CZECH MYCOLOGY 67(2): 137–156, AUGUST 31, 2015 (ONLINE VERSION, ISSN 1805-1421)

Contributions to the Finnish aphyllophoroid funga (Basidiomycota): new and rare species

PANU KUNTTU[1], MATTI KULJU[2], HEIKKI KOTIRANTA[3]

[1] University of Eastern Finland, School of Forest Sciences, P.O. Box 111, FI-80101 Joensuu, Finland; panu.kunttu@uef.fi
[2] Ylispuuntie 13, FI-90420 Oulu, Finland; m.kulju@kolumbus.fi
[3] Finnish Environment Institute, P.O. Box 140, FI-00251 Helsinki, Finland; heikki.kotiranta@ymparisto.fi

Kunttu P., Kulju M., Kotiranta H. (2015): Contributions to the Finnish aphyllophoroid funga (Basidiomycota): new and rare species. – Czech Mycol. 67(2): 137–156.

This article contributes to the knowledge of Finnish aphyllophoroid funga (mainly polypores and corticioids) with nationally or regionally new species and records of rare species. The record of *Tubulicrinopsis cystidiata* is the second in the world and *Tomentella fuscocinerea* is new to Finland. New records are provided for the following species with no more than 10 records in Finland: *Antrodia sitchensis*, *Chaetoporellus curvisporus*, *Colacogloea peniophorae*, *Deviodontia pilaecystidiata*, *Luellia recondita*, *Phlebia femsioeensis*, *Phlebia subcretacea*, *Piloderma lanatum*, *Plicatura crispa*, *Polyporus badius*, *Pycnoporellus alboluteus*, *Rigidoporus obducens*, *Skeletocutis ochroalba*, *Trechispora caucasica*, *Trechispora laevis*, *Tretomyces microsporus*, *Tubulicrinopsis cystidiata*, *Tulasnella albida* and *Xylodon nespori*. In addition, 49 aphyllophoroid fungi are reported as new to some subzones of the boreal vegetation zone in Finland. The ecology and distribution of some species are discussed and notes on the substrate of each record are given.

Key words: aphyllophorales, biogeography, boreal forest, corticioid, distribution, polypore.

Article history: received 28 April 2015, revised 26 June 2015, accepted 1 July 2015, published online 31 August 2015.

Kunttu P., Kulju M., Kotiranta H. (2015): Příspěvek k poznání finských nelupenatých hub (Basidiomycota): nové a vzácné druhy. – Czech Mycol. 67(2): 137–156.

Článek rozšiřuje poznatky o nelupenatých houbách Finska (zejména chorošotvarých a kornatcotvarých) o nové druhy pro tuto zemi nebo dílčí oblasti a záznamy o výskytu vzácných druhů. Nález *Tubulicrinopsis cystidiata* je druhý v celosvětovém měřítku a *Tomentella fuscocinerea* je novým druhem pro Finsko. Dále jsou uvedeny nové údaje o výskytu vzácných druhů (s dosud nejvýše 10 záznamy z Finska): *Antrodia sitchensis*, *Chaetoporellus curvisporus*, *Colacogloea peniophorae*, *Deviodontia pilaecystidiata*, *Luellia recondita*, *Phlebia femsioeensis*, *Phlebia subcretacea*, *Piloderma lanatum*, *Plicatura crispa*, *Polyporus badius*, *Pycnoporellus alboluteus*, *Rigidoporus obducens*, *Skeletocutis ochroalba*, *Trechispora caucasica*, *Trechispora laevis*, *Tretomyces microsporus*, *Tubulicrinopsis cystidiata*, *Tulasnella albida* a *Xylodon nespori*. Dalších 49 druhů nelupenatých hub je nových pro určité subzóny v rámci boreální vegetační zóny ve Finsku. Je diskutována ekologie a rozšíření vybraných druhů a jsou uvedeny poznámky k substrátu u konkrétních nálezů.

INTRODUCTION

Aphyllophoroid fungi are non-gilled form-groups of the Basidiomycota. They comprise various kinds of fungi, such as corticioids, polypores and clavarioids. Aphyllophoroid fungi are important in the decomposition of dead wood, and thus play an important role in forest ecosystems. In addition to wood decayers, aphyllophoroid fungi also include litter decayers, mycorrhizal species, and parasitic fungi (Kotiranta et al. 2009).

The first Finnish checklist of aphyllophoroid fungi was published in 2009, containing 756 corticioid and polypore species (Kotiranta et al. 2009). After this, many species new to Finland have been found, and plenty of biogeographical knowledge has accumulated especially of polypores and corticioids (e.g. Kunttu et al. 2011, 2013, 2014, Miettinen et al. 2011, Kotiranta & Larsson 2013, Kotiranta & Shiryaev 2013, Spirin et al. 2013).

So far, only a few intensive inventories covering all or almost all aphyllophoroid species have been carried out in Finland (Kunttu & Kulju 2009, Kotiranta & Shiryaev 2013). Normally, aphyllophoroid species are divided into morphological groups, like polypores, corticioids and tremelloids, and the studies usually focused on just one or two of these (e.g. Pippola & Kotiranta 2008, Juutilainen et al. 2011, Markkanen & Halme 2012). Especially the collection of non-poroid aphyllophoroid fungi is time-consuming: for example the basidiocarps of corticioids are small in size and mostly grow underneath the substrate. Therefore they are tricky to find, and most of these species need to be identified with a microscope. Because of inadequate sampling, many such species are still poorly known.

In this article we present new records of aphyllophoroid fungi from large-scale field studies conducted in different parts of Finland, but also some sporadic records are included. We consider two kinds of records: rare or seldom collected species with at most ten earlier records in Finland, and species which are new to some subzone (section) of the boreal vegetation zone in Finland.

