphae 1.5–3.0 μm wide, thin- to thick-walled. Skeletal hyphae up to 7 μm wide, thick-walled. Typical cystidia absent. Pseudocystidia (cystidia-like ends of hyphae) 3–10 μm wide, cylindric, smooth, hyaline or pale brown, thick-walled. Acanthocystidia 30–40 × 2–4 μm, with knob-like to thorn-like apex, thin-walled. Basidia 20–40 × 5–6 μm, subclavate, with 4 sterigmata, without basal clamp. Spores 6–8 × 2–3 μm, elliptic-cylindric, smooth, hyaline, thin-walled, amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 15 km E of peak of Paekdu-san Mt. (1), alt. *ca* 1800 m, taiga with *Abies nephrolepis*, *Larix olgensis*, *Ledum palustre*, *Picea ajanensis*, *P. koraiensis*, and *Vaccinium uliginosum*, on fallen dead twigs of coniferous trees, 30 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28978; *ca* 30 km E of peak of Paekdu-san Mt., alt. *ca* 1700 m, taiga, on fallen trunk of coniferous tree, 3. Sept. 1983, *leg*. *W. Wojewoda*, KRAM-F 28862; between Mupo (4) and Tuman-gang River (5), alt. *ca* 1500 m, taiga with *Larix olgensis*, on stump of *Larix olgensis*, 4 Sept. 1983, *leg*.

W. Wojewoda, KRAM-F 29024; alt. *ca* 1500 m, taiga with *Larix olgensis* and *Betula platyphylla*, on fallen trunk of coniferous tree, 29 June 1986, *leg. W. Wojewoda*, KRAM-F 29016; between Tuman-gang River (5) and Taehong-dan (6), alt. *ca* 1300–1500 m, taiga with *Larix olgensis*, on decayed trunk, 29.06.1986, *leg. W. Wojewoda*, KRAM-F 29014; basalt mount near Taehong-dan, *ca* 1500 m a.s.l., in mixed forest, on decayed stump of coniferous tree, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30294; shore of Samji-yon Lake (7), alt. *ca* 1400 m, taiga with *Larix olgensis*, *Picea ajanensis*, and *P. koraiensis*, on fallen trunk of *Larix olgensis*, 27 June 1985, *leg. B. Zarzycka*, KRAM-F 29023; mixed taiga, on roots of *Larix olgensis*, 28 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 30629; mixed taiga with *Abies*, *Betula*, *Larix*, and *Picea*, on fallen trunk of coniferous tree, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 29012; taiga with *Abies nephrolepis*, *Larix olgensis*, *Picea ajanensis*, and *P. koraiensis*, on fallen trunk of coniferous tree, 28 June 1986, *leg. W. Wojewoda*, KRAM-F 29040, 52985; *ca* 25 km NW of Samji-yon town (8), alt. *ca* 1850 m, coniferous taiga with *Larix olgensis*, on coniferous stump, 29 June 1985, *leg. B. Zarzycka*, KRAM-F 30696; alt. *ca* 1500 m, taiga with *Larix olgensis*, on fallen trunk of coniferous tree, 30 June 1986, *leg. W. Wojewoda*, KRAM-F 29013; Myohyang-san Mts: on slope of Wonman Mt. (31), alt. *ca* 1100 m, coniferous tree zone, in forest with *Picea ajanensis*, *P. koraiensis* and *Thuja koraiensis*, on fallen dead trunk of ?*Picea* sp., 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28977; on fallen dead trunk of *Abies nephrolepis*, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29085; Kumgang-san Mts: near Onjong-ri village (59), bank of Onjong-ri Stream, alt. *ca* 50 m, pine forest, on fallen twigs of *Pinus densiflora*, 21 July 1986, *leg. Z. Heinrich*, KRAM-F 28054; on stump of *Pinus densiflora*, 21 July 1986, *leg. W. Wojewoda*, KRAM-F 29015. – Some collections together with *Tremella encephala*.

DISTRIBUTION IN ASIA. China, India, Korea, Nepal (North Western Himalayas) and Russia (West Siberia and Primorski Krai).

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 102); Azbukina *et al*. (1984: 33); Breitenbach & Kränzlin (1986: 184, Pl. 203); Domański (1992: 116); Eriksson *et al*. (1984: 1431, Fig. 756); Ginns & Lefebvre (1993: 153); Mukhin (1993: Tab. 1); Pilát (1940: 65); Rattan (1977: 160, Figs C-D, p. 165); Teng (1996: 287).

Stereum subtomentosum Pouzar

České Mykol. **28**(3): 147–156. 1964.

Basidiocarp stereoid, flabellate or spatulate, reflexed, with distinct pileus up to 30–70 × 50 mm wide and often short stipe-like base. Upper surface concentrically zonate, undulating, slightly appressed-tomentose, greyish or ochre-yellowish, later greenish from algae, thin, with whitish margin. Underside (hymenophore) smooth to slightly tuberculate or undulate, light yellowish, grey-yellowish to light beige, spotting yellow when injured.

According to Eriksson *et al*. (1984) hyphal system monomitic, according to Breitenbach & Kränzlin (1986) dimitic. Hyphae without clamps. Generative hyphae 2.5–4.5 µm wide, thin- to thick-walled, smooth, hyaline, with septa. Skeletal hyphae 3.8–6.7 µm wide, thick-walled, without septa. Typical cystidia absent. Pseudocystidia 100–200 µm long, 5.8–9.7 µm wide, cylindric, often constricted at apex, smooth, hyaline, thick-walled except in apical part. Acutocystidia 30–40 × 4–5 µm, acute at apex, thin-walled, projecting slightly above basidia. Basidia 40.0–50.0 × 4.5–5.0 µm, subclavate, with 4 sterigmata, without basal clamp. Basidiospores 4.8–7.5 × 2.0–3.0 µm, elliptic-cylindric, smooth, hyaline, thin-walled, amyloid (Fig. 148).

SPECIMENS EXAMINED. Paekdu-san Mts: basalt mount between Tuman-gang River (5) and Taehong-dan (6), alt. *ca* 1300–1500 m, mixed taiga (*Betula*, *Quercus*, *Picea*, *Larix*), on fallen dead deciduous tree trunk, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28986; Myohyang-san Mts: near Kumgang Falls (17), alt. *ca* 300 m, forest with *Quercus*, on trunk of *Q. mongolica*, 13 July 1986, *leg. W. Wojewoda*, KRAM-F 29031; near Taeha Falls (18), alt. *ca* 450–500 m, forest with *Quercus*, on trunk of *Q. mongolica*, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29032; mixed forest, on deciduous trunk, 7 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29046. below Sangwon-am Monastery (19), alt. *ca* 500 m, deciduous forest, on dead trunk of *Quercus mongolica*, 5 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29029; above Myohyang-san Hotel (20), Hyang-san River Valley, alt. *ca* 100 m, mixed forest, on trunk of deciduous tree, 4 Aug.1983, *leg. W. Wojewoda*, KRAM-F 29030; in forest with *Quercus mongolica*, 8 June 1985, *leg. B. Zarzycka*, KRAM-F 27789; between Yuson Falls

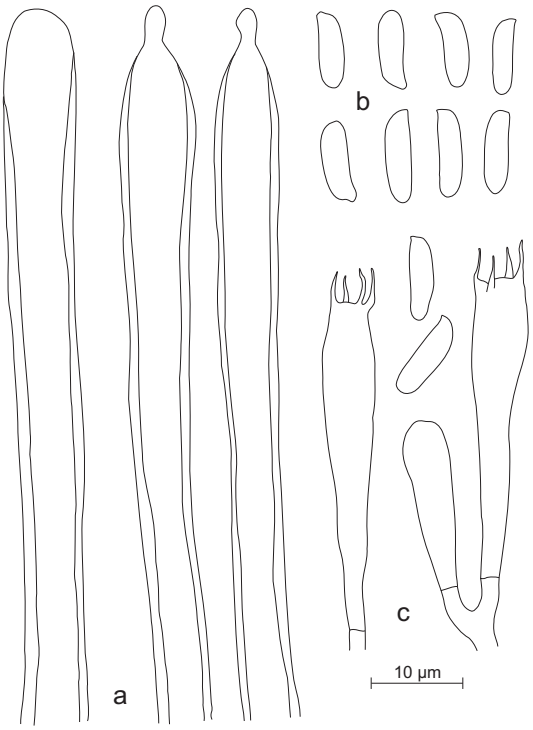


Fig. 148. *Stereum subtomentosum* Pouzar: a – pseudocystidia, b – basidiospores, c – basidia (KRAM-F 29046).

(24) and Pison Falls (25), alt. *ca* 750 m, mixed forest, on fallen decayed trunk, 14 July 1986, *leg. H. Komorowska*, KRAM-F 28552; near Kuchung Falls (26), alt. *ca* 800 m, deciduous forest, on trunk of *Quercus mongolica*, 7 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29027; near Habiro Temple (27), alt. *ca* 200 m, deciduous forest, on fallen trunk of deciduous tree, 16 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28985; on fallen twigs of deciduous tree, 13 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29033, 29043; above Habiro Temple, alt. *ca* 500 m, deciduous forest, on fallen trunk of *Acer* sp., 17 Sept. 1984, *leg*. *W. Wojewoda*, KRAM F28979; Isonnam Falls (29), alt. *ca* 200 m, on *Prunus* sp., 13 July 1986, *leg*. *H. Komorowska*, KRAM-F 28479; on slope of Wonman Mt. (31), alt. *ca* 900 m, deciduous forest, on dead standing trunk of deciduous tree (?*Acer*), 17 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28981, 28983; Suian-san Mts (48): alt. *ca* 150 m, deciduous forest, on *Zelkova serrata* trunk, 25 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29025; deciduous forest with *Carpinus*, *Quercus*, and *Zelkova*, on fallen trunk of deciduous tree, 6 July 1986, *leg*. *W. Wojewoda*, KRAM-F 29028; Kumgang-san Mts: Okryu-dong Valley (59), below Kuryong Falls, alt. *ca* 600 m, mixed forest, on trunk of deciduous tree, 14 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29041; on fallen dead twigs and trunks of deciduous trees, 5 Oct. 1984, *leg*. *W. Wojewoda*, KRAM-F 28980; 20 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28364, 29026; near Onjong-ri village (60), alt. ca 50 m, mixed forest with *Pinus densiflora* and *Quercus mongolica*, on fallen trunk of *Quercus* sp., 4 Oct. 1984, *leg*. *W. Wojewoda*, KRAM-F 28984.

DISTRIBUTION IN ASIA. Caucasus, Iran, Mongolia and Russia (Siberia and Far East).

NOTES. New to North Korea. Species occurring only in Northern Hemisphere in Europe, Asia and North America (Canada and United States).

REFERENCES. Azbukina *et al*. (1984: 33); Breitenbach & Kränzlin (1986: 184, Pl. 204); Davydkina (1980: 67, Fig. 6a, b, w; Pl. III: 14w); Eriksson *et al*. (1984: 1435, Figs 757–758); Domański (1992: 99); Ginns & Lefebvre (1993: 154); Hallenberg (1978: 75; 1981: 489); Jahn (1971: 91, Fig. 2: 3, Fig. 5, Photo: 1; 1979: 98, Pl. 67); Kotlaba (1987: 207, Pls XV-XVI); Mukhin (1993: Tab. 1); Uranchimehg *et al*. (1983: 374).

Xylobolus frustulatus (Pers.: Fr.) Boidin

Rev. Mycol. **23**(3): 341. 1958.

Thelephora frustulata Pers., Syn. Meth. Fung. 577. 1801. – *T. frustulata* Pers.: Fr.. Syst. Mycol. **1**: 445. 1821. – *Stereum frustulatum* (Pers.: Fr.) Fuckel, Jahresber. Ver. Naturkunde Herzogthum. Nassau **15**: 102. 1861.

Basidiocarps perennial, mostly 1–2 mm thick, distinctly stratified in several layers, rarely reflexed to dimidiate at margin, and then with upper part zonate and ± glabrous and dark brown. Hynenophore smooth.

Hyphal system monomitic. Hyphae 3.5–5.0 µm wide, hyaline to yellowish brown. Pseudocystidia rare. Acanthocystidia (acanthophysoid hyphae) 25–30 × 4–5 µm, cylindric, thin- or thick-walled, smooth or with protuberances. Basidia 25–30 × 4–5 µm, elongated-clavate, smooth or with a few basal proturberances (acanthobasidia), with 4 sterigmata. Basidiospores 4.5–5.0(–5.5) × 3.0–3.5 µm, elliptic, thin-walled, smooth, hyaline, amyloid.

SPECIMENS EXAMINED. Myohyang-san Mts: on slope of Wonman Mt. (31), alt. *ca* 700 m, mixed forest, on fallen dead trunk of *Quercus* sp., 17 Sept. 1984, *leg*.

W. Wojewoda, KRAM-F 28975; Kumgang-san Mts: Myonggyong-dae Ravine (56), alt. *ca* 900 m, mixed forest, on fallen trunk of ?*Quercus mongolica*, 17 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29036.

DISTRIBUTION IN ASIA. Armenia, China, India, Iran, Japan, Korea, Nepal (North Western Himalayas), Philippines, Russia (e.g. Far East) and Thailand.

NOTES. Known also from Europe, North America (Canada, Mexico, United States), and Australia.

REFERENCES. Anonymous (1983a: 102); Azbukina *et al*. (1984: 33); Davydkina (1980: 79, Fig. 16b); Domański (1992: 112); Ginns & Lefebvre (1993: 182); Hallenberg (1978: 82; 1981: 491); Hjortstam *et al*. (1988: 1605, Figs. 862–864); Imazeki & Hongo (1975, **1**: 134, Pl. 62: 355); Jahn (1979: 102, Pl. 72); L. Lange (1974: 20); Michael *et al*. (1988: 161, Pl. 11); Rattan (1977: 151, Figs A-B, p. 146, Pl. 4B); Teng (1996: 289, as *Stereum frustulosum*); Wojewoda (2000: 55).

Thelephorales Corner *ex* Oberw. 1976

Thelephoraceae Chevall. 1826

Hydnellum aurantiacum (Batsch: Fr.) P. Karst.

Meddn. Soc. Fauna Fl. Fenn. **5**: 41. 1879.

Hydnum suberosum var. β *aurantiacum* Batsch, El. Fung. Cont. **2**: 103. Pl. 40, Fig. 222. 1789. – *H. aurantiacum* (Batsch.) Alb. & Schwein., Consp. Fung. 265. 1805. – *H. aurantiacum* (Batsch) Alb. & Schwein.: Fr., Syst. Mycol. **1**: 403. 1821. – *Calodon aurantiacus* (Batsch: Fr.) P. Karst., Rev. Mycol. **3**(9): 20. 1881. – *Phaeodon aurantiacus* (Batsch: Fr.) J. Schröt., *in* Cohn, Kryptog. Fl. Schles. **3**(1): 459. 1888.

Pileus 20–30 mm in diam., infundibuliform, depressed at centre. Upper surface of pileus radially wrinkled-ribbed and with scattered tubercles, orange-brown toward centre, lighter toward margin, without distinct concentric zones. Flesh of pileus whitish to pale orange. Smell of meal or cucumber. Hymenophore hydnoid, orange-brown. Spines up to 3 mm long, cylindric. Stipe 15–30 × 3–5 mm, cylindric, solid, bulbous at base, subtomentose, orange-brown. Flesh of stipe orange-brown.

Hyphal system monomitic. Hyphae 2.0–5.8 µm wide, smooth, hyaline to light-brown, thin- or thick-walled, without clamps. Cystidia absent. Basidia 25.0–35.0 × 4.8–5.8 µm, slenderly clavate to suburniform, with 4 sterigmata, without basal clamp. Basidiospores (3.8–)5.8–6.7 × 3.8–5.8 µm, subglobose to elongate, light brown, with blunt tubercles, thin-walled, non-amyloid.

SPECIMEN EXAMINED. Myohyang-san Mts: near Kuchung Falls (26), alt. *ca* 800 m, mixed forest, on ground, 7 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 53044.

DISTRIBUTION IN ASIA. Caucasus, China, Japan, Korea and Russia (West Siberia and Far East).

REFERENCES. Anonymous (1983a: 103); Breitenbach & Kränzlin (1986: 220, Pl. 257); Domański (1978: 140, Pls. CXXX-CXXXI); Hansen & Knudsen (1997: 311); Imazeki & Hongo (1975, **2**: 133); Jülich (1984: 260); Maas Geesteranus (1975: 33, 91, Figs 10–11, Pls. 11–12a–b); Michael *et al*. (1986: 278, Pl. 90); Nikolaeva (1961: 249, Figs 189–190, 210: 13; Pls. LVI: 1, LVIII); Teng (1996: 320).

Thelephora anthocephala (Bull.): Fr.

Syst. Mycol. **1**: 433. 1821.

Clavaria anthocephala Bull., Herb. Fr. Pl. 452. 1789. – *Phylacteria anthocephala* (Bull.: Fr.) Pat., Hym. Eur. 54. 1887.

Basidiocarps up to 45 mm high, ramarious, coral-like, erect, gregarious, with flattened branches. Flesh thin, coriaceous, brownish. Hymenophore smooth, brown or ferruginose. Smell absent. Taste mild.