MATERIAL AND METHODS

The records in this article were mainly made during the years 2008 to 2014, but some older material is also included. These records are mostly linked to inventories of species assemblages in certain areas, or to ecological or biogeographical research of polypores and corticioids by the authors. The field work methods of these inventories varied to some extent. However, many of the records derive from inventories organised by Metsähallitus, Parks & Wildlife Finland. These records are from nature conservation areas where the purpose of the inventory was to survey the species richness. The method used in these inventories

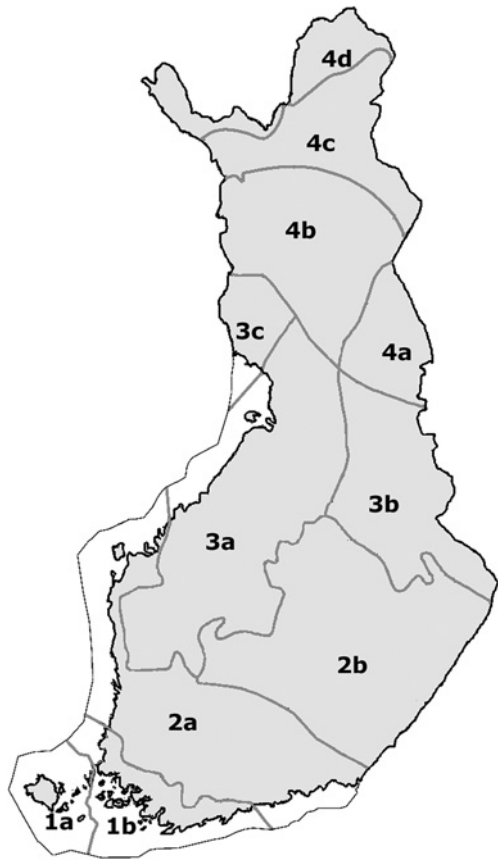

Fig. 1. Boreal forest vegetation zones (1–4) and their subzones in Finland. 1a – Hemiboreal, Åland; 1b – Hemiboreal, Oak Zone; 2a – Southern Boreal, Southwestern Finland and Southern Ostrobothnia; 2b – Southern Boreal, Lake District; 3a – Middle Boreal, Ostrobothnia; 3b – Middle Boreal, Northern Carelia – Kainuu; 3c – Middle Boreal, Southwestern Lapland; 4a – Northern Boreal, Kuusamo District; 4b – Northern Boreal, North Ostrobothnia; 4c – Northern Boreal, Forest Lapland; 4d – Northern Boreal, Fjeld Lapland.

was according to Junninen (2009). In other cases the inventory method was opportunistic sampling of species (Stokland & Sippola 2004).

In specimens examined, we use three levels for the names of sites: municipality, village / large nature conservation area, topographical name. For coordinates, we use the Finnish National Uniform Coordinate System (UCS, 27° E) according to Heikinheimo & Raatikainen (1981). Biogeographical provinces (at the beginning of each record) are according to Knudsen & Vesterholt (2008), the Latin names of which are presented on the website of the Finnish Museum of Natural History (Anonymus 2014). The map showing the forest vegetation zones and bo-

real subzones (Fig. 1) was prepared according to Rassi et al. (2010). In accordance with the above-mentioned sources, names of the subzones are presented in English (e.g. Ostrobothnia, Carelia), contrary to the Latin names of the biogeographical provinces (e.g. Ostrobottnia, Karelia). Voucher specimens are deposited in the herbaria of the Universities of Helsinki (H), Turku (TUR), Oulu (OULU), Tartu (TU) and/or in the reference herbarium of Anni Markkanen (A.M.).

Nomenclature is mainly according to Kotiranta et al. (2009), but names of some species follow Miettinen & Larsson (2011), Bernicchia & Gorjón (2010), and Niemelä (2012). The nomenclature of the genus *Hyphodontia* sensu lato follows Hjortstam & Ryvarden (2009). The Finnish national red-listing evaluation of the IUCN standard is according to Kotiranta et al. (2010). The decay stage classification (1–5) of tree trunks is according to Renvall (1995), where stage 1 means hard dead wood and 5 completely decayed wood. Trunk diameters were measured at breast height if the trunk was complete and at the base if the trunk was broken. We use the term "kelo" referring to dead and old-age trunks of Scots pine with a grey, hard and decorticated surface. Scots pine can become kelo trees mainly in dry and barren forest habitats (Leikola 1969, Niemelä et al. 2002).

The material was collected, identified and confirmed by several researchers mentioned in the collecting information. The most often mentioned researchers are referred to with the following abbreviations: MK = Matti Kulju, PK = Panu Kunttu, HK = Heikki Kotiranta, JP = Jorma Pennanen. The collector is also the identifier unless stated otherwise. The code after the collector's name or abbreviation is a personal sampling number of the specimen.

RESULTS

The record of *Tubulicrinopsis cystidiata* is the second in the world, and *Tomentella fuscocinerea* is reported as new to Finland. New records of the following 19 rare or infrequently collected species (in parentheses the ordinal number of this record in Finland): *Antrodia sitchensis* (11th), *Chaetoporellus curvisporus* (6th), *Colacogloea peniophorae* (8th), *Deviodontia pilaecystidiata* (4th), *Luellia recondita* (5th), *Phlebia femsioeensis* (4th), *Phlebia subcretacea* (8th), *Piloderma lanatum* (2nd and 3rd), *Plicatura crispa* (9th), *Polyporus badius* (9th), *Pycnoporellus alboluteus* (7th), *Rigidoporus obducens* (7th), *Skeletocutis ochroalba* (3rd), *Trechispora caucasica* (4th), *Trechispora laevis* (9th), *Tretomyces microsporus* (2nd), *Tubulicrinopsis cystidiata* (2nd), *Tulasnella albida* (4th) and *Xylodon nespori* (4th). In addition, 49 species are reported as new to some subzone of the boreal forest vegetation zone in Finland.

The numbers of species new to subzones of the boreal vegetation zone are as follows: Hemiboreal, Åland (1a) 8; Hemiboreal, Oak Zone (1b) 1; Southern Bo-

real, Southwestern Finland and Southern Ostrobothnia (2a) 3; Southern Boreal, Lake District (2b) 2; Middle Boreal, Ostrobothnia (3a) 3; Middle Boreal, Northern Carelia – Kainuu (3b) 10; Middle Boreal, Southwestern Lapland (3c) 6; Northern Boreal, Kuusamo District (4a) 1; Northern Boreal, North Ostrobothnia (4b) 6; Northern Boreal, Forest Lapland (4c) 8; Northern Boreal, Fjeld Lapland (4d) 1.