Hyphal system monomitic. Hyphae 3.0–5.8 µm wide, smooth, brown, thin- to thick-walled, with clamps. Cystidia absent. Basidia 40.0–50.0 × 7.7–9.0 µm, slenderly clavate, with 4 sterigmata and basal clamp. Sterigmata 8.0–9.7 × 1.5–2.0 µm. Basidiospores (5.8–)6.7–7.7(–9.7) × (4.8–)5.8–6.7(–8.7) µm, irregularly subglobose to oval, angular lobate, with scattered spines, pale brown, thin- to thick-walled, non-amyloid, some with an oil-drop (Fig. 149).

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 550 m, deciduous forest, on ground, under *Quercus mongolica*, 5 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 29167.

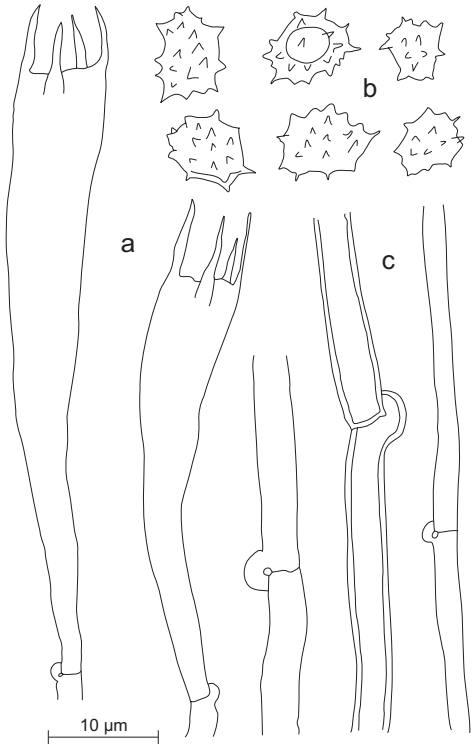


Fig. 149. *Thelephora anthocephala* (Bull.): Fr.: a – basidia, b – basidiospores, c – hyphae (KRAM-F 29167).

DISTRIBUTION IN ASIA. China, Japan and Pakistan.

NOTES. New to North Korea. A north temperate species, growing especially in deciduous forests.

REFERENCES. Breitenbach & Kränzlin (1986: 218, Pl. 254); Corner (1968: 39, Figs 11f–g, 18–20); Domański (1978: 208, 212, Pl. CXLI: 6, CXLIII: 1); Ginns & Lefebvre (1993: 157); Hansen & Knudsen (1997: 301); Jülich (1984: 256); Konrad & Maublanc (1930: Pl. 480: I); Michael *et al*. (1986: 288, Pl. 104); Teng (1996: 275–276, Fig. 242).

Thelephora palmata (Scop.): Fr.

Syst. Mycol. **1**: 432. 1821.

Clavaria palmata Scop., Fl. Carniol. **2**: 483. 1760. – *Phylacteria palmata* (Scop.: Fr.) Pat., Ess. Tax. 119. 1900.

Basidiocarp 25–40 mm high, ramarioid, coral-like, caespitose, with palmate, dichotomous, not flattened, spiculose branching (like Corner 1968: 73, Fig. 41, first left figure and Pl. 2, right figure, pro parte), stipitate. Hymenophore smooth, pale brown. Smell foetid, faint, like foul cabbage. Stipe 5.0–15.0 × 1.5–2.0 mm, cylindric.

Hyphal system monomitic. Hyphae 2.0–5.8 µm wide, smooth, brown, thin- to thick-walled, with clamps. Cystidia absent. Basidia 67.0–77.0 × 7.7–11.6 µm, cylindric-clavate, with 4 sterigmata and basal clamp. Basidiospores 8.7–11.6 × 7.7–9.7 µm, irregularly subglobose to elliptic, angular-lobate, with spines, pale brown, thin-walled, non-amyloid, some with 1–2 oil-drops (Fig. 150).

SPECIMEN EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 550 m, mixed forest, on ground, under *Pinus densiflora*, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 29166.

DISTRIBUTION IN ASIA. China, Japan, Russia (e.g. north Altai).

NOTES. New to North Korea. A north temperate species, growing especially in coniferous forests. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 218, Pl. 255); Corner (1968: 73, Figs 9e, 41, Pl. 2: 2); Domański (1978: 198, Pl. CXXXVII: 3, CXL: 3, CXLIII: 5); Ginns & Lefebvre (1993: 158); Gorbunova (1997: 15); Hansen & Knudsen (1997: 301); Jülich (1982: 467, Pl. 19b; 1984: 255); Konrad & Maublanc (1930: Pl. 480: II); Michael *et al*. (1986: 288, 422, Pl. 106); Teng (1996: 276).

Thelephora penicillata (Pers.): Fr.

Syst. Mycol. **1**: 434. 1821.

Merisma penicillatum Pers., Mycol. Eur. **1**: 156. 1822. For further synonyms see Corner (1968: 76).

Basidiocarp resupinate, forming suberect or decumbent, ligulate or spatulate branches becoming cristate and penicillate, encrusting stems and leaves of herbaceous plants, e.g. from Fabaceae family. Flesh of hymenophore brownish, dry like hymenophore of *Bjerkandera adusta*, brownish grey.

Hyphal system monomitic. Hyphae 3.8–9.7 µm wide, thin- or thick-walled, hyaline, yellowish to

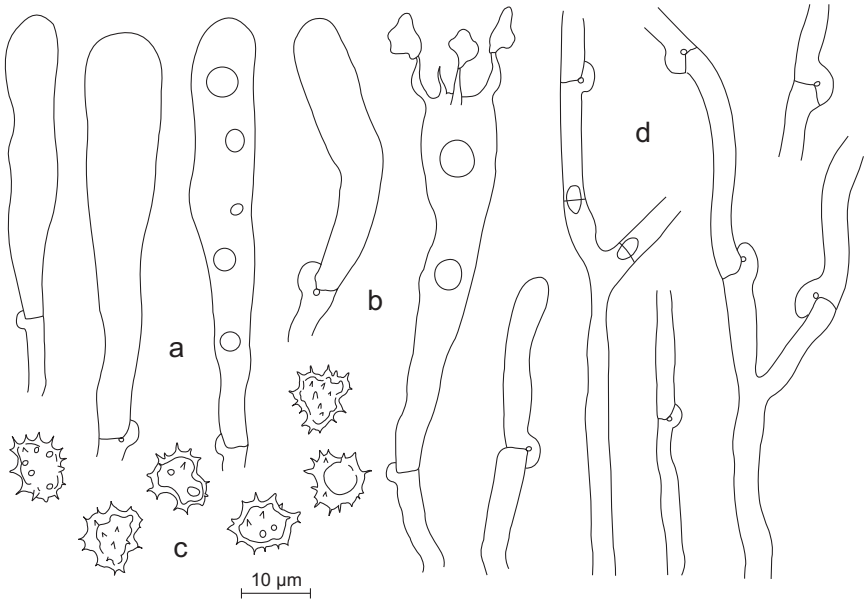


Fig. 150. *Thelephora palmata* (Scop.): Fr.: a – young basidia, b – mature basidium, c – basidiospores, d – hyphae (KRAM-F 29166).

brown, green in KOH, with clamps at all septa. Cystidia absent. Basidia 25.0–60.0 × 6.5–10.0 µm clavate with 4 sterigmata. Basidiospores 5.8–7.7 × 6.5–10.0 µm, angular-lobate, echinulate, with spines 0.9–1.4 µm long, brown, thick-walled.

SPECIMEN EXAMINED. Shore of Taesong-ho Lake (43), thicket, on herbaceous plants, 23 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52782.

DISTRIBUTION. Known from the north temperate zone (e.g. Europe and North America: Canada and United States) and South Africa.

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 218, Pl. 254); Corner (1968: 76, Fig. 44); Domański (1978: 202, Pl. CXL); Ginns & Lefebvre (1993: 158); Hansen & Knudsen (1997: 301); Jülich (1984: 256); Phillips (1981: 261); Ryman & Holmĺsen (1984: 95).

Thelephora terrestris Ehrh. *ex* Willd.: Fr.

Syst. Mycol. **1**: 431. 1821.

T. terrestris Ehr., Crypt. Exs. no. 178. 1785. – *T. terrestris* Ehr. *ex* Willd., Florae Berll. 397. 1787. – *Phylacteria terrestris* (Ehr. *ex* Willd.: Fr.) Pat., Ess. Tax. 19. 1900.

Basidiocarp pileate or semi-pileate, consisting of flabellate to rosette-shaped lobes, sometimes resupinate. Upper surface hispid-tomentose, concentrically zonate, grey- to brown. Margin lighter. Hymenophore irregularly verrucose, brown.

Hyphal system monomitic. Hyphae 3–5 µm wide, brown, smooth, thin-walled, with clamps. Cystidia absent. Basidia 50–80 × 5–6 µm, slenderly clavate, with 4 sterigmata and basal clamp. Basidiospores 7.5–9.0 × 4.5–6.0 µm, ovoid to elliptic, brown, with inflated-ventricose outgrowths, tuberculate to blunt-spined, thin-walled, non-amyloid (Fig. 151).

SPECIMENS EXAMINED. Paekdu-san Mts: near Samji-yon Hotel, shore of Samji-yon Lake (**7**), mixed taiga with *Larix olgensis*, 1 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 29170; Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 500 m, mixed forest with *Quercus mongolica* and *Pinus densiflora*, on fallen twigs, roots of trees, and ground, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28934, 52783; 13 July 1986, *leg. Z. Heinrich*, KRAM-F 27941; near Kuchung Falls (26), alt. *ca* 650 m, mixed forest with *Pinus densiflora*, on ground, 14 July 1986, *leg. W. Wojewoda*, KRAM-F 29168; Kumgang-san Mts: Okryu-dong Valley (59),

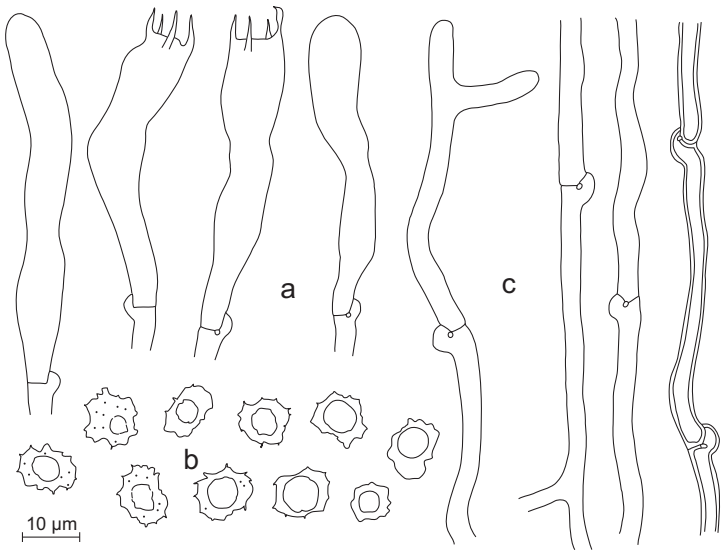


Fig. 151. *Thelephora terrestris* Ehrh. ex Willd.: Fr.: a – basidia, b – basidiospores, c – hyphae (KRAM-F 29169).

below Kuryong Falls, alt. *ca* 600 m, mixed forest, on roots of deciduous tree, and ground, 20 July 1986, *leg. W. Wojewoda*, KRAM-F 29169; shore of Samil-po Lake (62), alt. *ca* 100 m, pine forest, on roots of *Pinus densiflora* projecting from ground, 13 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 52994.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (e.g. Siberia and Far East).

NOTES. Cosmopolitan species. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 103); Azbukina *et al*. (1984: 33); Breitenbach & Kränzlin (1986: 220, Pl. 256); Corner (1968: 87, Figs 7, 10d, 51); Cunningham (1963: 230, Fig. 131); Ginns & Lefebvre (1993: 159); Hansen & Knudsen (1997: 301, Fig. 617); Phillips (1981: 261); Pilát (1934: 320; 1936: 409); Teng (1996: 277).

Tomentellina fibrosa (Berk. & M. A. Curtis) Larsen

Mycol. Mem. **4**: 115. 1974.

Zygodesmus fibrosus Berk. & M. A. Curtis, Grevillea **3**: 145. 1873. – *Tomentellina bombycina* P. Karst., Acta Soc. Fauna et Flora Fenn. **11**: 1. 1895. For further synonyms see Domański (1978: 272), Ginns & Lefebvre (1993: 166), and Svrček (1960: 239).

Basidiocarp resupinate, effused, tomentose. Hymenophore smooth, ferrugineous. Hyphal strands present.

Hyphal system dimitic. Generative hyphae 3–5 µm wide, smooth, hyaline to yellowish, thin-walled. Skeletal hyphae 3.0–7.7 µm wide, smooth, yellowish to brown, thick-walled. Clamps not seen. Septocystidia 90.0–194.0 × 5.8–7.7 µm, cylindric, brown, thick-walled, septate, without clamps. Basidia 30.0–55.0 × 5.8–7.7 µm, slenderly clavate, with 4 sterigmata, without basal clamp. Basidiospores (5.8–)7.7–11.5 µm across, subglobose, warted, warts often dichotomously branched.

SPECIMEN EXAMINED. Paekdu-san Mts: between Mubong (3) and Taehong-dan (6), in taiga, on dead fallen branches, and naked soil, 29 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 52784.

DISTRIBUTION IN ASIA. Russia (East Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 216, Pl. 251); Domański (1978: 272, Pl. CXVI); Ginns & Lefebvre (1993: 166); Hansen & Knudsen (1997:

302, Figs 628, 650c, 651, 652c, 654c); Jülich (1984: 251); Jülich & Stalpers (1980: 254); Svrček (1960: 239, Figs 50–52).

TREMELLOMYCETIDAE
Tremellales Fr. 1821

Exidiaceae R. T. Moore 1978

Basidiodendron caesiocinereum (Höhn. & Litsch.) Luck-Allen

Can. J. Bot. **41**: 1036, Figs 10–15. 1963.

Corticium caesiocinereum Höhn. & Litsch., Sitz.-Ber. Kaiserl. Akad. Wiss. Wien, I, **117**: 116, Fig. 9. 1908. – *Bourdotia caesiocinerea* (Höhn. & Litsch.) Bourdot & Galzin *ex* Pilát & Lindtner, Soc. Sci. Skoplie Bul. Sci. nat. **18**: 175. 1938.

Basidiocarp corticioid, resupinate, thin. Consistency wax-like, soft. Hymenophore whitish grey with slight pink tint, smooth, dull, finely pubescent under lens.

Hyphal system monomitic. Hyphae 1–3 μm wide, gelatinized, without clamps. Gloeocystidia 30–50 × 6–9 μm, fusoid, sinuous, sometimes with brownish contents. Basidia 9–14 × 7–9 μm, oval, longitudinally septate, with 2–4 epibasidia (sterigmata). Basidiospores 5–8 × 4–8 μm, subglobose or globose, smooth or very finely punctate, hyaline, with drops and distinct apiculus.

SPECIMENS EXAMINED. Suian-san Mts (48), alt. *ca* 500 m, near small hospital, in deciduous forest, on decayed stump, 6 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28870; Kumgang-san Mts: Okryu-dong Stream Valley (59), alt. *ca* 700 m, on deciduous tree, 14 Aug. 1983, *leg*. *W. Wojewoda*, KRAM-F 28851, together with *Botryohypochnus isabellinus*.

DISTRIBUTION IN ASIA. East Russia (Far East, Primorski Krai).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 56, Pl. 10); Ginns & Lefebvre (1993: 26); Govorova (1997: 12); Hansen & Knudsen (1997: 98, Fig. 33); Jülich (1984: 404); Raitviir (1967: 48, Fig. 31); Wojewoda (1977: 48, Fig. 6; 1981: 92, Pl. XX).

Craterocolla cerasi (Tul.) Bref.

Unters. Gesammtgeb. Mykol. **7**: 99, Pl. 6: 9–21. 1888.

Tremella cerasi Tul., J. Linn. Soc. (Bot.) **13**: 39. 1871 (teleomorph). – *Ditangium cerasi* (Tul.) Constantin & Dufour, Nouv. Fl. Champ. ed. 1, 1891 (anamorph).

Basidiocarp cerebriform, ochre-pink. Consistency gelatinous, soft.

Hyphal system monomitic. Hyphae 1.5–3.0 μm, hyaline, without clamps. Basidia (hypobasidia) 8–10 μm in diam., subglobose or oval, longitudinally septate, 4–celled, with 4 epibasidia (sterigmata). Basidiospores 8.0–10.0 × 3.0–4.5 μm, allantoid, smooth, hyaline, thin-walled, with drops, non-amyloid. Conidia (pycnospores) 6.0–8.0 × 2.5–3.5 μm, cylindric, smooth, hyaline, thin-walled.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), alt. *ca* 1400 m, taiga with *Abies nephrolepis*, *Larix olgensis*, *Picea ajanensis*, *P. koraiensis* and *Pinus koraiensis*, on standing dead trunk of ?*Picea* sp., 28 June 1986, *leg*. *W. Wojewoda*, KRAM-F 28894.

DISTRIBUTION IN ASIA. Russia (e.g. West Siberia).

NOTES. New to North Korea.