The taxa presented here include 3 endangered, 3 vulnerable, 4 near threatened and 3 data deficient species.

LIST OF SPECIES

Species are listed in alphabetic order, regardless of their systematic position.

Amylocorticium cebennense (Bourdot) Pouzar

New to Middle Boreal, Southwestern Lapland (3c).

Specimen examined: Ostrobottnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, UCS 7359432:3416909, 4 Sep 2014, on *Pinus sylvestris*, fallen trunk, diam. 8 cm, decay stage 2, leg. MK 12/14 & A.-L. Ruotsalainen (OULU), det. MK.

Antrodia albobrunnea (Romell) Ryvarden Fig. 2

New to Hemiboreal, Åland (1a). Near threatened.

Specimen examined: Alandia, Eckerö, Finbo, UCS 6717005:3091684, 31 Aug 2014, on *Pinus sylvestris*, cut log (diam. 30 cm, decay stage 3), on branch (diam. 7 cm, decay stage 2), *Vaccinium*-type heath forest dominated by Scots pine (diam. ca. 20 cm), leg. PK 8379 (TUR). The forest was selectively logged many decades ago.

Antrodia sitchensis (Baxter) Gilb. & Ryvarden

There are 10 earlier records known throughout Finland (Kotiranta et al. 2009, Kunttu et al. 2014). This record is from subzone 4b. Here we follow the species concept of Niemelä (2005). Endangered.

Specimen examined: Lapponia sompiensis, Sodankylä, Koitelaisenkaira, UCS 7520873:3507618, 9 Sep 2010, on *Pinus sylvestris*, fallen kelo trunk, diam. 30 cm, decay stage 3, leg. T. Kallio 793 (H), det. J. Kinnunen.

Antrodiella faginea Vampola & Pouzar

New to Northern Boreal, North Ostrobothnia (4b).

Specimen examined: Lapponia sompiensis, Sodankylä, Koitelaisenkaira, UCS 7534178:3500284, 13 Sep 2010, on *Salix caprea*, broken fallen trunk, diam. 20 cm, decay stage 4, leg. T. Kallio 838 (H), det. J. Kinnunen.

Basidiodendron caesiocinereum (Höhn. & Litsch.) Luck-Allen

New to Middle Boreal, Southwestern Lapland (3c).

Specimen examined: Ostrobottnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, Sorvanulkki, UCS 7358753:3416549, 6 Oct 2014, on *Picea abies*, fallen trunk, diam. 18 cm, decay stage 3, leg. MK 74/14 & P. Helo (OULU), det. MK.

Basidiodendron cinereum (Bres.) Luck-Allen

New to Northern Boreal, Forest Lapland (4c).

Specimen examined: Lapponia inarensis, Inari, Vätsäri Wilderness Area, Paksuniemi, UCS 7665363:3553150, 17 Aug 2009, on *Salix caprea*, broken fallen trunk, diam. 13 cm, decay stage 2, leg. PK 5008 (TUR), det. MK, conf. HK.

Botryobasidium conspersum J. Erikss.

New to Middle Boreal, Northern Carelia – Kainuu (3b).

Specimen examined: Ostrobottnia ouluensis, Pudasjärvi, Puhos, Pahkavaara, UCS 725515:354131, 28 Aug 1997, on *Alnus* sp., fallen trunk, diam. 8 cm, leg. M. Ohenoja 8 (OULU), det. MK. This specimen represents the anamorph *Haplotrichum conspersum* (Link) Hol.-Jech.

Ceraceomyces borealis (Romell) J. Erikss. & Ryvaden Fig. 3

New to Middle Boreal, Southwestern Lapland (3c).

Specimen examined: Ostrobottnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, Sorvanulkki, UCS 7358699:3416784, 6 Oct 2014, on *Picea abies*, fallen trunk, diam. 25 cm, decay stage 4, leg. MK 70/14 & P. Helo (OULU), det. MK.

Ceraceomyces tessulatus (W.B. Cooke) Jülich

New to Middle Boreal, Southwestern Lapland (3c) and Northern Boreal, Forest Lapland (4c).

Specimens examined: Ostrobottnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, UCS 7359229:3417222, on *Picea abies*, fallen trunk, diam. 4 cm, decay stage 1, 4 Sep 2014, leg. MK 7/14 & A.-L. Ruotsalainen (OULU), det. MK. – Lapponia inarensis, Inari, Lemmenjoki National Park, Laavujärvenvaara, UCS 7647847:3476106, 8 Aug 2008, *Betula* sp., broken fallen trunk, diam. 6 cm, decay stage 3, leg. PK 3265 (TUR), det. JP. – Inari, Hammastunturi Wilderness Area, Kyläaapa, UCS 7594442:3485862, 3 Sep 2008, on *Picea abies*, fallen broken trunk, diam. 12 cm, decay stage 3, charred, leg. PK 3572 (TUR), det. MK.

Chaetoporellus curvisporus (J. Erikss. & Hjortstam) J. Erikss. & Hjortstam

New to Middle Boreal, Northern Carelia – Kainuu (3b). This is the sixth record in Finland. Earlier records are from Koski (1b), Padasjoki, Lammi (2a), Muurame (2b) and Saarijärvi (3a) (Kotiranta et al. 2009, Kunttu et al. 2011), and were recorded on *Picea abies*, *Pinus sylvestris* and *Betula* sp. Near threatened.

Specimen examined: Ostrobottnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 7146473:3513040, 6 Oct 2013, on *Pinus sylvestris*, fallen trunk, diam. 8 cm, decay stage 4, leg. T. Helo (OULU), conf. MK.

Colacogloea peniophorae (Bourdot & Galzin) Oberw., R. Bauer & Bandoni

New to Hemiboreal, Åland (1a). This is the eighth record in Finland. All earlier records are from the southwestern archipelago or the south coast (subzone 1b) (Kotiranta et al. 2009, Kunttu et al. 2009, Kunttu et al. 2012, Miettinen 2012). *Colacogloea peniophorae* is apparently much more common than hitherto recorded. It has often been overlooked when quickly identifying the host species (mostly *Peniophorella praetermissa*).

Specimen examined: Alandia, Eckerö, Svartnö, UCS 6708:3093, 2 Sep 2014, on *Peniophorella praetermissa / Alnus glutinosa*, fallen trunk, diam. 23 cm, decay stage 2, leg. PK 8471 (TUR), det. MK.

Fig. 2. *Antrodia albobrunnea* on dead Scots pine (*Pinus sylvestris*) in Eckerö, 31 Aug 2014 (PK 8379). Photo Panu Kunttu.

Fig. 3. *Ceraceomyces borealis* on dead Norway spruce (*Picea abies*) in Rovaniemi, 6 Oct 2014 (MK 70/14). Photo Pekka Helo.

Fig. 4. *Phlebiella christiansenii* on Norway spruce (*Picea abies*) in Rovaniemi, 6 Oct 2014 (MK 55/14). Photo Pekka Helo.

Fig. 5. *Tretomyces microsporus* on dead Scots pine (*Pinus sylvestris*) in Paltamo, 2 Sep 2012 (P. Helo 2306). Photo Pekka Helo.

Coniophora fusispora (W.B. Cooke & Ellis) Sacc.

New to Hemiboreal, Åland (1a).

Specimen examined: Alandia, Eckerö, Inre fjärden, Udden, UCS 6707:3091, 31 Aug 2014, on *Pinus sylvestris*, fallen trunk, diam. 7 cm, decay stage 2, leg. PK 8362 (TUR), det. JP.

Dacryobolus karstenii (Bres.) Oberw. ex Parmasto

New to Northern Boreal, Forest Lapland (4c). This is a common species on dry pine logs.

Specimen examined: Lapponia inarensis, Inari, Hammastunturi Wilderness Area, Kuikkajänkä, UCS 7591341:3479995, 21 Aug 2008, on *Pinus sylvestris*, log, diam. 14 cm, decay class 2, leg. PK 3466 (TUR), det. JP.

Deviodontia pilaecystidiata (S. Lundell) Hjortstam & Ryvarden

Syn. *Hyphodontia pilaecystidiata* (S. Lundell) J. Erikss.

This is the fourth record in Finland, from subzone 3a. Earlier records are from Puolanka (3b), Kiiminki (3a) and Tervola (3c) (Kotiranta et al. 2009). Vulnerable.

Specimen examined: Ostrobottnia ouluensis, Haukipudas, Martimon sydänmaa, Satamo-oja, UCS 723622:345266, 28 Mar 1993, on *Salix pentandra*, dead standing tree, leg. M. Ohenoja 13 (OULU), det. MK.

Femsjonia peziziformis (Lév.) P. Karst.

New to Middle Boreal, Northern Carelia – Kainuu (3b).

Specimen examined: Ostrobottnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 7146519:3513867, 10 Oct 2013, on *Pinus sylvestris*, fallen trunk, diam. 35 cm, decay stage 2, kelo tree, leg. P. Helo 2513 (OULU), conf. MK.

Globulicium hiemale (Laurila) Hjortstam

New to Middle Boreal, Northern Carelia – Kainuu (3b). This species is very common everywhere where fallen conifers are present.

Specimen examined: Ostrobottnia kajanensis, Sotkamo, Parkua, Komula, UCS 7107954:3546556, 29 Aug 2008, on *Picea abies*, fallen trunk, diam. 3 cm, decay stage 3, leg. P. Helo 1658 (OULU), det. MK.

Gloiodon strigosus (Sw.: Fr.) P. Karst.

New to Hemiboreal, Åland (1a). This is one of the southernmost records in Finland (Kotiranta et al. 2009, Savola 2015). Near threatened.

Specimen examined: Alandia, Saltvik, Boxö ön, UCS 6716113:3121056, 5 Sep 2014, on partly erect, corticated, dead *Salix caprea*, diam. 14 cm, decay stage 1, *Alnus glutinosa* dominated mixed seasonally flooded wet forest, next to a little fen, the basidiocarp on the underside of the trunk was one metre long, leg. PK 8580 (TUR), conf. JP.

Hyphoderma medioburiense (Burt) Donk

New to Northern Boreal, Forest Lapland (4c).

Specimen examined: Lapponia inarensis, Inari, Vätsäri Wilderness Area, Karhujänkä, UCS 7663870:3553454, 18 Aug 2009, on *Salix caprea*, branch, diam. 5 cm, decay stage 2, leg. PK 5025 (TUR), det. MK.

Hypochnicium albostramineum (Bres.) Hallenb.

New to Middle Boreal, Northern Karelia – Kainuu (3b).

Specimen examined: Ostrobottnia kajanensis, Sotkamo, Korholanmäki, Losonvaara, UCS 7105325:3545497, 12 Oct 2010, on *Picea abies*, cut log, diam. 23 cm, decay stage 4, leg. P. Helo 1931 (OULU), det. MK.

Hypochnicium punctulatum (W.B. Cooke) J. Erikss.

New to Northern Boreal, North Ostrobothnia (4b).

Specimen examined: Lapponia sompiensis, Sodankylä, Pomokaira, Jäkälävaara, UCS 7554102: 3469430, 24 Aug 2009, on *Betula* sp., broken fallen trunk, diam. 17 cm, decay stage 2, leg. PK 5117 (TUR), det. MK.

Leucogyrophana sororia (Burt) Ginns

New to Northern Boreal, Forest Lapland (4c).

Specimen examined: Regio kuusamoënsis, Salla, Värriö Strict Nature Reserve, Petäjikkö-Pulkka, UCS 7522446:3615263, 17 Sep 2009, on *Pinus sylvestris*, fallen trunk, diam. 21 cm, decay stage 4, kelo, leg. PK 5547 (TUR), det. JP.