REFERENCES. Breitenbach & Kränzlin (1986: 62, PL. 20); Hansen & Knudsen (1997: 99); Jülich (1984: 406); Mukhin (1993: Tab. 1); Raitviir (1967: 75); Shvartsman (1964: 71, Figs 15–16); Wojewoda (1977: 164, Fig. 60; 1981: 132, Pl. XXXVI).

Exidia plana (Wiggers) Donk

Persoonia **4**: 168. 1966.

Tremella plana Wiggers, Prim. Fl. Hols. 95. 1780. – *E. glandulosa* (Bull.): Fr. ss. auct.

Basidiocarp pulvinate-undulating and lobed or cerebriform, black or, rarely, dark blackih brown. Consistency gelatinous. Hymenophore smooth with numerous large glandular warts.

Hyphal system monomitic. Hyphae 1.0–1.5 μm wide, gelatinized, smooth, hyaline, thin-walled, with clamps. Cystidia absent. Basidia (hypobasidia, probasidia) 16–18 × 7–8 μm, oval, pyriform, 4-celled, longitudinally septate. Basidiospores 12.0–14.0 × 4.5–5.5 μm, allantoid, hyaline, smooth, thin-walled, sometimes with oil-drops, forming secondary spores.

SPECIMENS EXAMINED. Paekdu-san Mts: between Mubong (3) and Taechongdan (6), alt. *ca* 1500 m, taiga with *Larix olgensis* and *Betula platyphylla*, on fallen dead twig of *B. platyphylla*, 29 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28847; shore of Samji-yon Lake (7), on fallen dead twig of deciduous tree, 28 June 1986, *leg*. *W. Wojewoda*, KRAM-F 28850; Myohyang-san Mts: near Myohyang-san Hotel (20), alt. *ca* 100 m, deciduous forest, on living trunk of *Acer mono*, 12 July 1986, *leg*. *W. Wojewoda*, KRAM-F 28849; near Habiro Temple (27), alt. *ca* 200 m, deciduous forest, on fallen dead trunk of deciduous tree, 16 Sept. 1984, *leg*. *W. Wojewoda*, KRAM-F 28848; Pyongyang town: Central Botanical Garden (36), on fallen dead branch of *Betula platyphylla*, 9 July 1986, *leg*. *W. Wojewoda*, KRAM-F 52594.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (West Siberia and Far East).

NOTES. Known also from Europe and North America (United States).

REFERENCES. Anonymous (1983a: 129); Breitenbach & Kränzlin (1986: 62, Pl. 21); Ginns & Lefebvre (1993: 64); Govorova (1997: 12); Imazeki & Hongo (1975, **2**: 131, Pl. 61, Fig. 345, not typical basidiocarps!); Jülich (1984: 412); Mukhin (1993: Tab. 1); Raitviir (1967: 70); Shvartsman (1964: 65, Figs 11–12); Teng (1996: 269); Wojewoda (1977: 159, Fig. 1F, 58, Pls. VIII & IX; 1981: 124).

Exidia repanda Fr.

Syst. Mycol. **2**: 225. 1822.

Basidiocarp 10–30 mm in diam., tough to firm-gelatinous, yellow-brown to reddish brown. Stipe short, central.

Hyphal system monomitic. Basidia 12.5–15.0 × 7.5–10.0 μm, with 4 sterigmata. Basidiospores 8.4–13.8 × 2.4–3.6 μm, allantoid or suballantoid, hyaline, smooth, thin-walled, apiculate, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), mixed taiga, on fallen dead twigs of *Betula platyphylla*, 28 June 1986, *leg*. *W. Wojewoda*, KRAM-F 29307.

DISTRIBUTION IN ASIA. Russia (West Siberia and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Ginns & Lefebvre (1993: 64); Govorova (1997: 12); Hansen & Knudsen (1997: 101, Fig. 42); Jülich (1984: 410); Mukhin (1993: Tab. 1); Neuhoff (1934–1938: 16, Pl. 2: 12–22); Raitviir (1967: 68, Fig. 57); Wojewoda (1977: 150, Fig. 55; 1981: 126, Pl. I: 9).

Exidia saccharina (Alb. & Schwein.): Fr.

Syst. Mycol. **2**: 225. 1822.

Tremella spiculosa var. *saccharina* Alb. & Schwein., Consp. Fung. Nisk. 302. 1805.

Basidiocarp up to 80 mm, tough-gelatinous, cerebriform, pale brown, reddish to brown.

Hyphal system monomitic. Hyphae 1–4 μm wide, smooth, hyaline, thin-walled, with clamps. Basidia (metabasidia) 10–17 × 7–13 μm, with 4 long sterigmata (epibasidia). Basidiospores 8.7–13.5 × 2.9–3.8 μm, allantoid, thin-walled, hyaline, smooth, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 5 km SE of Paekdu-san Mt. peak (1), alt. *ca* 1900 m, below upper border of forest, coniferous taiga with *Larix olgensis* and *Abies*, on dead fallen trunk of *A. nephrolepis*, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 53282; *ca* 30 km E of Paekdu-san Mt. peak, alt. *ca* 1500 m, coniferous taiga, on fallen trunk of *Larix olgensis*, 3 July 1983, *leg. W. Wojewoda*, KRAM-F 28846.

DISTRIBUTION IN ASIA. Russia (e.g. West Siberia).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Ginns & Lefebvre (1993: 64); Hansen & Knudsen (1997: 101, Fig. 43); Michael *et al*. (1986: 362, 426, Pl. 198); Mukhin (1993: Tab. 1); Raitviir (1967: 68); Wojewoda (1977: 147, Fig. 54; 1981: 129, Pl. XXXV).

Exidiopsis calcea (Pers.) Wells

Mycologia **53**: 348, Fig. 11. 1962 (1961).

Thelephora calcea Pers., Syn. Fung. 181. 1801. – *Corticium calceum* (Pers.) Quél., Fl. Myc. 6. 1888. – *Sebacina calcea* (Pers.) Bres., Fungi Trid. **2**: 64, Pl. 175. 1898.

Basidiocarp corticioid, resupinate, coriaceous, not gelatinous. Hymenophore smooth, farinose, white to greyish, waxy to almost dry, resembling white paint.

Hyphal system monomitic. Hyphae 1–4 μm wide, with clamps. Cystidia absent. Basidia 13–20 × 10–13 μm, oval to pyriform, longitudinally septate, 2–4-celled. Basidiospores 12.0–15.0 × 4.5–6.0 μm, allantoid or suballantoid, thin-walled, hyaline, smooth, with granular contents, non-amyloid.

SPECIMEN EXAMINED. Paekdu-san Mts: *ca* 15 km SE of Paekdu-san Mt. peak (1), *ca* 20 km NW of Samji-yon town (8), alt. *ca* 1900 m, taiga with *Abies nephrolepis*, *Larix olgensis* and *Picea ajanensis*, on fallen dead trunk of coniferous tree, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28893.

DISTRIBUTION IN ASIA. China, Israel, Kazakhstan, Mongolia and Russia (West Siberia, vicinity of Yakutsk and Far East).

NOTES. New to North Korea.

REFERENCES. Binyamini (1998: 312, Fig. 6); Breitenbach & Kränzlin (1986: 56, Pl. 11); Ginns & Lefebvre (1993: 66); Govorova (1997: 12); Hansen & Knudsen (1997: 103, Fig. 46); Karpova-Benois (1972: 140); Mukhin (1993: Tab. 1); Pilát (1934: 332; 1936: 421; 1940: 62); Raitviir (1967: 52, Fig. 36); Ryman & Holmĺsen (1984: 65); Shvartsman (1964: 62); Wojewoda (1977: 106, Fig. 37; 1981: 110).

Pseudohydnum gelatinosum (Scop.: Fr.) P. Karst.

Not. Faun. Fl. Fenn. **9**: 374. 1868.

Hydnum gelatinosum Scop., Fl. Carniol., ed. 2, **2**: 472. 1772. – *H. gelatinosum* Scop.: Fr., Syst. Mycol. **1**: 407. 1821. – *Tremellodon gelatinosus* (Scop.: Fr.) Fr., Hym. Eur. 618. 1874.

Basidiocarp 25–40 mm across, 5–15 mm thick, imbricate, pileate, spatulate to flabellate, with short stipe or subsessile. Stipe (if present) lateral, up to 30 mm long. Upper sterile surface rough or papillose, white to grey. Hymenophore hydnaceous, densely spinose, whitish or greyish-white. Spines up to 4 mm long, conic, white to greyish. Flesh gelatinous, soft, translucent, without odour or taste.

Hyphal system monomitic. Hyphae 1.5–2.0 μm wide, thin-walled, smooth, hyaline, with clamps. Cystidia absent. Hypobasidia 8.0–14.0 × 6.0–8.5 μm, broadly elliptic, pyriform to subglobose, longitudinally septate, 2–4-celled, with 2–4 sterigmata (epibasidia). Basidiospores 4.5–6.0 × 4.0–5.0 μm, globose to subglobose, thin-walled, hyaline, smooth, with granular contents, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 5 km S of Samji-yon town (8), alt. *ca* 1300 m, mixed taiga, on stump of unidentified tree, 5 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28857; *ca* 15 km NE of Samji-yon town, taiga with *Larix olgensis*, on stump of unidentified coniferous tree, 4 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28863.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (Altai, Siberia and Far East).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1978: 189; 1983a: 130); Azbukina *et al*. (1984: 31); Breitenbach & Kränzlin (1986: 62, Pl. 19); Ginns & Lefebvre (1993: 132); Gorbunova (1997: 15); Govorova (1997: 12); Hansen & Knudsen (1997: 110); Imazeki & Hongo (1975, **1**: 131, Fig. b; **2**: 170, Pl. 57); Jahn (1979: 72, Pl. 38); Mukhin (1993: Tab. 1); Raitviir (1967: 76); Teng (1996: 267, Fig. 236, as *Tremellodon gelatinosum*); Vasilyeva (1978: 186, Pl. 228); Wojewoda (1977: 81, Fig. 1D, 2M, Pl. III; 1981: 63, Pl. IX: 6); Zang & Zong (1983: 63, 69, Pl. 14: 2).

Sebacina incrustans (Pers.: Fr.) Tul.

J. Linn. Soc. (bot.) **13**: 36. 1871.

Corticium incrustans Pers., Obs. Mycol. **1**: 39. 1796. – *C. incrustans* Fr., Syst. Mycol. **1**: 448. 1821. – *Sebacina laciniata* (Bull.) Bres., Ann. Mycol. **1**: 116. 1903.

Basidiocarp up to 1 mm thick, resupinate, attached slightly to substrate. Consistency gelatinous, wax-like, cartilaginous or almost coriaceous. Hymenophore smooth to undulating-tuberculate, whitish cream, greyish or yellow, sometimes with pink tint.

Hyphal system monomitic. Hyphae 2.0–3.5 μm, thin-walled, hyaline, without clamps. Cystidia absent. Hypobasidia 15–20 × 8–12 μm, 2–4-celled, longitudinally septate, with 2–4 very long epibasidia (sterigmata). Basidiospores 13–17 × 8–10 μm, elliptic to oval, thin-walled, hyaline, smooth, with granular contents (Fig. 152).

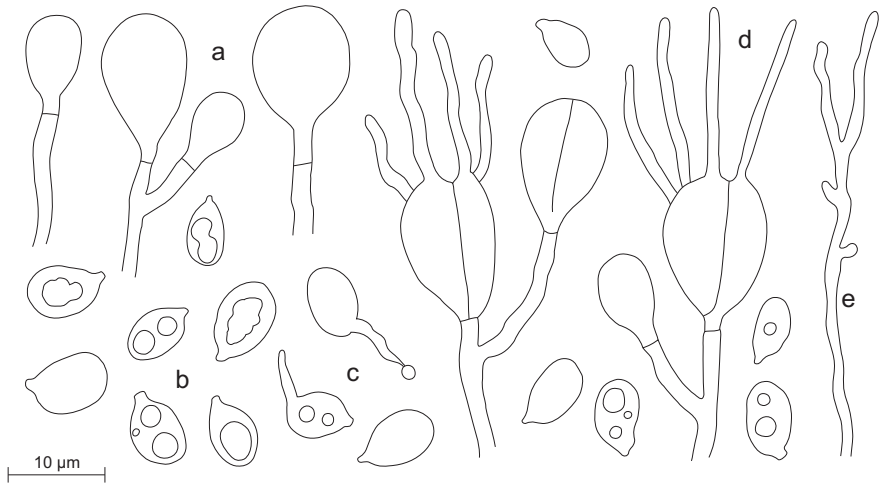


Fig. 152. *Sebacina incrustans* (Pers.: Fr.) Tul.: a – young basidia, b – basidiospores, c – germinating basidiospores, d – mature basidia, e – hyphae (KRAM-F 28866).

SPECIMENS EXAMINED. Myohyang-san Mts: near Sangwon-am Monastery (19), alt. *ca* 600 m, mixed forest, encrusting dead, fallen leaves, 5 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28866; near Myohyang-san Hotel (20), mixed forest, on ground and on fallen leaves, 4 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28867; near Kuchung Falls (26), alt. *ca* 800 m, in mixed forest on fallen dead leaves and twigs, 7 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28868; Wonsan town (50), Botanical Garden, on soil and on bases of stumps, also encrusting living herbaceous plants, e.g. grass, 20 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28865; Kumgang-san Mts: near Onjong-ri village (60), alt. *ca* 50–100 m, mixed forest, on dead and living leaves of herbaceous plants, 15 Aug. 1983, *leg. W. Wojewoda*, KRAM-F 28869.

DISTRIBUTION IN ASIA. China, Iran, Korea and Russia (e.g. Far East).

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 129); Breitenbach & Kränzlin (1986: 58, Pl. 15); Ginns & Lefebvre (1993: 142); Govorova (1997: 12); Hallenberg (1981: 500); Hansen & Knudsen (1997: 105, Fig. 64); Pilát (1940: 62); Raitviir (1967: 59, Fig. 47); Shvartsman (1964: 59, Figs 8–9); Teng (1996: 270, Fig. 237); Wojewoda (1977: 124, Fig. 2C, 45, Pls. XVII, XVIII and XIX; 1981: 167, Pl. LVII).

Tremellaceae Fr. 1821

Tremella encephala Pers.

Syn. Meth. Fung. 623. 1801.

Basidiocarp hemispherical-pulvinate. Hymenophore tuberculate-undulating, cerebriform, white, yellowish, ochraceous or pale pinkish brown.

Hyphal system monomitic. Hyphae 1.5–4.0 µm, hyaline, smooth, thin- or thick-walled, with clamps. Basidia (hypobasidia) 12–20 × 12–18 µm, subglobose, longitudinally septate, with 2 long epibasidia. Basidiospores 8.0–11.0 × 7.5–9.0 µm, globose or short-elliptic, smooth, hyaline, non-amyloid, with oil-drops and distinct apiculus.

SPECIMENS EXAMINED. Paekdu-san Mts: *ca* 30 km E of peak of Paekdu-san Mt. (1), alt. *ca* 1700 m, 3 Sept. 1983, *leg. W. Wojewoda*, KRAM-F 28862; *ca* 25 km N of Samjiyon town (8), alt. *ca* 1600 m, on ?*Picea* sp., 30 June 1986, *leg. W. Wojewoda*, KRAM-F 28861. – Taiga, in mycelium of *Stereum sanguinolentum*, growing on fallen trunks of coniferous trees.

DISTRIBUTION IN ASIA. Georgia, Japan, Kazakhstan, Mongolia and Russia (West Siberia, Far East, Primorski Krai).

NOTES. New to North Korea. Known also from Europe and North America (Canada and United States).

REFERENCES. Breitenbach & Kränzlin (1986: 66, Pl. 26); Ginns & Lefebvre (1993: 169); Govorova (1997: 13); Jahn (1979: 96, Pl. 65); Mukhin (1993: Tab. 1); Raitviir (1967: 72); Wojewoda (1977: 171, Fig. 61; 1981: 140, Pl. I: 5; XLVIII: 1).

Tremella foliacea Pers.

Obs. Mycol. **2**: 98. 1799.

Basidiocarp 30–100 mm in diam., consisting of leaf-like lobes, caramel brown, reddish orange-brown to brown-violet. Individual lobes undulating. Consistency gelatinous.

Hyphal system monomitic. Hyphae 2–6 µm wide, smooth, hyaline, thin-walled, with clamps. Basidia (hypobasidia) 13–16 × 10–13 µm, globose or oval, longitudinally septate, 2–4-celled, with 2–4 epibasidia (sterigmata). Basidiospores 8–10 × 6–8 µm, oval to ovoid-globose, smooth, hyaline, thin-walled, with large apiculus, non-amyloid.