Luellia recondita (H.S. Jacks.) K.H. Larss. & Hjortstam

New to Southern Boreal, Southwestern Finland and Southern Ostrobothnia (2a). There are four earlier records from Finland, all from the hemiboreal zone (subzones 1a and 1b) (Kotiranta et al. 2009, Kunttu et al. 2012).

Specimen examined: Karelia australis, Hamina, Pyhältö, Lapatunjärvi, UCS 6734:3519, 13 Oct 1981, leg. L. Fagerström (H), det. MK.

Lyomyces sambuci (Pers.) P. Karst.

New to Middle Boreal, Northern Carelia – Kainuu (3b).

Specimen examined: Ostrobottnia kajanensis, Kajaani, Kruununpuodinmäki, UCS 7125831: 3535457, 3 Nov 2012, *Sambucus racemosa*, branch, diam. 2 cm, decay stage 2, leg. P. Helo 2478 (OULU), det. T. Helo, conf. MK.

Peniophorella pallida (Bres.) K.H. Larss.

New to Middle Boreal, Northern Carelia – Kainuu (3b).

Specimen examined: Ostrobottnia kajanensis, Kajaani, Karankalahti, Kontinkangastie, UCS 7115731:3538625, 28 Aug 2008, on *Pinus sylvestris*, fallen trunk, diam. 23 cm, decay stage 4, leg. P. Helo 1646 (OULU), det. MK.

Perenniporia medulla-panis (Jacq.: Fr.) Donk

New to Southern Boreal, Southwestern Finland and Southern Ostrobothnia (2a). Vulnerable.

Specimen examined: Nylandia, Porvoo, Stensböle, UCS 6695919:3428698, 24 Sep 2008, on *Quercus robur*, fallen branch, diam. 12 cm, decay stage 2, leg. K. Savola A/240908 (H), det. M.E. Niemi.

Phellinus chrysoloma (Fr.) Donk **s. str.**

New to Middle Boreal, Ostrobothnia (3a). According to Niemelä (2012) there are only a few DNA-confirmed *P. chrysoloma* specimens in Finland. *P. chrysoloma* has apparently a southern distribution (but only along the coast of the Gulf of Bothnia), extending to the Oulu region in the north (Niemelä 2012). Most of the

specimens collected in Finland as *P. chrysoloma*, belong to *Phellinus abietis* (P. Karst.) H. Jahn.

Specimen examined: Ostrobottnia ouluensis, Haukipudas, Kalimeenoja S, Tuirahovi-Myllykoski, UCS 72218:34926, 28 Sep 1969, on *Picea abies*, leg. M. Ohenoja/8 (OULU), det. MK, conf. T. Niemelä.

Phlebia centrifuga P. Karst.

New to Hemiboreal, Åland (1a). Near threatened.

Specimen examined: Alandia, Eckerö, Inre Fjärden, Udden, UCS 6707728:3091634, 30 Aug 2014, on *Picea abies*, dead standing trunk, diam. 33 cm, decay stage 1, uneven-aged spruce-dominated *Oxalis-Maianthemum* heath forest, leg. PK 8344 (TUR), conf. JP.

Phlebia femsioeensis (Litsch. & S. Lundell) J. Erikss. & Hjortstam

This is the fourth record in Finland, made in subzone 3b. Earlier records are from Koski and Hämeenlinna (2a), and Kuhmo (3b) (Kotiranta et al. 2009, Kunttu et al. 2013).

Specimen examined: Ostrobottnia ouluensis, Pudasjärvi, Puhos, Pieni Haukijärvi, UCS 724998: 353568, 20 Aug 1997, on *Pinus sylvestris*, fallen trunk, diam. 8 cm, leg. M. Ohenoja 9 (OULU), det. MK, conf. HK.

Phlebia subcretacea (Litsch.) M.P. Christ.

New to Northern Boreal, Forest Lapland (4c). This is the eighth record in Finland; earlier records are from Southern and Eastern Finland (Kotiranta et al. 2009).

Specimen examined: Lapponia sompiensis, Savukoski, Värriö Strict Nature Reserve, Pommituskukkulat, UCS 7519522:3607357, 15 Sep 2009, on *Pinus sylvestris*, complete fallen trunk, diam. 37 cm, decay stage 4, kelo, leg. PK 5478 (TUR), det. MK.

Phlebiella christiansenii (Parmasto) K.H. Larss. & Hjortstam Fig. 4

New to Middle Boreal, Southwestern Lapland (3c).

Specimen examined: Ostrobottnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, Sorvanulkki, UCS 7358515:3417097, 6 Oct 2014, on *Picea abies*, broken fallen trunk, diam. 30 cm, decay stage 3, leg. MK 55/14 & P. Helo (OULU), det. MK.

Piloderma lanatum (Jülich) J. Erikss. & Hjortstam

New to Southern Boreal, Lake District (2b) and Northern Boreal, Fjeld Lapland (4d). These are the second and third records from Finland. The first Finnish specimen *P. lanatum* var. *bisporum*, found in Helsinki (1b) (Kotiranta et al. 2009) differs at least morphologically from *P. lanatum* var. *lanatum* (these records).

Specimens examined: Tavastia australis, Luhanka, Lempää S, Sepänmäki S, UCS 6848:3433, 21 Oct 2004, on *Juniperus communis*, diam. 2 cm, decay stage 2, leg. HK 20990 (H), det. MK. – Lapponia inarensis, Utsjoki, Kevo Strict Nature Reserve, Keneskoski UCS 7740:3500, 23 Sep 2009, on *J. communis*, diam. 2 cm, decay stage 2, leg. HK 23152 (H), det. MK; ibid., on *J. communis*, diam. 1 cm, decay stage 1, leg. HK 23180 (H), det. MK.

Piloderma sphaerosporum Jülich

New to Northern Boreal, North Ostrobothnia (4b).

Specimen examined: Lapponia sompiensis, Sodankylä, Pomokaira, Jäkälävaara, UCS 7554233: 3469710, 24 Aug 2009, on *Pinus sylvestris*, broken fallen kelo trunk, diam. 23 cm, decay stage 2, leg. PK 5109b (TUR), det. MK.

Piloporia sajanensis (Parmasto) Niemelä

New to Northern Boreal, North Ostrobothnia (4b). Endangered.

Specimen examined: Lapponia sompiensis, Savukoski, Vintilänkaira, UCS 7506008:3540267, 26 Aug 2010, on *Picea abies*, complete fallen trunk, diam. 20 cm, decay stage 3, leg. T. Kallio 584 (H), det. J. Kinnunen.

Plicatura crispa (Pers.: Fr.) Rea

New to Southern Boreal, Lake District (2b). According to herbaria H and TUR, there are about eight earlier records in Finland but the most recent one is from Utsjoki (4d) in 1965. Data deficient.

Specimen examined: Savonia australis, Punkaharju, Lohikoski, UCS 6832468:3602187, 7 Oct 2008, on *Betula* sp., fallen branch, diam. 3 cm, decay stage 2, leg. A. Markkanen 1899 (A.M.), det. A. Markkanen & P. Halme.

Polyporus badius (Pers.) Schwein.

Kotiranta et al. (2009) mention seven localities from Southern and Eastern Finland but it is obvious that some more records have been made later (Vauhkonen et al. 2011, Savola 2015). Substrates recorded: *Alnus glutinosa*, *Acer platanoides*, *Populus tremula* and *Ulmus glabra* (Kotiranta et al. 2009). Vulnerable.

Specimens examined: Nylandia, Porvoo, Stensböle, UCS 6695515:3428615, 27 Oct 2008, on *Populus tremula*, fallen trunk, diam. 27 cm, decay stage 3, leg. K. Savola E1/271008, det. M.E. Niemi. – Regio aboënsis, Kemiönsaari, Biskopsö, UCS 6659608:3250001, 30 Aug 2011, on six fallen trunks or cut logs of *Populus tremula* with diameters 18–51 cm (mean 32 cm), decay stage mainly 1, moist herb-rich forest, leg. PK 7632, 7635, 7636, 7639, 7640, 7640 (H, TUR), conf. JP.

Polyporus melanopus (Pers.: Fr.) Fr.

New to Northern Boreal, Fjeld Lapland (4c).

Specimen examined: Lapponia inarensis, Inari, Muotkatunturit Wilderness Area, Kuosmusvaara, UCS 7656407:3483049, 10 Jul 2014, on the ground in mixed forest, leg. PK 8321 (TUR).

Postia floriformis (Quél. ex Bres.) Jülich

New to Middle Boreal, Southwestern Lapland (3c).

Specimens examined: Ostrobottnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, UCS 7359657:3416756, 25 Sep 2011, on *Picea abies*, diam. 35 cm, decay stage 1, leg. MK 71/11 & T. Tenno (OULU), det. MK. – Rovaniemi, Pisavaara Strict Nature Reserve, Kuusilaki, UCS 7356028:3417705, 30 Sep 2011, on *Picea abies*, diam. 15 cm, decay stage 1, leg. MK 83/11 (OULU).

Pseudotomentella tristis (P. Karst.) M.J. Larsen

New to Northern Boreal, North Ostrobothnia (4b).

Specimen examined: Lapponia sompiensis, Sodankylä, Pomokaira, Jäkälävaara, UCS 7554233: 3469710, 24 Aug 2009, on *Pinus sylvestris*, broken fallen kelo trunk, diam. 23 cm, decay stage 2, leg. PK 5109a (TUR), det. MK.

Pycnoporellus alboluteus (Ellis & Everh.) Kotl. & Pouzar

This is the seventh locality in Finland. Earlier records are from Tervola, Rovaniemi (3c), Pudasjärvi, Taivalkoski (4a), and Rovaniemi (4b) (Kotiranta et al. 2009). The number of occupied trunks is much higher, for example in the Pisavaara Strict Nature Reserve. Substrates: *Picea abies*, *Alnus incana* and

Populus tremula, almost solely on trees decayed by *Fomitopsis pinicola*. Endangered.

Specimen examined: Ostrobottnia ultima, Kemijärvi, Javarustunturi, UCS 7425601:3510942, 6 Sep 2010, on *Picea abies*, fallen trunk, diam. 40 cm, decay stage 3, dead basidiocarp, leg. T. Kallio.

Radulomyces confluens (Fr.: Fr.) M.P. Christ.

New to Middle Boreal, Northern Carelia – Kainuu (3b). *Radulomyces confluens* is a very common species everywhere in Finland, and the lack of records from subzone 3b was due to the scarcity of collectors in that area.

Specimens examined: Ostrobottnia kajanensis, Kajaani, Variskangas, Tilhitie, UCS 7123755: 3537560, 9 Nov 2004, on *Betula* sp., branch, diam. 2 cm, decay stage 3, leg. P. Helo 1402 (OULU), det. MK. – Kajaani, Variskangas, Tilhitie, UCS 7123730:3537558, 9 Nov 2004, on *Salix* sp., fallen trunk, diam. 2 cm, decay stage 3, leg. P. Helo 1403 (OULU), det. MK.

Rigidoporus obducens (Pers.: Fr.) Pouzar

New to Southern Boreal, Southwestern Finland and Southern Ostrobothnia (2a). This is the seventh record in Finland. The earlier ones are from the southernmost part of Finland, near the coast line (1a) (Kotiranta et al. 2009, Savola 2015). Data deficient.

Specimen examined: Tavastia australis, Hattula, Metsänkylä, Ellilä, UCS 6772824:3361626, 2 Oct 2008, on *Ulmus* sp., whole fallen trunk, diam. 50 cm, decay stage 2, leg. & det. A. Markkanen 1859 (A.M.), conf. T. Niemelä and J. Kinnunen.

Rigidoporus populinus (Schumach.: Fr.) Pouzar

New to Northern Boreal, Kuusamo District (4a).