SPECIMENS EXAMINED. Paekdu-san Mts: shore of Samji-yon Lake (7), alt. *ca* 1400 m, mixed taiga with *Abies nephrolepis*, *Betula platyphylla*, *Larix olgensis*, *Picea ajanensis*, and *P. koraiensis*, on fallen trunk of *Betula platyphylla*, 30 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28897; Myohyang-san Mts: near Unson Falls (23), alt. *ca* 600 m, mixed forest, on living attached twig of *Quercus mongolica*, 14 July 1986, *leg. W. Wojewoda*, KRAM-F 28898; slope of Wonman Mt. (31), alt. *ca* 1000 m, mixed forest, fallen trunk of *Betula* sp., 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 28899; coniferous zone, forest with *Picea jezoensis*, *P. koraiensis*, *Pinus koraiensis* and *Thuja koraiensis*, on stump of coniferous tree, 17 Sept. 1984, *leg. W. Wojewoda*, KRAM-F 29306; Suian-san Mts (48), alt. *ca* 200 m, mixed forest, on trunk of *Quercus* ?*mongolica*, 6 July 1986, *leg. W. Wojewoda*, KRAM-F 28896; Kumgang-san Mts: Okryu-dong Valley, near Kuryong Falls (59), alt. *ca* 700 m, mixed forest, on fallen dead trunk of *Quercus* ?*mongolica*, 20 July 1986, *leg. W. Wojewoda*, KRAM-F 28895.

DISTRIBUTION IN ASIA. China, Japan, Korea and Russia (Siberia and Far East).

NOTES. Known also from Europe and North America (Canada and United States).

REFERENCES. Anonymous (1983a: 129); Azbukina *et al.* (1984: 31); Breitenbach & Kränzlin (1986: 66, Pl. 27); Ginns & Lefebvre (1993: 170); Govorova (1997: 13); Imazeki & Hongo (1975, **2**: 170, Pl. 57: 333); Jahn (1979: 70, Pl. 36); Mukhin (1993: Tab. 1); Pilát (1934: 332); Raitviir (1967: 75); Teng (1996: 268); Wojewoda (1977: 193, Figs 1 I, 75).

Tremella fuciformis Berk.

Hook. London J. Bot. **8**: 277. 1856.

T. flavidula Lloyd, Mycol. Writ. **7**: 1276. 1924.

Basidiocarp up to 60 mm broad, composed of thin, crispate, flattened, foliaceous lobes, gelatinous, whitish, translucent.

Hyphae with clamps. Probasidia subglobose. Metabasidia 10.0–14.5 × 7.5–12.5 µm, ovoid. Sterigmata 4, up to 30 × 3 µm, cylindric. Basidiospores elliptic, ovate or subglobose, 6.6–8.4 × 4.2–7.2 µm.

SPECIMEN EXAMINED. Ryongak-san Mt. (42), alt. *ca* 250 m, mixed forest with *Castanea* sp., *Pinus densiflora*, and *Quercus* sp., on stump of ?*Quercus* sp., 16 June 1986, *leg. W. Wojewoda*, KRAM-F 29316.

DISTRIBUTION IN ASIA. China (e.g. Tibet), Japan, Korea and Russia (e.g. Far East).

NOTES. Pantropical species but known also from temperate Northern Hemisphere (Europe and North America: Canada and United States). Cultivated for food in the Asiatic Far East.

REFERENCES. Anonymous (1978: 188; 1983a: 130); Ginns & Lefebvre (1993: 170); Govorova (1997: 13); Imazeki & Hongo (1975, **1**: 131); Lowy (1971: 103); Roberts & Meijer (1997: 278, Fig. 12); Teng (1996: 267); Wen & Sun (1999: 362); Wojewoda (1977: 189, Fig. 73, Pls. XI & XII; 1981: 151); Zang & Zong (1983: 63).

REFERENCES

ADHIKARI M. K. 1990. History of mycological explorations in Nepal. *Cryptog. Mycol.* **11**(2): 111–128.

ALLESIO C. L. 1985. Fungi Europaei. **2**. *Boletus* Dill. ex L. Libreria editrice Biella Giovanna, Saronno.

ANONYMOUS. 1964. Index of the Korean phanerogamic plants. Pyongyang (in Korean).

ANONYMOUS. 1967. Distribution maps of plant diseases. Ed. 2. Map No. 275. Commonwealth Mycological Institute, Kew.

ANONYMOUS. 1978. Coloured illustrations of the Korean Fungi. Pyongyang (in Korean).

ANONYMOUS. 1980. Mt. Kumgang-san. International Tourist Bureau, Pyongyang.

ANONYMOUS. 1982a. Korean Review. Foreign Languages Publishing House, Pyongyang.

ANONYMOUS. 1982b. Mt. Myohyang. Foreign Languages Publishing House, Pyongyang.

ANONYMOUS. 1982c. Mt. Paekdu. Foreign Languages Publishing House, Pyongyang.

ANONYMOUS. 1983a. Index of the Korean cryptogamic plants. Pyongyang (in Korean).

ANONYMOUS. 1983b. Mushroom. *Korea* **325**: 13.

ANTONÍN V. & HAUSKNECHT A. 1993. First European records of *Hohebuehelia angustata* (Berk.) Sing. *Czech Mycol*. **47**(1): 39–44.

ANTONÍN V. & NOORDELOOS M. E. 1993. A monograph of *Marasmius*, *Collybia* and related genera in Europe. Part 1. *Marasmius*, *Setulipes*, and *Marasmiellus*. *Libri Botanici* **8**: 1–229.

ANTONÍN V. & NOORDELOOS M. E. 1997. A monograph of *Marasmius*, *Collybia* and related genera in Europe. Part 2. *Collybia*, *Gymnopus*, *Rhodocollybia*, *Crinipellis*, *Chaetocalathus*, and additions to *Marasmiellus*. *Libri Botanici* **17**: 3–256.

ARNOLD R. W. 1969. Bestimmungsschlüssel für die wichtigsten und häufigsten mykophilen Aascomyceten und Hyphomyceten. *Z. Pilzk*. **35**(1–2): 41–45.

ARNOLDS E. 1983. Ecology and coenology of macrofungi in grasslands and moist heathlands in Drentghe, the Netherlands. 2. *Biblioth*. *Mycol*. **90**: 1–150.

ARNOLDS E. 1990. Tribus Hygrocybeae (Kühner) Bas & Arnolds; Tribus Hygrophoreae (Kühner) Bas & Arnolds. In: C. BAS, TH. W. KUYPER, M. E. NOORDELOOS & E. C. VELLINGA (eds), *Flora Agaricina Neerlandica* **2**: 70–133. A. A. Balkema, Rotterdam/Brookfield.

AZBUKINA Z. M., BARDUNOV L. W., BARINOVA S. S., BEZDELEVA T. A., BULAKH E. M., BUNKINA I. A., BUCH T. G., GAMBARIAN S. K., EGOROVA L. N., KIAZHEVA L. A., KUKHARENKO L. A., MEDVEDEVA L. A., OKSENIUK G. I., PARMASTO E. KH., KHAVKINA O. K., KHARKEWICH S. S. & CHERDANTSEVA V. JA. 1984. Flora Verkhneyssurijskogo Statsionara. In: Z. M. AZBUKINA & S. S. KHARKEWICH (eds), Akademia Nauk SSSR, Dal'nevostochnyy Nauchniy Tsentr, Biologo-pochvenniy Institut, Vladivostok.

BAS C. 1983a. *Flammulina* in Western Europe. *Persoonia* **12**(1): 51–66.

BAS C. 1983b. On the application of the name *Agaricus lacrymabundus* Bull.: Fr. *Persoonia* **12**(1): 103–106.

BAS C.1995. Tribus Pseudohiatulae (Sing.) Sing. In: C. BAS, TH. W. KUYPER, M. E. NOORDELOOS & E. C. VELLINGA (eds), *Flora Agaricina Neerlandica* **3**: 170–173. A. A. Balkema. Rotterdam/Brookfield.

BASSO M. T. 1999. Fungi Europaei. **7**. *Lactarius* Pers. Mykoflora, Alassio.

BENEDIX E. H. 1959. Zur Verbreitung des Riesentränschlings *Stropharia ferrii* Bres. in Deutschland. *Westfäl*. *Pilzbriefe* **2**(4): 49–54.

BIGELOW H. E. 1982. North American Species of *Clitocybe*. Part 1. *Beih*. *Nova Hedwigia* **72**: 1–280.

BIGELOW H. E. 1985. North American Species of *Clitocybe*. Part 2. *Beih*. *Nova Hedwigia* **81**: 281–471.

BINYAMINI N. 1977. Rare and interesting records of Israeli agaric flora. *Nova Hedwigia* **28**(4): 759–768.

BINYAMINI N. 1998. Addenda to the lignicolous Aphyllophorales, Ceratobasidiales, and Auriculariales Fungi from Israel. VIII. *Israel J*. *Plant Sci*. **46**(4): 309–313.

BITNER K. 1953. Fungi parasitizing on mushrooms. *Acta Soc*. *Bot*. *Poloniae* **22**(4): 689–722 (in Polish with English summary).

BOEKHOUT T. 1999. *Xerula* Maire emend. Dörfelt. In: C. BAS, TH. W. KUYPER, M. E. NOORDELOOS & E. C. VELLINGA (eds), *Flora Agaricina Neerlandica* **4**: 181–184 . A. A. Balkema. Rotterdam/Brookfield.

BOEKHOUT T. & NOORDELOOS M. E. 1999. *Tricholomopsis* Sing. In: C. BAS, TH. W. KUYPER, M. E. NOORDELOOS & E. C. VELLINGA (eds), *Flora Agaricina Neerlandica* **4**: 151–152. A. A. Balkema. Rotterdam/Brookfield.

BOJARCZUK T. & BORATYŃSKI A. 1985. Dendrological notes from Democratic People's Republic of Korea. *Arbor*. *Kórnickie* **29**(1984): 171–186 (in Polish with English summary).

BON M. 1974. *Agrocybe sphaleromorpha* (Bull.: Fr.) Fayod 1889. *Doc*. *Mycol*. **4**(15): 51–52.

BON M. 1984. Les Tricholomes de France et d'Europe occidentale. Editions Lechevalier S.A.R.L., Paris. *Encyclopédie Mycologique* **36**: 1–324.

BON M. 1997. Flore Mycologique d'Europe. 4. Les Clitocybes, Omphales et ressemblants. Tricholomataceae (2). Clitocyboideae. *Doc*. *Mycol*., *Mémoire hors série* **4**: 1–181.

BONDARTSEV A. S. 1953. Trutovye griby evropeiskoi czasti SSSR i Kavkaza. Izdatel'stvo Akademii Nauk SSSR, Moskva–Leningrad.

BONDARTSEV A. S. & LIUBARSKIY L. W. 1964. Polyporaceae rarae et pro parte asiatica URSS ignotae. *Novitates systematicae plantarum non vascularum* **1964**: 175–186.

BONDARTSEVA M. A. & PARMASTO E. KH. 1986. Familiae Hymenochaetaceae, Lachnocladiaceae, Coniophoraceae, Schizpophyllaceae. In: M. V. GORLENKO (ed.), *Clavis diagnostica Fungorum URSS*. *Ordo Aphyllophorales*. **1**. Nauka, Leningrad (in Russian).

BORATYŃSKI A. 1984. Herbarium materials of trees and shrubs from the Democratic People's Republic of Korea. *Fragm*. *Florist*. *Geobot*. **28**(1982): 555–589.

BOTTOMLEY A. M. 1948. Gasteromycetes of South Africa. *Bothalia* **4**(3): 473–810.

BRAND A. W. 1990. Profiles of fungi 28. *Mycologist* **4**(2): 87.

BREITENBACH J. & KRÄNZLIN F. 1984. Fungi of Switzerland. **1**. Ascomycetes. Verlag Mykologia, Lucerne.

BREITENBACH J. & KRÄNZLIN F. 1986. Fungi of Switzerland. **2**. Heterobasdiomycetes (jelly fungi), Aphyllophorales (non

gilled-fungi), Gasteromycetes (puffballs). Verlag Mykologia, Lucerne.

Breitenbach J. & Kränzlin F. 1991. Fungi of Switzerland. **3**. Boletes and agarics 1st part: Strobilomycetaceae and Boletaceae, Paxillaceae, Gomphidiaceae, Hygrophoraceae, Tricholomataceae, Polyporaceae (lamellate). Verlag Mykologia, Lucerne.

Breitenbach J. & Kränzlin F. 1995. Fungi of Switzerland. **4**. Agarics 2nd part: Entolomataceae, Pluteaceae, Amanitaceae, Agaricaceae, Coprinaceae, Bolbitiaceae, Strophariaceae. Verlag Mycologia, Lucerne.

Breitenbach J. & Kränzlin F. 2000. Fungi of Switzerland. **5**. Agarics 3rd part: Cortinariaceae. Verlag Mycologia, Lucerne.

Bresadola J. 1903. Fungi polonici novi a cl. viro B. Eichler lecti. *Ann. Mycol.* **1**: 65–131.

Bresadola J. 1927–1933. Iconographia mycologica. Societá Botanica Italiana, Milano (vol.: **1**–**2**, 1927; **3–6**, 1928; **7**–**12**, 1929; **13**–**16**, 1930).

Bruchet G. 1970. Contribution a l'étude du genre *Hebeloma* (Fr.) Kummer; Partie spéciale. *Bull. Mens Soc. Linn. Lyon* **39**, *Supplement* **6**: 1–132.

Burdsall H. H. 1985. A contribution to the taxonomy of the genus *Phanerochaete* (Corticiaceae, Aphyllophorales). *Mycol. Mem.* **10**: 1–165.

Cacialli G., Caroti V. & Doveri F. 1996. *Laccaria trichodermophora* Mueller: un nome nuovo per una vecchia specie. *Doc. Mycol.* **26**(103): 37–43.

Candusso M. 1997. Fungi Europaei. **6**. *Hygrophorus* s.l. Libreria Basso, Alassio.

Candusso M. & Lansoni G. 1990. Fungi Europaei. **4**. *Lepiota* s.l. Libreria Editrice Biella Giovanna, Saronno.

Capellano A. 1976. Position systematique du genre *Macrocystidia* Heim ex Josserand. *Bull. Trimestriel Soc. Mycol. France* **92**(2): 221–228.

Capelli A. 1984. Fungi Europaei. **1**. *Agaricus* L.: Fr. (*Psalliota* Fr.). Libreria editrice Biella Giovanna, Saronno.

Cetto B. 1980a. Der große Pilzführer. **1**. BLV Verlagsgesellschaft, München–Wien–Zürich.

Cetto B. 1980b. Der große Pilzführer. **2**. BLV Verlagsgesellschaft, München–Wien–Zürich.

Cetto B. 1983. Der große Pilzführer. **3**. BLV Verlagsgesellschaft, München–Wien–Zürich.

Cetto B. 1984. Der große Pilzführer. **4**. BLV Verlagsgesellschaft, München–Wien–Zürich.

Chamuris G. P. 1985. On distinguishing *Stereum gausapatum* from the "*S. hirsutum*-complex". *Mycotaxon* **22**: 1–12.

Chamuris G. P. 1988. The non-stipitate stereoid fungi in the northeastern United States and adjacent Canada. *Mycol. Mem.* **14**: 1–247.

Chen Z. Ch. 1975. Notes on new Formosan forest fungi II. Some lignicolous fungi. *Taiwania* **20**(2): 201–212.

Chen Z. Ch. 1978. Note on new Formosan forest fungi. VI. Genus *Cordyceps* and their distribution in Taiwan. *Taiwania* **23**: 153–162.

Christiansen M. P. 1960. Danish Resupinate Fungi. Part II. Homobasidiomycetes. *Dansk Bot. Ark.* **19**(2): 59–388.

Clémençon H. 1982a. Kompendium der Blätterpilze II. *Marasmius*. *Z. Mykol.* **48**(1): 3–16.

Clémençon H. 1982b. Kompendium der Blätterpilze Europaische omphalinoide Tricholomataceae. *Z. Mykol.* **48**(2): 195–237.

Clémençon H. 1984. Kompendium der Blätterpilze. *Clitocybe*. *Beih. Z. Mykol.* **5**(1): 1–68.

Cooke M. C. 1884. Illustrations of British Fungi (Hymenomycetes). Williams & Norgate, London.

Corner E. J. H. 1950. A monograph of *Clavaria* and allied genera. Oxford Univeristy Press, London.

Corner E. J. H. 1966. A monograph of cantharelloid Fungi. Oxford University Press, London.

Corner E. J. H. 1968. A monograph of *Thelephora* (Basidiomycetes). *Beih. Nova Hedwigia* **27**: 1–110 + Pls 6.

Cunningham G. H. 1944 (Reprint 1979). The Gasteromycetes of Australia and New Zealand. *Biblioth. Mycol.* **67**: 1–236.

Cunningham G. H. 1963. The Thelephoraceae of Australia and New Zealand. *New Zealand Dept. Sci. Industr. Res. Bull.* **145**: 1–359.

Dähncke R. M. & Dähncke S. M. 1980. 700 Pilze in Farbfotos. 3. Auflage. Verlag Aarau, Stuttgart.

Dai Y. C. 1999. *Phellinus* sensu lato (Aphyllophorales, Hymenchaetaceae) in East Asia. *Acta Bot. Fenn.* **166**: 1–115.

Dai Y. C. 2000. Changbai wood-rotting fungi 12. Species of *Hymenochaete* (Basidiomycota). *Mycotaxon* **76**: 445–450.

Dai Y. C. & Niemelä T. 1997. Synopsis of the genus *Inonotus* (Basidiomycetes) sensu lato in China. *Mycotaxon* **65**: 273–283.

Davydkina T. D. 1980. Stereumovye griby Sovetskovo Soyuza. Nauka, Leningrad.

Demoulin V. 1968. Gasteromycètes de Belgique. *Bull. Jard. Bot. Belg.* **38**: 1–101.