Specimen examined: Regio kuusamoënsis, Taivalkoski, Vaarakylä, Iso Hirvivaara, UCS 72930: 35568, 26 Apr 1992, on living *Betula pendula*, leg. M. Ohenoja 11 (OULU), det. E. Ohenoja, conf. MK.

Skeletocutis kuehneri A. David

New to Hemiboreal, Åland (1a).

Specimen examined: Alandia, Eckerö, Finbo, UCS 6716081:3091098, 1 Sep 2014, on *Pinus sylvestris*, fallen trunk, diam. 55 cm, decay stage 2, leg. PK 8424 (TUR), det. JP.

Skeletocutis ochroalba Niemelä

This is the third record from Finland (all in subzone 2a). Earlier ones are from Lammi, not far from the town of Hämeenlinna (Kotiranta et al. 2009). The substrate was *Picea abies* in both cases.

Specimen examined: Tavastia australis, Hämeenlinna, Aulanko, UCS 6770254:3363264, 1 Oct 2008, on *Picea abies*, broken fallen trunk, diam. 6 cm, decay stage 2, leg. & det. A. Markkanen 1855 (A.M.), conf. T. Niemelä.

Tomentella fuscocinerea (Pers.: Fr.) Donk

New species to Finland and hence new to Hemiboreal, Oak zone (1b).

Specimen examined: Regio aboënsis, Dragsfjärd, Stora Buskär, UCS 6644647:3229257, 17 Aug 2010, *Betula pubescens*, fallen broken trunk, diam. 18 cm, decay stage 4, length 1.6 m, leg. PK 6586 (TUR, TU), det. U. Kõljalg.

Tomentella radiosa (P. Karst.) Rick

New to Northern Boreal, North Ostrobothnia (4b).

Specimens examined: Lapponia sompiensis, Pelkosenniemi, Pyhä-Luosto National Park, Huttuoja, UCS 7435356:3500808, 7 Sep 2009, on conifer, fallen broken trunk, diam. 23 cm, decay stage 3, charred, leg. PK 5351 (TUR), det. MK. – Sodankylä, Pomokaira, Jäkälävaara, UCS 7553550:3468160, 26 Aug 2009, on *Pinus sylvestris*, fallen branch of kelo tree, diam. 7 cm, decay stage 2, leg. PK 5152 (TUR), det. MK.

Trechispora caucasica (Parmasto) Liberta

This is the fourth record in Finland. The earlier ones are also from the Hemiboreal Oak zone (1b) (Kotiranta et al. 2009, Kunttu et al. 2012).

Specimen examined: Nylandia, Raseborg, Gullö, Edesbacka, UCS 66522:32985, 27 Sep 2001, on *Picea abies*, stump, decay stage 4, leg. HK 18874 & R. Saarenoksa (H), det. MK.

Trechispora laevis K.H. Larss.

New to Hemiboreal, Åland (1a). There are eight earlier records from Finland, the Hemiboreal zone (Parainen 3 records, Helsinki), Southern Boreal zone (Lammi and Padasjoki) and Middle Boreal zone (Suomussalmi and Rovaniemi) (Kotiranta et al. 2009, Kunttu et al. 2009, 2012, 2014).

Specimen examined: Alandia, Eckerö, Finbo, Brännsvikkärret, UCS 6716:3091, 1 Sep 2014, on *Picea abies*, fallen trunk, diam. 12 cm, decay stage 4, leg. PK 8398 (TUR), det. MK.

Trechispora microspora (P. Karst.) Liberta

New to Hemiboreal, Åland (1a).

Specimen examined: Alandia, Eckerö, Finbo, Brännsvikkärret, UCS 6716:3091, 31 Aug 2014, on *Juniperus communis*, fallen trunk, diam. 8 cm, decay stage 3, leg. PK 8376 (TUR), det. MK.

Tretomyces microsporus Kotir., Saaren. & K.H. Larss. Fig. 5

New to Middle Boreal, Ostrobothnia (3a). This is the second locality in Finland. The first one was in Lieksa (3b), where it was found on two charred and strongly decayed *Pinus sylvestris* trunks (Kotiranta et al. 2011).

Specimen examined: Ostrobottnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 7146659: 3513997, 2 Sep 2012, on *Pinus sylvestris*, charred rootstalk, diam. 35 cm, decay stage 3, leg. P. Helo 2306 (OULU), det. MK, conf. HK.

Tubulicrinopsis cystidiata Kotir. & Miettinen

New to Middle Boreal, Northern Carelia – Kainuu (3b). This is the second record in Finland and, furthermore, the second record in the world. The first one was discovered on *Picea abies* in Lammi (2a) (Kotiranta et al. 2007, 2009). The fruit body of this species is so small and thin that it has been collected only accidentally, together with a larger "target" species. Data deficient.

Specimen examined: Ostrobottnia kajanensis, Kajaani, Variskangas, Tilhitie, UCS 7123743: 3537563, 1 Nov 2011, on deciduous tree, rootstalk, diam. 20 cm, decay stage 3, leg. P. Helo 2195 (OULU), det. MK, conf. HK.

Tulasnella albida Bourdot & Galzin

New to Northern Boreal, Forest Lapland (4c). This is the fourth record in Finland. Earlier records are from Sipoo, Padasjoki (2a) and Pieksänmaa (2b). Recorded hosts are *Populus tremula*, *Betula* sp. and *Abies sibirica* cult. (Kotiranta et al. 2009). *Tulasnella albida* is not so rare as reported, but it used to be confused with *T. eichleri* Bres.

Specimen examined: Lapponia inarensis, Inari, Vätsäri Wilderness Area, Kirakkaniemi, UCS 7666376:3551418, 19 Aug 2009, on *Pinus sylvestris*, broken fallen trunk, diam. 11 cm, decay stage 4, kelo tree, leg. PK 5071 (TUR), det. HK.

Tylospora asterophora (Bonord.) Donk

New to Middle Boreal, Northern Carelia – Kainuu (3b).