Demoulin V. 1969. Les Gasteromycètes. Les Naturalistes Belges, Bruxelles.

Demoulin V. & Dring D. M. 1975. Gasteromycetes of Kivu (Zaïre), Rwanda and Burundi. *Bull. Jard. Bot. Belg.* **45**(3–4): 339–372.

Dennis R. W. G. 1968. British Ascomycetes. Verlag J. Cramer, Lehre.

Dennis R. W. G. 1970. Fungus flora of Venezuela and adjacent countries. *Kew Bull., Addit. Ser.* **3**: 1–531.

Dennis R. W. G. 1986. Fungi of the Hebrides. Royal Botanic Gardens, Kew.

Dermek A. & Pilát A. 1988. Poznajemy grzyby. Ossolineum, Wrocław.

Doi Y. 1991. Type Collection in the Herbarium of National Science Museum, Tokyo (TNS) Agaricales Named by Dr. Tsuguo Hongo (1). *Bull. Natl. Sci. Mus. Tokyo*, *Ser. B*, **17**(2): 49–58.

Domański S. 1965. Podstawczaki (Basidiomycetes), bezblaszkowe (Aphyllophorales), żagwiowate I (Polyporaceae I), szczeciniakowate I (Mucronoporaceae I). In: J. Kochman & A. Skirgiełło (eds), *Flora Polska. Rośliny zarodnikowe Polski i ziem ościennych. Grzyby* (*Fungi*). **1**. Państwowe Wydawnictwo Naukowe, Warszawa.

Domański S. 1972. Fungi. Polyporaceae I (resupinatae), Mucronoporaceae I (resupinatae). Foreign Scientific Publications Department of the National Center for Scientific, Technical and Economic Information, Warsaw.

Domański S. 1974. Bondarzewiaceae, Fistulinaceae, Ganodermataceae, Polyporaceae. In: S. Domański (ed.), *Mała flora grzybów*. **1**(1). *Basidiomycetes* (*Podstawczaki*), *Aphyllophorales* (*Bezblaszkowe*). Państwowe Wydawnictwo Naukowe, Warszawa–Kraków.

Domański S. 1975. Auriscalpiaceae, Bankeraceae, Clavicoronaceae, Coniophoraceae, Echinodontiaceae, Hericiaceae, Hydnaceae, Hymenochaetaceae, Lachnocladiaceae. In: S. Domański (ed.), *Mała flora grzybów*. **1**(2). *Basidiomycetes* (*Podstawczaki*), *Aphyllophorales* (*Bezblaszkowe*). Państwowe Wydawnictwo Naukowe, Warszawa–Kraków.

Domański S. 1976. *Resinicium bicolor* in Poland. *Mem. New York Bot. Gard.* **28**(1): 58–66.

Domański S. 1978. Amylariaceae, Aphelariaceae, Cantharellaceae, Gomphaceae, Physalacriaceae, Punctulariaceae, Sparassidaceae, Thelephoraceae. In: S. Domański (ed.), *Mała flora grzybów*. **1**(3). *Basidiomycetes* (*Podstawczaki*), *Aphyllophorales* (*Bezblaszkowe*). Państwowe Wydawnictwo Naukowe, Warszawa–Kraków.

Domański S. 1984. Clavariaceae, Clavariadelphaceae, Clavulinaceae, Pterulaceae, Ramariaceae, Stephanosporaceae, Gomphaceae (II), Hericiaceae (II). In: S. Domański (ed.), *Mała flora grzybów*. **1**(4). *Basidiomycetes* (*Podstawczaki*), *Aphyllophorales* (*Bezblaszkowe*). Państwowe Wydawnictwo Naukowe, Warszawa–Kraków.

Domański S. 1988. *Acanthobasidium–Irpicodon*. In: S. Domański (ed.), *Mała flora grzybów*. **1**(5). *Basidiomycetes* (*Podstawczaki*), *Aphyllophorales* (*Bezblaszkowce*), *Corticiaceae*. Państwowe Wydawnictwo Naukowe, Warszawa–Kraków.

Domański S. 1991. *Kavinia–Rogersella*, *Lindtneria*. In: S. Domański (ed.), *Mała flora grzybów*. **1**(6). *Basidiomycetes* (*Podstawczaki*), *Aphyllophorales* (*Bezblaszkowce*), *Stephanosporales* (*Stefanosporowce*), *Corticiaceae*, *Stephanosporaceae*. Państwowe Wydawnictwo Naukowe, Warszawa–Kraków.

Domański S. 1992. *Sarcodontia–Ypsilonidium*, *Christiansenia* & *Syzygospora*. In: S. Domański (ed.), *Mała flora grzybów*. **1**(7). *Basidiomycetes* (*Podstawczaki*), *Aphyllophorales* (*Bezblaszkowce*), *Corticiaceae*. Instytut Botaniki im. W. Szafera PAN, Kraków.

Domański S., Orłoś H. & Skirgiełło A. 1967. Podstawczaki (Basidiomycetes), bezblaszkowe (Aphyllophorales), żagwiowate II (Polyporaceae II), szczecinkowate II (Mucronoporaceae pileatae), lakownicowate (Ganodermataceae), bondarcewowate (Bondarzewiaceae), boletkowate (Boletopsidaceae), ozorkowate (Fistulinaceae). In: J. Kochman & A. Skirgiełło (eds), *Flora Polska. Rośliny zarodnikowe Polski i ziem ościennych. Grzyby* (*Mycota*). **3**. Państwowe Wydawnictwo Naukowe, Warszawa.

Domański S., Orłoś H. & Skirgiełło A. 1973. Fungi. Polyporaceae II (pileate), Mucronoporaceae II (pileate), Ganodermataceae, Bondarzewiaceae, Boletopsidaceae, Fistulinaceae. Foreign Scientific Publications Department of the National Center for Scientific, Technical and Economic Information, Warsaw.

Donk M. A. 1966. Check-list of European hymenomycetous Heterobasidiae. *Persoonia* **4**(2): 145–335.

Donk M. A. 1974. Check list of European polypores. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschapen*, *Afd. Natuurkunde*, *2 Ser.* **62**: 1–469.

Dörfelt H. 1979. Taxonomische Studien in der Gattung *Xerula* R. Mre. *Feddes Repert.* **90**(5–6): 363–388.

Dörfelt H. 1981. Taxonomische Studien in der Gattung *Xerula* R. Mre. V. *Feddes Repert.* **92**(9–10): 631–674.

Dörfelt H. 1983. Taxonomische Studien in der Gattung *Xerula* R. Mre (VI). *Feddes Repert.* **94**(1–2): 43–85.

Dörfelt H. 1985. Die Erdsterne. A. Ziemsen Verlag, Wittenberg Lutherstadt.

Dring D. M. 1980. Clathraceae. *Kew Bull.* **35**(1): 1–96.

Dueñas M. 2002. Annotated List of Heterobasidiomycetous Fungi for the Iberian Peninsula and Balearic Islands. *Biblioth. Mycol.* **196**: 1–90.

Eckblad F.-E. 1957. Some Gasteromycetes from Tirich Mir, Chitral State, Western Pakistan collected by Per Wendelbo. *Scientific Results of the Norwegian Expedition to Tirich Mir 1950* **5**: 37–39.

Eckblad F.-E. 1970. Gasteromycetes from Iraq, Iran and Afghanistan. *Nytt Magasin for Botanikk* **17**(3–4): 129–138.

Eckblad F.-E. 1976. Contributions to the Gasteromycet-Flora of Iran. *Iranian J. Bot.* **1**(1): 65–69.

Eckblad F.-E. & Ellingsen H. J. 1984. Gasteromycetes from China collected by Dr. Harry Smith 1921–1923, 1924–1925 and 1934. *Sydowia* **37**: 29–42.

Elborne S. A. 1995. *Hohenbuehelia* S. Schulz. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica*. **3**: 158–166. A. A. Balkema. Rotterdam/Brookfield.

Ellis M. B. & Ellis J. P. 1990. Fungi without gills (Hymenomycetes and Gasteromycetes). An identification book. Chapman & Hall, London.

Enderle M. & Laux H. E. 1980. Pilze auf Holz. Kosmos Gesellschaft der Naturfreunde Franckh'sche Verlagshandlung, Stuttgart.

Engel H., Krieglsteiner G. J., Dermek A. & Watling R. 1983. Die Gattung *Boletus* in Europa. Schneider-Druck, Graphissche Kunstanstalt, Weidhausen.

Eriksson J. & Ryvarden L. 1973. The Corticiaceae of North Europe. **2**. *Aleurodiscus–Confertobasidium*. Fungiflora, Oslo.

Eriksson J. & Ryvarden L. 1975. The Corticiaceae of North Europe. **3**. *Coronicium–Hyphoderma*. Fungiflora, Oslo.

Eriksson J. & Ryvarden L. 1976. The Corticiaceae of North Europe. **4**. *Hyphodermella–Mycoacia*. Fungiflora, Oslo.

Eriksson J., Hjortstam K. & Ryvarden L. 1978. The Corticiaceae of North Europe. **5**. *Mycoaciella–Phanerochaete*. Fungiflora, Oslo.

Eriksson J., Hjortstam K. & Ryvarden L. 1981. The Corticiaceae of North Europe. **6**. *Phlebia–Sarcodontia*. Fungiflora, Oslo.

Eriksson J., Hjortstam K. & Ryvarden L. 1984. The Corticiaceae of North Europe. **7**. *Schizopora–Suillosporium*. Fungiflora, Oslo.

Favre J. 1960. Catalogue descriptif des champignons supérieurs de la zone subalpine du Parc National Suisse. *Résultats des recherches scientifiques entreprises au Parc National Suisse* **6**: 325–610.

Fiasson J. L. & Niemelä T. 1984. The Hymenochaetales: a revision of the European poroid taxa. *Karstenia* **24**: 14–18.

Fischer M. 2000. *Porodaedalea* (*Phellinus pini* group, Basidiomycetes) in Europe: a new species on *Larix sibirica*, *P. niemelaei*. *Karstenia* **40**: 43–48.

Gerhardt E. 1990. Checkliste der Großpilze von Berlin (West) 1970–1990. *Englera* **13**: 1–251.

Gilbertson R. L. 1976. The genus *Inonotus* (Aphyllophorales: Hymenochaetaceae) in Arizona. *Mem. New York Bot. Gard.* **28**(1): 67–85.

Gilbertson R. L. & Ryvarden L. 1986. North American Polypores. **1**. *Abortiporus–Lindtneria*. Fungiflora, Oslo.

Gilbertson R. L. & Ryvarden L. 1987. North American Polypores. **2**. *Megasporoporia–Wrightoporia*. Fungiflora, Oslo.

Gilliam M. S. 1975. New North American species of *Marasmius*. *Mycologia* **67**(4): 817–844.

Gilliam M. S. 1976. The genus *Marasmius* in the Northeastern United States and adjacent Canada. *Mycotaxon* **4**: 1–144.

Ginns J. 1982. A monograph of the genus *Coniophora* (Aphyllophorales, Basidiomycetes). *Opera Bot.* **61**: 1–61.

Ginns J. H. & Freeman G. W. 1994. The Gloeocystidiellaceae (Basidiomycota, Hericiales) of North America. *Biblioth. Mycol.* **157**: 1–118.

Ginns J. & Lefebvre M. N. L. 1993. Lignicolous corticioid fungi (Basidiomycota) of North America. Systematics, distribution, and ecology. *Mycol. Mem.* **19**: 1–247.

Gorbunova I. A. 1997. The Macromycetes of some forest phytocoenosis of the North of Altai. *Mikol. Fitopatol.* **31**(3): 14–21 (in Russian with English summary).

Gorlenko M. B., Bondartseva M. A., Garibova L. W., Sidorova I. I. & Sizova T. P. 1980. Griby SSSR. Mysl', Moskva.

Gorlenko M. B., Sokolov D. V., Evlakova A. A., Litvinov M. A., Melik-Khachatrian D. G., Miľko A.A., Novoteľnova N. S., Parmasto E. Kh, Slepian E. I., Tomilin V. A., Bab'eva I. P, Vimba E. K., Bondartseva M. A., Vasiľkov B. P., Garibova L. V, Dudka I. A., D'yakov Yu. T., Karatygin I. P., Levkina L. M., Lekomtseva S. N, Prokhorov V. P., Raitviir A. G., Sidorova I. I., Sizova T. P., Sepanova M. Yu., Rarasov K. L. & Uspenskaya G. D. 1976. Griby. In: A. Fedorov (ed.), *Zhiz'n rasteniy*. **2**. Prosveshchenie, Moskva.

Govorova O. K. 1997. The Heterobasidiomycetous fungi on nature reserves of the Russian Far East. *Mikol. Fitopatol.* **31**(3): 10–13 (in Russian with English summary).

Govorova O. K. 1999. Clavarioid fungi from surroundings of the city of Vladivostok. *Mikol. Fitopatol.* **33**(4): 228–232 (in Russian with English summary).

Gulden G. 1980. Alpine *Galerina*s (Basidiomycetes, Agaricales) with special reference to their occurence in South Norway at Finse on Hardangervidda. *Norw. J. Bot.* **27**: 219–253.

Gulden G. 1987. The genus *Galerina* on Svalbard. In: G. A. Laursen, J. F. Ammirati & S. A. Redhead (eds), *Arctic and alpine mycology* **2**: 177–204. Plenum Press, New York and London.

Gulden G. & Jenssen K. M. 1988. Arctic and alpine Fungi **2**. Sopp Konsulenten Gulden, Jenssen, Stordal. Oslo.

Gumińska B. 1997. Basidiomycetes, Hygrophoraceae. In: A. Skirgiełło (ed.), *Fungi* (*Mycota*). **26**. Instytut Botaniki Uniwersytetu Jagiellońskiego, Kraków (in Polish with English keys).

Guzmán G. 1970. Monografia del genero "*Scleroderma*" Pers. emend. Fr. (Fungi – Basidiomycetes). *Darwiniana* **16**(1–2): 233–407.

Hallenberg N. 1978. Wood-Fungi (Corticiaceae, Coniophoraceae, Lachnocladiaceae, Thelephoraceae) in N. Iran. 1. *Iranian J. Pl. Pathol.***14**: 38–87.

Hallenberg N. 1981. Synopsis of wood-inhabiting Aphyllophorales (Basidiomycetes) and Heterobasidiomyces from N. Iran. *Mycotaxon* **12**(2): 473–502.

Hallenberg N. 1985. On the *Hypochnicium eichleri* complex (Basidiomycetes). *Mycotaxon* **24**: 431–436.

Halling R. E. 1983. The genus *Collybia* (Agaricales) in the Northeastern United States and adjacent Canada. *Mycol. Mem.* **8**: 1–148.

Hansen L. & Knudsen H. (eds). 1992. Nordic Macromycetes. **2**. Polyporales, Boletales, Agaricales, Russulales. Nordsvamp, Copenhagen.

Hansen L. & Knudsen H. (eds). 1997. Nordic Macromycetes. **3**. Heterobasidioid, aphyllophoroid and gastromycetoid Basidiomycetes. Nordsvamp, Copenhagen.

Hansen L. & Knudsen H. (eds). 2000. Nordic Macromycetes. **1**. Ascomycetes. Nordsvamp, Copenhagen.

Harmaja H. 1969. The genus *Clitocybe* (Agaricales) in Fennoscandia. *Karstenia* **10**: 5–168.

Harmaja H. 2002. *Amylolepiota*, *Clavicybe* and *Cystodermella*, new genera of the Agaricales. *Karstenia* **42**(2): 39–48.

Harmaja H. 2003. Notes in *Clitocybe s. lato* (Agaricales). *Ann. Bot. Fenn.* **40**: 213–218.

Hattori T. & Zang M. 1995. List of Polypores collected in East China. *Bull. Natl. Sci. Mus. Tokyo*, *Ser. B*, **1**(2): 95–105.

Heim R. 1931. Le genre *Inocybe*. *Encyclopédie Mycologique* **1**: 1–429 + Pls 35.

Hesler L. R. 1969. North American species of *Gymnopilus*. *Mycol. Mem.* **3**: 1–117.

Hjortstam K. & Ryvarden L. 1990. *Lopharia* and *Porostereum* (Corticiaceae). Fungiflora, Oslo.

Hjortstam K., Spooner B. M. & Oldridge S. G. 1990. Some Aphyllophorales and Heterobasidiomycetes from Sabah, Malaysia. *Kew Bull.* **45**(2): 303–322.

Hjortstam K., Larsson K.-H. & Ryvarden L. 1987. The Corticiaceae of North Europe. **1**. Introduction and keys. Fungiflora, Oslo.

Hjortstam K., Larsson K.-H. & Ryvarden L. 1988. The Corticiaceae of North Europe. **8**. *Phlebiella*, *Thanatephorus–Ypsilonidium*. Fungiflora, Oslo.

Holec J. 1998a. The taxonomy of *Pholiota aurivella* and *Pholiota adiposa* – a return to Batsch and Fries. *Czech Mycol.* **50**: 201–221.

Holec J. 1998b. *Pholiota aurivella* (colour plate). *Czech Mycol.* **50**: 325, Figs 3 & 4.

Holec J. 2001. The genus *Pholiota* in central and western Europe. *Libri Botanici* **20**: 1–220. IHV-Verlag, Eching bei München.

Holubova-Jechova V. 1976. *Haplotrichum* Link instead of *Oidium* Link, a necessary nomenclatural change. *Česká Mykol.* **30**(1): 3–4.

Holubova-Jechova V. 1980. Revision and subdivision of *Haplotrichum* – anamorphs of *Botryobasidium*. *Mycotaxon* **12**(1): 122–130.

Hora F. B. 1960. New Check List of British Agarics and Boleti. Part IV. *Trans. Brit. Mycol. Soc.* **43**: 440–459.

Horak E. 1968. Synopsis generum Agaricalium (Die Gattungstypen der Agaricales). *Beiträge zur Kryptogamenflora der Schweiz* **13**: 1–741.

Horak E. 1971. Studies on the genus *Descolea* Sing. *Persoonia* **6**(2): 231–248.

Horak E. 1977. The genus *Melanotus* Pat. *Persoonia* **9**: 305–327.

Horak E. 1978. *Pleuroflammula*. *Persoonia* **9**: 439–451.

Horak E. 1981. Notes on Taxonomy and Biogeography of *Rozites* Karsten. *Sydowia* **34**: 94–108.

Horak E. 1982. Agaricales in Antarctica and Subantarctica: distribution, ecology and taxonomy. In: G. A. Laursen & J. F. Ammirati (eds), *Arctic and alpine mycology*: 82–117. University of Washington Press, Seattle.

Horak E. 1983. Mycogeography in the South Pacific Region: Agaricales, Boletales. *Austral. J. Bot.*, *Supplement* **10**: 1–41.

Hrouda P. 2001. Pleurotoid fungi of the family Polyporaceae in the Czech Republic and Slovakia. *Czech Mycol.* **53**(1): 29–87.

Imazeki R. & Hongo T. 1975. Coloured illustrations of Fungi of Japan. **1**: 1–181; **2**: 1–238, Hoikusha Publ. CO., LTD, Osaka.

Jacobsson S. 1990. *Pholiota* in northern Europe. *Windahlia* **19**: 1–86.

Jahn H. 1971. Stereoide Pilze in Europa (Stereaceae Pil. emend. Parm. u. a., *Hymenochaete*) mit besonderer Berücksichtigung Ihres Vorkommens in der Bundesrepublik Deutschland. *Westfäl. Pilzbriefe* **8**(4–7): 69–176.

Jahn H. 1979. Pilze die an Holz wachsen. Verlag Bussesche Verlagshandlung, Herford.

Josserand M. 1937. Notes critiques sur quelques champignons de la région lyonnaise. *Bull. Trimestriel Soc. Mycol. France* **53**: 175–230.

Jülich W. 1972. Monographie der Athelieae (Corticiaceae, Basidiomycetes). *Willdenowia Beih.* **7**: 1–283.

Jülich W. 1982. Higher taxa of Basidiomycetes. *Biblioth. Mycol.* **85**(1981): 1–482.

Jülich W. 1984. Die Nichtblätterpilze, Gallertpilze und Bauchpilze. Aphyllophorales, Heterobasidiomycetes, Gastromycetes. In: H. Gams (ed.), *Kleine Kryptogamenflora*, *Band* **IIb/1**. *Basidiomyceten*. **1**. G. Fischer Verlag, Stuttgart–New York.

Jülich W. & Stalpers J. A. 1980. The resupinate non-poroid Aphyllophorales of the temperate Northern hemisphere. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschapen*, *Afd. Natuurkunde*, *Tweede Reeks* **74**: 1–335.

Karpova-Benois K. A. 1972. Fungi basidiales lignum destruentes et parasitici in Republica Autonomia Jacutiae inventi. *Novitates Systematicae Plantarum non Vascularium* **9**: 139–151 (in Russian).

Kiet T. T. 1998. Preliminary checklist of macrofungi of Vietnam. *Feddes Repert.* **109**(3–4): 257–277.

Kirk M. P., David P. F. & Stalpers J. C. 2001. Ainsworth & Bisby's Dictionary of the Fungi. 9 ed. CAB International, Wallinford.

Kits van Waveren E. 1985. The Dutch, French and British species of *Psathyrella*. *Persoonia*, *Supplement* **2**: 1–300.

Ko S. K. & Jung H. S. 1999. Phylogenic re-evaluation of *Trametes consors* based on mitochondrial small subunit ribosomal DNA sequences. *F. E. M. S. Microbiol. Lett.* **170**: 181–186.

Kobayasi Y. 1981. The Genus *Auricularia*. *Bull. Natl. Sci. Mus. Tokyo*, *Ser. B*, **7**(2): 41–67.

Komarova E. P. 1964. Opredelitel' trutovykh gribov BSSR. Izdatel'stvo Nauka i Tekhnika, Minsk.

Konrad P. & Maublanc A. 1924–1935. Icones selectae Fungorum. Paul Lechevalier, Paris.

Konrad P. & Maublanc A. 1948. Les Agaricales. *Encyclopédie Mycologique* **14**: 1–469.

Kotiranta H. & Saarenoksa R. 2002. New combinations in *Irpex* (Aphyllophorales, Basidiomycetes). *Polish Bot. J.* **47**(2): 103–107.

Kotlaba F. 1976. Contribution to the knowledge of the Turkish Macromycetes. *Česká Mykol.* **30**(3–4): 156–169.

Kotlaba F. 1984. Geographical distribution and ecology of polypores (Polyporales s. l.) in Czechoslovakia. Academia, Praha (in Czech with English summary).

Kotlaba F. 1987. *Stereum subtomentosum* its ecology and geographical distribution in Czechoslovakia. *Česká Mykol.* **41**: 207–218 (in Czech with English summary).

Koval' E. Z. 1974. Ad floram fungorum mycophilorum partis australis regionis Primorskensis (Oriens Extremus) notula. *Novosti Sist. Nizsh. Rast.* **1**(1): 202–206.

Kreisel H. 1961. Die phytopathogenen Grosspilze Deutschlands. VEB G. Fischer Verlag, Jena.

Kreisel H. 1962. Die Lycoperdaceae der Deutschen Demokratischen Republik. *Feddes Repert.* **64**(2–3): 89–201.

Kreisel H. 1967. Taxonomish-Pflanzengeographishe Monographie der Gattung *Bovista*. *Beih. Nova Hedwigia* **25**: 1–244.

Kreisel H. (ed.). 1987. Pilzflora der Deutschen Demokratischen Republik. VEB G. Fischer Verlag, Jena.

Kühner R. 1935. Le genre *Galera*. *Encyclopédie Mycologique*. **7**: 1–240.

Kühner R. 1938. Le Genre *Mycena*. *Encyclopédie Mycologique* **10**: 1–710.

Kühner R. 1949. *Conocybe* (*Galera*) *pubescens* (Gillet) et la développement de son carpophore. *Botaniste* **34**: 275–290.

Kühner R. 1972a. Agaricales de la zone alpine. Genre *Galerina* Earle. *Bull. Trimestriel Soc. Mycol. France* **88**: 41–118.

Kühner R. 1972b. Agaricales de la zone alpine. Genres *Galera* Earle et *Phaeogalera* gen. nov. *Bull. Trimestriel Soc. Mycol. France* **88**: 119–153.

Kühner R. 1976. Agaricales de la zone Alpine. Lépistées I. *Bull. Trimestriel Soc. Mycol. France* **92**(1): 5–32.

Kühner R. & Romagnesi H. 1953. Flore analytique des champignons supérieurs (Agarics, Bolets, Chanterelles) comprenant les espèces de l'Europe occidentale et centrale ainsi que la plupart de celles de l'Algérie et du Maroc. Masson et Cie., Paris.

Kuyper Th. W. 1985. Studies in *Inocybe* – I. Revision of the new taxa of *Inocybe* described by Velenovský. *Persoonia* **12**: 375–400.

Kuyper Th. W. 1986. A revision of the genus *Inocybe* in Europe. I. Subgenus *Inosperma* and the smooth-spored species of subgenus *Inocybe*. *Persoonia*, *Supplement* **3**: 1–247.

Kuyper Th. W. 1995a. *Clitocybe* (Fr.) Staude. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 42–62. A. A. Balkema, Rotterdam/Brookfield.

Kuyper Th. W. 1995b. *Rickenella* Raithhelhuber. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 157–158. A. A. Balkema, Rotterdam/Brookfield.

Kytövuori I. 1988. The *Tricholoma caligatum* group in Europe and North Africa. *Karstenia* **28**(2): 65–77.

Lange J. E. 1935–1940. Flora Agaricina Danica. I–V. Recato A/S, Copenhaga (vol. **1** – 1935; **2** – 1936; **3** – 1938; **4** – 1939; **5** – 1940).

Lange L. 1974. The Distribution of Macromycetes in Europe. *Dansk Bot. Ark.* **30**(1): 1–105.

Lange M. & Hora F. B. 1963. Collins guide to Mushrooms & Toadstools. Collins, London.

Langer E. 1994. Die Gattung *Hyphodontia* John Eriksson. *Biblioth. Mycol.* **154**: 1–298.

Langer G. 1994. Die Gattung *Botryobasidium* Donk (Corticiaceae, Basidiomycetes). *Biblioth. Mycol.* **158**: 1–459.

Larsen M. J. & Cobb-Poulle L. A. 1990. *Phellinus* (Hymenochaetaceae). A survey of the world taxa. Fungiflora, Oslo. *Synopsis Fungorum* **3**: 1–206.

Lee J. S., Ko K. S. & Jung H. S. 2000. Phylogenic analysis of *Xylaria* based on nuclear ribosomal ITS1-5.8S-ITS2 sequences. *F. E. M. S. Microbiol. Lett.* **187**: 89–93.

Lemke P. A. 1964. The genus *Aleurodiscus* (sensu stricto) in North America. *Canad. J. Bot.* **42**(2): 213–282.

Lin S.-H. & Chen Z.-Ch. 1990. The Corticiaceae and the resupinate Hydnaceae of Taiwan. *Taiwania* **35**(2): 69–110.

Lindsey J. P. 2001. Synonymy of two species of *Aleurodiscus*. *Harvard Pap. Bot.* **6**(1): 139–146.

Lloyd C. G. 1909. Synopsis of the known Phalloids. Cincinnati.

Lloyd C. G. 1912. Synopsis of the Stipitate Polyporoids. Cincinnati.

Lowy B. 1971. Tremellales. *Flora Neotropica Monograph* **6**: 1–153.

Maas Geesteranus R. A. 1975. Die terrestrischen Stachelpilze Europas. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschapen*, *Afd*. *Natuurkunde*, *Tweede Reeks* **65**: 1–127.

Maas Geesteranus R. A. 1992a. *Mycena*s of the Northern Hemisphere. I. Studies in *Mycenas* and other papers. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschapen*, *Afd*. *Natuurkunde*, *Tweede Reeks* **90**: 1–391.

Maas Geesteranus R. A. 1992b. *Mycena*s of the Northern Hemisphere. II. Conspectus of the *Mycenas* of the Northern Hemisphere. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschapen*, *Afd*. *Natuurkunde*, *Tweede Reeks* **90**: 1–493.

Maekawa N. 1993. Taxonomic study of Japanese Corticiaceae (Aphyllophorales) I. *Rep*. *Tottori Mycol*. *Inst*. **31**: 1–149.

Maekawa N. 1994. Taxonomic study of Japanese Corticiaceae (Aphyllophorales) II. *Rep*. *Tottori Mycol*. *Inst*. **32**: 1–123.

Maekawa N. 1998. Taxonomic study of Japanese Corticiaceae (Aphyllophorales) IV. *Rep*. *Tottori Mycol*. *Inst*. **36**: 1–12.

Maekawa N., Suhara H., Kinjo K. & Kondo R. 2003. Corticioid fungi (Basidiomycota) in mangrove forests of the islands of Iriomote and Okinawa, Japan. *Mycoscience* **44**: 403–409.

Maekawa N., Yang Z. L. & Zang M. 2002. Corticioid fungi (Basidiomycetes) collected in Sichuan Province, China. *Mycotaxon* **188**: 81–95.

Maekawa N. & Zang M. 1995. Corticiaceous Fungi (Aphyllophorales, Basidiomycotina) collected in Yunnan, China. *Bull*. *Natl*. *Sci*. *Mus*. *Tokyo*, *Ser*. *B*, **21**(2): 87–94.

Malençon G. & Bertault R. 1975. Flore des champignons superieurs du Maroc. **2**. *Travaux de l'Institut Scientifique Chérifien et de la Faculté des Sciences de Rabat*. *Sér*. *bot*. *biol*. *végét*. **33**: 1–539. Centre National de la Recherche Scientifique de France, Rabat.

Marchand A. 1971–1986. Champignons du Nord et du Midi. **1–9**. Société Mycologique des Pyrénées Méditerranéennes, Perpignan.

Martin G. W. 1952. Revision of the North Central Tremellales. *State University of Iowa Studies in Natural History* **19**, *Study Ser*. *No*. **423**(3). Reprint (1969): *Biblioth*. *Mycol*. **22**: 1–122.

McNabb R. F. R. 1965a. Taxonomic studies in the Dacrymycetaceae. II. *Calocera* (Fries) Fries. *New Zealand Journal of Botany* **3**(1): 31–58.

McNabb R. F. R. 1965b. Taxonomic studies in the Dacrymycetaceae. III. *Dacryopinax* Martin. *New Zealand Journal of Botany* **3**(1): 59–72.

McNabb R. F. R. 1965c. Taxonomic studies in the Dacrymycetaceae. IV. *Guepiniopsis* Martin. *New Zealand Journal of Botany* **3**(2): 159–167.

McNabb R. F. R. 1973. Taxonomic studies in the Dacrymycetaceae. VIII. *Dacrymyces* Nees ex Fries. *New Zealand Journal of Botany* **11**(3): 461–524.

Melik-Khachatrian D. G. 1980. Agarikovye (shljapochnye) griby (Agaricales). In: D. N. Teterevnikovojj–Babajan (ed.), *Mikoflora Armjanskojj SSR* **5**: 1–543. Izdatel'stvo Erevanskogo Universiteta, Erevan.

Michael E., Hennig B. & Kreisel H. 1977. Handbuch für Pilzfreunde **3**. VEB G. Fischer Verlag, Jena.

Michael E., Hennig B. & Kreisel H. 1983a. Handbuch für Pilzfreunde. **1**. Die wichtigsten un häufigsten Pilze mit besonderer Berücksichtigung der Giftpilze. 5 Auflage. VEB G. Fischer Verlag, Jena.

Michael E., Hennig B. & Kreisel H. 1983b. Handbuch für Pilzfreunde. **5**. Blätterpilze – Milchlinge und Täublinge. 2 Auflage. VEB G. Fischer Verlag, Jena.

Michael E., Hennig B. & Kreisel H. 1985. Handbuch für Pilzfreunde. **4**. Blätterpilze – Dunkellblätter. 3 Auflage. VEB G. Fischer Verlag, Jena.

Michael E., Hennig B. & Kreisel H. 1986. Handbuch für Pilzfreunde. **2**. Nichtblätterpilze (Basidiomyzeten ohne Blätter, Askomyzeten). 3 Auflage. VEB G. Fischer Verlag, Jena.

Michael E., Hennig B. & Kreisel H. 1987. Handbuch für Pilzfreunde. **3**. Blätterpilze – Hellblätter und Leistlinge. 4 Auflage. VEB G. Fischer Verlag, Jena.

Michael E., Hennig B. & Kreisel H. 1988. Handbuch für Pilzfreunde. **6**. Die Gattungen der großpilze Europas. Bestimmungsschlüssel und Gesamtregister der Bände I bis V. 2 Auflage. VEB G. Fischer Verlag, Jena.

Miller O. K. 1968. A revision of the genus *Xeromphalina*. *Mycologia* **60**(1): 156–188.

Moore R. T. 1990. Order Platygloeales ord. nov. *Mycotaxon* **39**: 245–248.

Morochkovs'kiy S. F., Zerova M. Ya., Lavitska Z. G. & Smitska M. F. 1969. Askomitseti. In: D. K. Zerov (ed.), *Viznachnik gribiv Ukrainy* **2**. Vidavnitsvo Naukova Dumka, Kiiv.

Morris B. 1990. An annotated check-list of the Macrofungi of Malawi. *Kirkia* **13**(2): 323–364.

Moser M. 1963. Ascomyceten (Schlauchpilze) In: H. Gams (ed.), *Kleine Kryptogamenflora*. **IIa**. VEB G. Fischer Verlag, Jena.

Moser M. 1983. Die Röhrlinge und Blätterpilze (Polyporales, Boletales, Agaricales, Russulales). In: H. Gams (ed.), *Kleine Kryptogamenflora*. **IIb/2**. *Basidiomycetes*. **2**. 5 ed. VEB G. Fischer Verlag, Jena.

Moser M., Jülich W. & Furrer-Ziogas C. 1985–1986. Farbatlas der Basidiomyceten. **1–3**. G. Fischer Verlag, Stuttgart.

Mueller G. M. 1992. Systematics of *Laccaria* (Agaricales) in the continental United States and Canada with discussions on extralimital taxa and descriptions of extant types. *Fieldiana Botany* **30**: 1–158.

Mukhin V. A. 1993. Biota ksilotrofnykh bazidiomitsetov Zapadno-Sibirskoy Ravniny. Rossiyskaya Akademiya Nauk, Ural'skoye Otdeleniye. Institut Ekologii Rasteniy i Zhivotnykh. YIF Nauka, Ekaterinburg.

Munk A. 1957. Danish Pyrenomycetes. A Preliminary Flora. *Dansk Bot. Ark.* **17**(1): 1–491.

Nakasone K. K. 2001. Taxonomy of the genus *Radulodon*. *Harvard Pap. Bot.* **6**(1): 163–177.

Natarajan K. & Raman N. 1980. South Indian Agaricales – IX. *Sydowia* **33**: 225–235.

Naumov N. A. 1964. Flora gribov Leningradskoy oblasti. Izdatel'stvo. Vypusk II. Diskomicety. Nauka, Moskva–Leningrad.

Nespiak A. 1990. Podstawczaki (Basidiomycetes), bedłkowce (Agaricales), zasłonakowate (Cortinariaceae), strzępiak (*Inocybe*). In: J. Kochman & A. Skirgiełło (eds), *Flora Polska. Rośliny zarodnikowe Polski i ziem ościennych. Grzyby* (*Mycota*) **19**. Państwowe Wydawnictwo Naukowe, Warszawa–Kraków.

Neuhoff W. 1934–1938. Die Gallertpilze (*Tremellineae*). In: Pilze Mitteleuropas. **2a**. Verlag von Dr. Werner Klinkhardt, Leipzig.

Niemelä T. 1972. On Fennoscandian Polypores. II. *Phellinus laevigatus* (Fr.) Bourd. & Galz. and *P. lundellii* Niemelä, n. sp. *Ann. Bot. Fennici* **9**: 41–59.

Niemelä T. 1987. The raduloid species of *Schizopora*. *Beiträge zur Kenntnis der Pilze Mitteleuropas* **3**: 365–370.

Niemelä T. 1998. *Steccherinum bourdotii* in North Europe. *Folia Cryptog. Estonica* **33**: 93–97.

Niemelä T. & Uotila P. 1977. Lignicolous macrofungi from Turkey and Iran. *Karstenia* **17**: 33–39.

Nikolaeva T. L. 1961. Familia Hydnaceae. In: W. P. Savich (ed.), *Flora Plantarum Cryptogamarum URSS* **6**. *Fungi* **2**. Izdatel'stvo Akademii Nauk SSSR, Moskva–Leningrad (in Russian).

Noordeloos M. E. 1980. *Entoloma* subgen. *Nolanea* in the Netherlands and adjacent regions with a reconnaissance of its remaining taxa in Europe. *Persoonia* **10**: 427–534.

Noordeloos M. E. 1983. Notulae ad Floram Agaricinam Neerlandicam I–III. *Persoonia* **12**: 31–49.

Noordeloos M. E. 1987. Notulae ad Floram Agaricinam Neerlandicam XV. *Persoonia* **13**: 237–262.

Noordeloos M. E. 1988. Entolomataceae Kotl. & P. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **1**: 77–177. A. A. Balkema. Rotterdam/Brookfield.

Noordeloos M. E. 1992. Fungi Europaei **5**. *Entoloma* s.l. Massimo Canduso, Saronno.

Noordeloos M. E. 1995a. *Collybia* (Fr.) Staude. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 106–123. A. A. Balkema, Rotterdam/Brookfield.

Noordeloos M. E. 1995b. *Marasmiellus* Murrill. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 123–129. A. A. Balkema, Rotterdam/Brookfield.

Noordeloos M. E. 1995c. *Marasmius* Fr. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 136–153. A. A. Balkema, Rotterdam/Brookfield.

Noordeloos M. E. 1995d. *Resupinatus* Nees. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 166–167. A. A. Balkema, Rotterdam/Brookfield.

Noordeloos M. E. 1999. Family Strophariaceae. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **4**: 27–107. A. A. Balkema, Rotterdam/Brookfield.

Noordeloos M. E. & Christensen M. 1999. *Tricholoma* (Fr.: Fr.) Staude. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **4**: 107–148. A. A.Balkema, Rotterdam/ Brookfield.

Noordeloos M. E. & Kuyper Th. W. 1995. *Lepista* (Fr.) W. G. Sm. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 67–75. A. A.Balkema, Rotterdam/Brookfield.

Norstein S. 1990. The genus *Crepidotus* (Basidiomycotina, Agaricales) in Norway. *Synopsis Fungorum* **2**: 1–115.

Núñez M. & Ryvarden L. 1995. *Polyporus* (Basidiomycotina) and related genera. *Synopsis Fungorum* **10**: 1–85.

Núñez M. & Ryvarden L. 1997. The genus *Aleurodiscus* (Basidiomycotina). *Synopsis Fungorum* **12**: 1–164.

Núñez M. & Ryvarden L. 2000. East Asian Polypores. *Synopsis Fungorum* **13**: 1–168.

Núñez M. & Ryvarden L. 2001. East Asian Polypores. *Synopsis Fungorum* **14**: 169–522.

Oberwinkler F. 1965. Die Gattung *Tubulicrinis* Donk s.l. *Z. Pilzk.* **31**(1–2): 12–48.

Oberwinkler F. & Tschen J. 1989. A new *Dacrymyces* species from Taiwan. *Trans. Mycol. Soc. Japan* **30**: 349–356.

Olesiński L. & Wojewoda W. 1987. Data on macromycetes flora of the North-Eastern Poland. *Acta Mycol.* **21**(1985): 193–232.

Orton P. D. 1960. New Check List of British Agarics and Boleti. Part III. Notes on genera and species in the list. *Trans. Brit. Mycol. Soc.* **43**(2): 159–439.

Orton P. D. 1969. Notes on British Agarics. III. *Notes from the Royal Botanic Garden of Edinburgh* **29**: 75–127.

Orton P. D. & Watling R. 1979. Coprinaceae. Part 1. *Coprinus*. In: D. M. Henderson, P. D. Orton & R. Watling (eds), *British Fungus Flora Agarics and Boleti* **2**: 1–148. Royal Botanic Garden, Edinburgh.

Park S. S. & Cho D. H. 1985. The Flora of Higher Fungi in Mt. Muhack Areas (II). *Kwangju Health Junior College* **10**: 101–109.

Park S. S. & Cho D. H. 1989. The Flora of Higher Fungi in Mt. Jiri Areas (III). *Korean J. Mycol*. **17**(3): 132–136.

Park S. S., Cho D. H. & Lee J. Y. 1986. The Flora of Higher Fungi in Mt. Jiri Areas (I). *Korean J. Mycol*. **14**(4): 247–252.

Park S. S., Cho D. H. & Lee J. Y. 1987. The Flora of Higher Fungi in Mt. Muhack Areas (III). *Korean J. Mycol*. **15**(2): 71–75.

Park S. S., Cho D. H. & Ryoo Ch. I. 1990. The Flora of Higher Fungi in Mt. Jiri Areas (IV). *Korean J. Mycol*. **18**(2): 51–57.

Parmasto E. 1965. Opredeliteľ rogatikovykh gribov SSSR sem. Clavariaceae. Izdateľstvo Nauka, Moskva–Leningrad.

Parmasto E. 1970. The Lachnocladiaceae of the Soviet Union. Academy of Sciences of the Estonian S.S.R, Institute of Zoology and Botany, Tartu (in Russian with English summary).

Parmasto E. 2001. *Hymenochaete cruenta* and *H. sphaericola*, two sibling species of Hymenochaetales (Hymenomycetes, Basidiomycota). *Czech Mycol*. **52**(4): 307–315.

Pegler D. N. 1977. A preliminary agaric flora of East Africa. *Kew Bull*., *Addit. Ser*. **6**: 1–615.

Pegler D. N. 1983. The genus *Lentinus*. A world monograph. *Kew Bull*., *Addit. Ser*. **10**: 1–281.

Pegler D. N. 1986. Agaric flora of Sri Lanka. *Kew Bull*., *Addit. Ser*. **12**: 1–519.

Pegler D. N. & Brand A. W. 1995. Profiles of fungi. 71. *Galerina clavata* (Vel.) Kühner. *Mycologist* **9**(4): 156–157.

Peintner U. & Horak E. 2002. *Inocybe* (Basidiomycotina, Agaricales) from Kamchatka (Siberia, Russia): taxonomy and ecology. *Sydowia* **54**(2): 198–241.

Petrov A. N. & Belova N. V. 1999. K flore makromitsetov severnoy Mongolii. *Mikol. Fitopatol*. **33**(1): 25–29.

Pews H.-U. 1987. Korea – Land der Morgenfrische. VEB H. Haack, Geographish-Kartographische Anstalt, Gotha.

Phillips R. 1981. Mushrooms and other fungi of Great Britain and Europe. Ward Lock Limited, London.

Piątek M. 2000. *Inonotus hispidus* (Bull.: Fr.) Karst. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **1**: 35–40. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Piątek M. 2001. *Colacogloea peniophorae* (Platygloeales) in Poland. *Acta Mycol*. **36**(2): 203–209.

Pilát A. 1934. Additamenta ad floram Sibiriae Asiaque orientalis mycologicam. Pars secunda. *Bull. Trimestriel Soc. Mycol. France* **49**(3–4): 256–339.

Pilát A. 1935. *Pleurotus* Fries. In: Ch. Kavina (ed.), *Atlas des champignons de l'Europe* **2**. Chez les èditeurs, Praha.

Pilát A. 1936. Additamenta ad floram Sibiriae Asiaeque orientalis mycologicam. *Bull. Trimestriel Soc. Mycol. France* **51**(3–4): 351–426.

Pilát A. 1940. Basidiomycetes chinenses a cel. Emilio Licentio on itineribus per Chinam septentrionalem annis 1914–1936 susceptis, lecti. *Ann. Mycol*. **38**(1): 61–82.

Pilát A. 1946. Evropské druhy houževnatců *Lentinus* Fr. *Atlas hub evropských* **5**: 1–44.

Pilát A. 1948. Monographie des espèces européennes du genre *Crepidotus* Fr. In: A. Pilát (ed.), *Atlas des champignons de l'Europe* **6**. Musée Nat., Sect. Botanique, Prague.

Pilát A. 1951. The Bohemian species of the genus *Agaricus*. *Acta Musei Nationalis Pragae* **7B**(1), *Botanica* **1**: 1–142.

Pilát A. 1952. Naše houby. Brázda, Praha.

Pilát A. (ed.) 1958a. Gasteromycetes houby – brichatky. Nakladelství Československé Akademie Věd, Praha.

Pilát A. 1958b. Übersicht der europäischen Clavariaceen unter besonderer Berücksichtigung der tschechoslowakischen Arten. *Acta Musei Nationalis Pragae* **14B**(3–4): 129–255.

Pilát A. 1959. Naše houby. II. Kritické druhy našich hub. Nakladelství Československé Akademie Věd, Praha.

Poelt J. & Jahn H. 1963. Mitteleuropëische Pilze. Verlag E. Cramer, Hamburg.

Pouzar Z. 2001. Notes on the taxonomy and distribution of Aphyllophorales I. *Czech Mycol*. **53**(2): 121–131.

Quimio T. H. & Opinia N. L. 1978. Agaricales of Mt. Makiling (Philippines): II. Genus *Agaricus*. *Nova Hedwigia*. **29**: 847–858.

Raitviir A. G. 1967. Opredeliteľ geterobasidialnykh gribov (Heterobasidiomycetidae) SSSR. Izdateľstvo Nauka, Leningrad.

Rattan S. S. 1977. The Resupinate Aphyllophorales of the North Western Himalayas. *Biblioth. Mycol*. **60**: 1–427.

Rattan S. S., Abdullah S. K. & Ismail A. L. S. 1978. Studies of fungi causing diseases and decays of trees in Iraq. *Nova Hedwigia*. **29**: 765–779.

Redhead S. A. 1984. Mycological observations 4–12: on *Kuehneromyces*, *Stropharia*, *Marasmius*, *Mycena*, *Geopetalum*, *Omphalopsis*, *Phaeomarasmius*, *Naucoria* and *Prunulus*. *Sydowia* **37**: 246–270.

Redhead S. A. 1988. Notes on the genus *Xeromphalina* (Agaricales, Xerulaceae) in Canada: biogeography, nomenclature, taxonomy. *Canad. J. Bot*. **66**: 479–507.

Redhead S. A. 1989. A biogeographical overview of the Canadian mushroom flora. *Canad. J. Bot*. **67**: 3003–3062.

Redhead S. A., Lutzoni F., Moncalvo J.-M. & Vilgalys R. 2002. Phylogeny of agarics: partial systematics solutions for core omphaloid genera in the Agaricales (Euagarics). *Mycotaxon* **83**: 19–57.

Redhead S. A. & Seifert K. E. 2001a. *Asterophora* Ditmar ex Link 1809 versus *Nyctalis* Fries 1825, and the status of *Ugola* Anderson 1763. *Taxon* **50**: 243–268.

Redhead S. A. & Seifert K. E. 2001b. Proposal to conserve the name *Agaricus lycoperdoides* Bull. [≡*Asterophora lycoperdoides* (Bull.) Ditmar] (*Basidiomycetes*: *Tricholomataceae*) against *Asterophora agaricoides* Fr.: Fr. and *Asterophora lycoperdoides* Fr.: Fr. *Taxon* **50**: 279–280.

Reid D. A. 1974. A monograph of the British Dacrymycetales. *Trans. Brit. Mycol. Soc.* **62**(3): 433–494.

Reid D. A., Pegler D. N. & Spooner B. M. 1981. An annotated list of the Fungi of the Galapagos Islands. *Kew Bull.* **35**(4): 847–892.

Rexer K.-H. & Kost G. 1989. Zur Systematik der Agaricoiden Hymenomyceten I. *Z. Mycol.* **55**(2): 207–240.

Ricken A. 1915. Die Blätterpilze (Agaricaceae) Deutschlands und der angrenzenden Länder, besonders Oesterreichs and der Schweiz. Verlag Th. O. Weigel, Leipzig.

Roberts P. 1999. *Rhizoctonia* – forming fungi. A taxonomic guide. The Herbarium, Royal Botanic Gardens, Kew.

Roberts P. & de Meijer A. A. R. 1997. Macromycetes from the State of Parana, Brazil. 6. Sirobasidiaceae & Tremellaceae. *Mycotaxon* **54**: 261–283.

Romagnesi H. 1970–1971. Petit atlas des champignons **1**(1970)**–2**(1971). Bordas, Paris-Bruxelles-Montréal.

Ronikier A. 2003. New record and distribution of *Mycena oregonensis* (Agaricales, Basidiomycetes) in Europe. *Polish Bot. J.* **48**(2): 127–130.

Rudnicka-Jezierska W. 1991. Podstawczaki (Basidiomycetes), purchawkowe (Lycoperdales), tęgoskórowe (Sclerodermatales), pałeczkowe (Tulostomatales), gniazdnicowe (Nidulariales), sromotnikowe (Phallales), osiakowe (Podaxales). In: A. Skirgiełło (ed.), *Flora Polska. Rośliny zarodnikowe Polski i ziem ościennych. Grzyby* (*Mycota*) **23**. Polska Akademia Nauk, Instytut Botaniki, Kraków.

Ryman S. & Holmåsen I. 1984. Svampar. En fälthandbok. Interpublishing, Stockholm.

Ryvarden L. 1972. *Radulodon*, a new genus in the Corticiaceae (Basidiomycetes). *Canad. J. Bot.* **50**: 2073–2076.

Ryvarden L. 1976a. On the identity of *Acia sibirica* Pil. and *A. licentii* Pil. *Česká Mykol.* **30**(1): 38–40.

Ryvarden L. 1976b. The Polyporaceae of North Europe. **1**. *Albatrellus–Incrustoporia*. Fungiflora, Oslo.

Ryvarden L. 1978. The Polyporaceae of North Europe. **2**. *Inonotus–Tyromyces*. Fungiflora, Oslo.

Ryvarden L. & Gilbertson R. L. 1993. European Polypores. **1**. *Abortiporus–Lindtneria*. *Synopsis Fungorum* **6**: 1–387.

Ryvarden L. & Gilbertson R. L. 1994. European Polypores. **2**. *Meripilus–Tyromyces*. *Synopsis Fungorum* **7**: 388–743.

Ryvarden L. & Johansen I. 1980. A preliminary polypore flora of East Africa. Fungiflora, Oslo.

Senn-Irlet B. 1995. The genus *Crepidotus* (Fr.) Staude in Europe. *Persoonia* **16**(1): 1–80.

Senn-Irlet B., Jenssen K. M. & Gulden G. 1990. Arctic and Alpine Fungi. **3**. Soppkonsulenten A/S, Oslo.

Sharma I. R. 2000. Genera of Indian Polypores. Botanical Survey of India Ministry of Environment and Forests, Calcutta.

Shvartsman S. R. 1964. Geterobazidial'nye (Auriculariales, Tremellales, Dacryomycetales) i avtobazidial'nye (Exobasidiales, Aphyllophorales) griby. In: E. I. Ivanova (ed.), *Flora sporovykh rasteniy Kazakhstana* **4**. Izdatel'stvo Akademii Nauk Kazakhskoj SSR, Alma-Ata.

Shvartsman S. R. & Filimonova I. M. 1970. Gasteromitsety – Gasteromycetes. In: T. I. Shevchuk & E. I. Ivanova (eds), *Flora sporovykh rasteniy Kazakhstana* **6**. Izdatel'stvo Nauka Kazakhskoy SSR, Alma-Ata.

Singer R. 1951. The Agaricales in modern taxonomy. *Lilloa* **22**(1949): 5–832.

Singer R. 1952. Type studies on Basidiomycetes VII. *Sydowia* **6**: 344–351.

Singer R. 1961. Type studies on Basidiomycetes X. *Persoonia* **2**: 1–62.

Singer R. 1965. Monographic studies on South American Basidiomycetes, especially those of the East Slope of the Andes and Brazil. 2. The genus *Marasmius* in South America. *Sydowia* **18**(1964): 106–358.

Singer R. 1973. A monograph of the neotropical species of *Marasmiellus*. *Beih. Nova Hedwigia* **44**: 1–339.

Singer R. 1978. Interesting and new species of Basidiomycetes from Ecuador. II. *Nova Hedwigia* **29**: 1–98.

Singer R. 1983. Weiss- und rosasporige Agaricales (Tricholomataceae und Pluteaceae) aus Österreich. *Sydowia* **36**: 227–287.

Singer R. & Digillo C. 1952. Prodromo de la Flora Agaricina Argeentina. *Lilloa* **25**: 5–461.

Skirgiełło A. 1975. Fungi. Basidiomycetes, Boletales. Foreign Scientific Publications Department of the National Center for Scientific, Technical and Economic Information, Warsaw.

Skirgiełło A. 1991. Podstawczaki (Basidiomycetes), gołąbkowe (Russulales), gołąbkowate (Russulaceae). I, gołąbek (*Russula*). In: A. Skirgiełło (ed.), *Flora Polska. Rośliny zarodnikowe Polski i ziem ościennych. Grzyby* (*Mycota*) **20**. Państwowe Wydawnictwo Naukowe, Warszawa–Kraków (in Polish with English key).

Skirgiełło A. 1998. Podstawczaki (Basidiomycetes), gołąbkowe (Russualaceae). II, mleczaj (*Lactarius*). In: A. Skirgiełło (ed.), *Flora Polska. Rośliny zarodnikowe Polski i ziem ościennych. Grzyby* (*Mycota*) **25**. Polska Akademia Nauk, Instytut Botaniki im. W. Szafera, Kraków (in Polish with English key).

Skirgiełło A. 1999. Podstawczaki (Basidiomycetes), łuskowcowate (*Pluteaceae*). In: A. Skirgiełło (ed.), *Flora Polska. Rośliny zarodnikowe Polski i ziem ościennych. Grzyby* (*Mycota*) **27**. Polska Akademia Nauk, Instytut

Botaniki im. W. Szafera, Kraków (in Polish with English key).

Slysh A. R. 1960. The genus *Peniophora* in New York State and adjacent regions. *State University College or Forestry at Syracuse University*. *Technical Publications* **83**: 1–95.

Smith A. H. 1947. North American species of *Mycena*. *University of Michigan Studies* **17**: 1–521.

Smith A. H. 1951. The North American species of *Naematoloma*. *Mycologia* **43**: 467–521.

Smith A. H. & Singer R. 1964. A monograph on the genus *Galerina* Earle. Hafner Publishing Company, New York–London.

Snell W. H. & Dick E. A. 1970. The Boleti of Northeastern North America. Verlag J. Cramer, Lehre.

Sokół S. 2000. The Ganodermataceae of Poland. Taxonomy, ecology and distribution. *Prace Naukowe Uniwersytetu Śląskiego w Katowicach* **1867**: 1–134 (in Polish with English and German summaries).

Sosin P. E. 1973. Opredelitel' gasteromitsetov SSSR. Izdatel'stvo Nauka, Leningrad.

Stangl J. 1989. Die Gattung *Inocybe* in Bayern. *Hoppea* **46**: 5–388.

Stangl J., Krieglsteiner G. J. & Enderle M. 1991. Die Gattung *Crepidotus* (Fries) Staude 1957 in Deutschland unter besonderer Berük sichtigung Augsburgeer Funde. *Z. Mykol*. **57**(1): 117–148.

Staszkiewicz J. 1992a. Variability of the cones of *Picea jezoensis* and *P. koraiensis* (Pinaceae) in the massif of Paekdu-san in North Korea. *Fragm*. *Florist*. *Geobot*. **37**(1): 241–249.

Staszkiewicz J. 1992b. Variability of the cones of *Larix olgensis* (Pinaceae) in the massif of Paekdu-san in North Korea. *Fragm*. *Florist*. *Geobot*. **37**(2): 487–497.

Storey R. & Park E. 2001. Korea. 5th edition. Lonely Planet Publications, Melbourne–Oakland–London–Paris.

Stuchlik L. & Komorowska H. 1997. Botanical and ecological investigations in North Korea by W. Szafer Institute of Botany, Polish Academy of Sciences, Cracow. In: Polish Korean Joint Seminar Pułtusk, 16–18.09.1996. *Fragm*. *Faunist*. **40**(23): 273–280.

Suhirman & Núñez M. 1998. Indonesian Aphyllophorales 3. Poroid and stereoid species from Kerinci-seblat National Park, Western Sumatra. *Mycotaxon* **68**: 273–292.

Sunhede S. 1990. Geastraceae (Basidiomycotina). Morphology, ecology, and systematics with special emphasis on the northern European species. *Synopsis Fungorum* **1**(1989): 1–534.

Šrůtek M. & Lepš J. 1994. Variation in Structure of *Larix olgensis* Stands along the Altitudinal Gradient on Paektu-san, Chanbai-san, North Korea. *Arctic Alpine Res*. **26**(2): 166–173.

Svrček M. 1960. Tomentelloideae Cechoslovakiae. Genera resupinata familiae Thelephoraceae s. str. *Sydowia* **14**(1–6): 170–245.

Syarzhanina G. 1994. Mushrooms of Belarus: Boletales, Agaricales, Russulales. Navuka i Tekhnika, Mensk (in Belarussian with English summary).

Tellería M. T. 1990. Annotated list of the Corticiaceae sensu lato (Aphyllophorales, Basidiomycotina), for Peninsular Spain and Balearic Islands. *Biblioth*. *Mycol*. **135**: 1–152.

Teng S. C. 1996. Fungi of China. Edited by R. P. Korf, Mycotaxon, Ltd., Ithaca, New York.

Thomsen I. M. 1998. Characters of fruitbodies, basidiospores and cultures for recognizing *Amylostereum areolatum* and *A. chailletii*. *Mycotaxon* **69**: 419–428.

Thorn R. G. & Barron G. L. 1986. *Nematoctonus* and the tribe Resupinateae in Ontario, Canada. *Mycotaxon* **25**(2): 321–453.

Uljé C. B. & Noordeloos M. E. 1997. Studies in *Coprinus* IV – *Coprinus* section *Coprinus*. Subdivision and revision of subsection *Alachuani*. *Persoonia* **16**: 265–333.

Uranchimehg G., Bondartseva M. A. & Nezdoyminogo E. L. 1983. Notes on macromycetes of the mountain-taiga and mountain-steppe vegetation belts of Mongolian Folk Republic. *Mikol*. *Fitopatol*. **17**(5): 374–377.

Urbonas V. 1997. Polyporales, Strobilomycetales, Boletales, Hygrophorales. In: A. Minkevičius (ed.), *Mycota Lithuaniae* **8**. UAB "Valstiečių Laikraštis", Vilnius (in Lithuanian with English summary).

Vargas O., Guzmán-Davalos L. & Vazquez L. S. 1993. Observations on some little known macrofungi from Jalisco (Mexico). *Mycotaxon* **49**: 437–447.

Vasilkov B. P. 1955. Ocherk geograficheskogo rasprostranenya shlapochnykh gribov v SSSR. Izdatel'stvo Akademii Nauk SSSR, Moskva–Leningrad.

Vasilyeva L. N. 1973. Die Blätterpilze und Röhrlinge (Agaricales) von Primorsky Region. Nauka, Leningrad (in Russian).

Vasilyeva L. N. 1978. S'edobnye griby Dal'nego Vostoka. Daln'nevostochnoe Knizhnoe Izdatel'stvo, Vladivostok.

Vasilyeva L. N. 1987. Pirenomitsety i lokuloaskomitsety severa Dal'nego Vostoka. Izdatel'stvo Nauka, Leningrad.

Vasilyeva L. N. 1998. Fungi. **4**. Pyrenomycetidae et Loculoascomycetidae. In: Z. M. Azbukina (ed.), *Plantae non vasculares*, *Fungi et Bryopsidae Orientis Extremi Rossica*. Nauka, Sanct-Petersburg (in Russian).

Vasser S. P. 1980. Flora gribov Ukrainy. Naukova Dumka, Kiev.

Vasser S. P. 1985. Agarikovye griby SSSR. Naukova Dumka, Kiev.

Vasudeva R. S. 1962. Fungi of India. Supplement I. Indian Council of Agricultural Research, New Delhi.

Vauras J. 1989. *Inocybe* sectio *Calosporae* in NW Europe. *Karstenia* **28**(2): 79–86.

Vellinga E. C. 1990. Pluteaceae Kotl. & P. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **2**: 31–64. A. A. Balkema, Rotterdam/Brookfield.

Vellinga E. C. 1995a. Tribus Laccarieae (Jülich) Bas. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 96–103. A. A. Balkema, Rotterdam/Brookfield.

Vellinga E. C. 1995b. Tribus Panelleae Sing. ex Sing. In: C. Bas, Th. W. Kuyper, M. E. Noordeloos & E. C. Vellinga (eds), *Flora Agaricina Neerlandica* **3**: 167–170. A. A. Balkema, Rotterdam/Brookfield.

Watling R. 1982. Bolbitiaceae: *Agrocybe*, *Bolbitius* & *Conocybe*. In: D. M. Henderson, P. D. Orton & R. Watling (eds), *British Fungus Flora*, *Agarics and Boleti* **3**: 1–138. Her Majesty's Stationery Office, Edinburgh.

Watling R. & Gregory N. M. 1987. Strophariaceae & Coprinaceae p.p. *Hypholoma*, *Melanotus*, *Psilocybe*, *Stropharia*, *Lacrymaria* & *Panaeolus*. In: D. M. Henderson, P. D. Orton & R. Watling (eds), *British Fungus Flora*, *Agarics and Boleti* **5**: 1–121. Royal Botanic Garden, Edinburgh.

Watling R. & Gregory N. M. 1989. Crepidotaceae, Pleurotaceae and other pleurotoid agarics. In: D. M. Henderson, P. D. Orton & R. Watling (eds), *British Fungus Flora*, *Agarics and Boleti* **6**: 1–157. Royal Botanic Garden, Edinburgh.

Watling R. & Turnbull E. 1998. Cantharellaceae, Gomphaceae and amyloid-spored and xeruloid members of Tricholomataceae (exl. *Mycena*). In: D. M. Henderson, P. D. Orton, P. D. & R. Watling. (eds), *British Fungus Flora*, *Agarics and Boleti* **8**: 1–189. Royal Botanic Garden, Edinburgh.

Watling R., Gregory N. M. & Orton P. D. 1993. Cortinariaceae p.p. *Galerina*, *Gymnopilus*, *Leucocortinarius*, *Phaeocollybia*, *Phaeogalera*, *Phaeolepiota*, *Phaeomarasmius*, *Pleuroflammula*, *Rozites* & *Stagnicola*. In: D. M. Henderson, P. D. Orton & R. Watling (eds), *British Fungus Flora*, *Agarics and Boleti* **7**: 1–131. Royal Botanic Garden, Edinburgh.

Wen H.-A. & Sun S.-X. 1999. Fungal flora of tropical Guangxi, China: Macrofungi. *Mycotaxon* **57**: 359–369.

Wojewoda W. 1977. Podstawczaki (Basidiomycetes), trzęsakowe (Tremellales), uszakowe (Auriculariales), czerwcogrzybowe (Septobasidiales). In: A. Skirgiełło & J. Kochman (eds), *Flora Polska*. *Rośliny zarodnikowe Polski i ziem ościennych*. *Grzyby* (*Mycota*) **8**. Państwowe Wydawnictwo Naukowe, Warszawa–Kraków.

Wojewoda W. 1981. Basidiomycetes, Tremellales, Auriculariales, Septobasidiales. In: S. Domański (ed.), *Mała flora grzybów* **2**. Państwowe Wydawnictwo Naukowe, Warszawa–Kraków (in Polish with English summary).

Wojewoda W. 2000. *Xylobolus frustulatus* (Pers.: Fr.) Boid. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **1**: 55–61. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Wojewoda W. 2001. *Punctularia strigosozonata* (Fungi, Corticiaceae) in Poland and North Korea. *Fragm*. *Florist*. *Geobot*. **45**(2000): 501–507.

Wojewoda W. 2002a. *Daedaleopsis tricolor* (Bull.: Fr.) Bondartsev & Singer. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **2**: 39–44. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Wojewoda W. 2002b. *Irpicodon pendulus* (Alb. & Schwein.: Fr.) Pouzar. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **2**: 77–79. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Wojewoda W. 2002c. *Punctularia strigosozonata* (Schwein.) P. H. B. Talbot. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **2**: 81–83. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Wojewoda W. 2002d. *Scotomyces subviolaceus* (Peck) Jülich. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **2**: 99–101. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Wojewoda W. 2002e. *Tubulicrinis borealis* J. Erikss. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **2**: 127–129. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Wojewoda W., Heinrich Z. & Komorowska H. 1990. Mycological investigations in the Democratic People's Republic of Korea. In: K. Zarzycki & U. Korzeniak (eds), *Research Progress Report* (*1988–1990*). *Polish Bot*. *Stud*., *Guideb*. *Ser*. **1**: 59.

Wojewoda W., Heinrich Z. & Komorowska H. 1993. Macrofungi of North Korea. In: J. B. Faliński & Z. Mirek (eds), *Polish geobotanical investigations abroad*. *Materials of the 36th Geobotanical Seminar*, *Warsaw*, *15–16 March 1991*. *Wiadom*. *Bot*. **37**(3–4): 125–128 (in Polish with English summary).

Wojewoda W., Heinrich Z. & Komorowska H. 2002a. *Trichaptum biforme* (Fr.) Ryvarden. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **2**: 119–126. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Wojewoda W., Komorowska H. & Piątek M. 2002b. *Hymenochaete cruenta* (Pers.: Fr.) Donk. In: W. Wojewoda (ed.), *Atlas of the geographical distribution of fungi in Poland* **2**: 69–76. W. Szafer Institute of Botany of the Polish Academy of Sciences, Kraków.

Wu S. H. 1990. The Corticiaceae (Basidiomycetes) subfamilies Phlebioideae, Phanerochaetoideae and Hyphodermoideae in Taiwan. *Acta Bot*. *Fennica* **142**: 1–123.

Wu S. H. 2002. New records of the Corticiaceae from mainland China. *Mycotaxon* **82**: 289–294.

Wu S. H. & Chen Z. Ch. 1989. *Pulcherricium caeruleum* (Fr.) Parm. (Corticiaceae, Basidiomycetes), a new record from Taiwan. *Taiwania* **34**(1): 1–4.

Wu S. H. & Chen Z. Ch. 1990. New record of Corticiaceae (Basidiomycetes) collected from the National Taiwan University Campus. *Taiwania* **35**(1): 64–67.

Wu S. H. & Mueller G. M. 1997. Biogeographic ralationships between the macrofungi of temeperate eastern Asia and eastern North America. *Canad. J. Bot.* **75**: 2108–2116.

Ying J., Zong Y., Mao X., Ma Q. & Zang M. 1983. Agaricales, Gasteromycetes. In: Y. Z. Wang & M. Zang (eds), Fungi of Xizang (Tibet). The series of the scientific expedition to the Quinghai-Xizang plateau. Science Press, Academia Sinica, Beijing (in Chinese with English summary).

Zang M. 1985. Notes on the genus *Dacryopinax* from China. *Mycotaxon* **22**: 99–104.

Zang M. & Kinjo N. 1998. Notes on the alpine *Cordyceps* of China. *Mycotaxon* **66**: 215–229.

Zang M. & Zong Y. 1983. Hymenomycetes, Phragmobasidiomycetidae, Holobasidiomycetidae. In: Y. Z. Wang & M. Zang (eds), Fungi of Xizang (Tibet). The series of the scientific expedition to the Quinghai-Xizang plateau. Science Press, Academia Sinica, Beijing (in Chinese with English summary).

Zhang X. Q. 1999. Fungal flora of tropical Guangxui, China: Aphyllophorales s.l. *Mycotaxon* **72**: 371–376.

Zhao J. D. 1989. The Ganodermataceae in China. *Biblioth. Mycol.* **132**: 1–176.

Zhao J., Xu L., Zhang X., Chen M., Chen L. & Shen R. X. 1983. Poroid Families and Thelephoroid Families. In: Y. Z. Wang & M. Zang (eds), Fungi of Xizang (Tibet). The series of the scientific expedition to the Quinghai-Xizang plateau. Science Press, Academia Sinica, Beijing (in Chinese with English summary).

Received 20 October 2003

Index of Latin Names of fungi

Names of genera are in boldface type, names in italics are synonyms, page numbers in boldface type indicate pages containing description of the taxon, page numbers with asterisk (*) indicate pages with illustrations.