Specimen examined: Ostrobottnia kajanensis, Sotkamo, Korholanmäki, Losonvaara, UCS 7105441:3544935, 17 Oct 2011, on *Picea abies*, piece of root, diam. 13 cm, decay stage 3, leg. P. Helo 2096 (OULU), det. MK.

Vararia investiens (Schwein.) P. Karst.

New to Middle Boreal, Ostrobothnia (3a).

Specimen examined: Ostrobottnia media, Pyhäntä, Ahokylä, UCS 7107650:3485035, 1 Sep 2004, on *Pinus sylvestris*, fallen branch, diam. 1.5 cm, decay stage 2, leg. P. Helo 1294 (OULU), det. MK.

Xylodon nespori (Bres.) Hjortstam & Ryvarden

This is the fourth record in Finland. Earlier records are from Kemiö (1b), Suomussalmi (3b), and Kuusamo (4a) (Kotiranta et al. 2009).

Specimen examined: Regio kuusamoënsis, Kuusamo, Liikasenvaara, Sirkkapuro, UCS 7362:3612, 18 Aug 1993, on *Pinus sylvestris*, leg. E. Ohenoja (OULU), det. MK.

DISCUSSION

The most remarkable records mentioned in this paper are the second record of *Tubulicrinopsis cystidiata* in the world (both finds from Finland), *Tomentella fuscocinerea*, which is new to Finland, the second Finnish record of *Tretomyces microsporus*, and the third Finnish record of *Skeletocutis ochroalba*. It is also noteworthy that *Piloderma lanatum* var. *lanatum*, if genetically separate from *P. lanatum* var. *bisporum*, had not been reported from Finland before.

Tubulicrinopsis cystidiata was found in Kajaani (3b), where it grew on a dead deciduous tree, whereas the earlier record was made in Lammi (2a) on Norway spruce (Kotiranta et al. 2007). The distance between these two localities is almost 400 km. This second known record of *T. cystidiata* does not provide any hints of its substrate preferences.

Tomentella fuscocinerea is widespread in the northern hemisphere, but rather rare, and has been found e.g. in North America, Europe, eastern parts of Russia, Central Asia, the Caucasus (Svrček 1958, Kõljalg 1996, Barrett et al.

2010), and possibly also Pakistan (Hanif et al. 2012). Substrates are e.g. fallen coniferous needles, bryophytes, soil and humus (Yurchenko 2006).

Tretomyces microsporus seems to favour strongly decayed, at least partly charred pine, since all the hitherto found specimens were growing on such substrates. Both of the two Finnish records were made in Eastern Finland, and in both cases the substrate was charred and strongly decayed Scots pine.

Skeletocutis ochroalba was found in a recreation area by the town of Hämeenlinna (2a) while the earlier two findings are from Lammi, not far from this new site (Kotiranta et al. 2009). The host was Norway spruce in all these cases. Microscopically, *S. ochroalba* is practically identical with its hardwood-dwelling counterpart *S. nivea*.

Piloderma lanatum was found in the northernmost part of Finland, 1000 km north of the first Finnish collection (Helsinki, 1b). The first Finnish specimen was *P. lanatum* var. *bisporum*. We do not know if *P. lanatum* var. *lanatum* and *P. lanatum* var. *bisporum* are conspecific (we have not seen sequenced specimens of these). *Piloderma lanatum* has a wide distribution in Europe, but it is rare everywhere (Bernicchia & Gorjón 2010). All material of the genus *Piloderma* in Finnish herbaria (H, TUR, JYV, OULU) has been confirmed or re-identified by MK.

Most new records of aphyllophoroid fungi presented in this paper are from regions where they had been expected, relatively close to their formerly known distribution areas. However, the records of some species are far from their earlier finds or at least in a surprising direction. Examples are the following species, new to Lapland: *Antrodiella faginea*, *Hypochnicium punctulatum* and *Leucogyrophana sororia*. Of the rare ones, the new records of *Chaetoporellus curvisporus*, *Phlebia femsioeensis*, *Phlebia subcretacea* and *Tulasnella albida* are by far the northernmost in Finland (Kotiranta et al. 2009). One obvious explanation of the "expansion" of southern species to the north is the increasing collecting activity in Lapland. However, we cannot fully exclude the possibility that the warming of the climate has also affected this phenomenon.

Until our new record from Åland, the southwesternmost record of *Antrodia albobrunnea* was from Kurjenrahka National Park in Nousiainen (1b) in 1993, where its habitat was a well-preserved old-growth forest (Savola 1995). In addition to this there are five records from southernmost Finland (Kotiranta & Niemelä 1996), but they are all at least 20 years old. In Sweden the main distribution area lies nowadays north of Värmland but some isolated localities are known from Småland in southern Sweden (Nitare 2000). Also the records of *Gloiodon strigosus* and *Phlebia centrifuga* are interesting because they are very rare in southwestern Finland (Kotiranta et al. 2009). The main distribution areas of these three virgin forest species are today mainly in northern and eastern Finland (Kotiranta & Niemelä 1996), where large well-preserved old-growth forests occur.

In the past, *Plicatura crispa* occurred throughout Finland, but nowadays it has been evaluated to be regionally extinct from subzones 1b, 2a and 2b. According to data from herbaria (H, TUR), old records are from Vårdö (1a) 1962, Pohja (1a) 1881, Helsinki (1a) 1858 and 1905, Porvoo (2a) 1905 and 1924, Sastamala (2a) 1859, Kuopio (2b) 1902–1906, and Utsjoki (4d) 1961–1965. Host trees are various deciduous trees, like *Betula* sp. and *Alnus incana*. In Sweden, *Plicatura crispa* occurs only in the south up to the Dalarna region in the north (Nitare 2000), but in Russia it is common in e.g. clear-cut areas and other seemingly trivial habitats.

Two species, *Pycnoporellus alboluteus* and *Deviodontia pilaecystidiata*, have an interesting distribution pattern in Finland: the finds of these two are from relatively restricted areas, although suitable environments should be present both further north and south. At least *Pycnoporellus alboluteus* has its habitat preferences in old-growth forests. Extensively inventoried nature conservation areas in Lapland however lack *P. alboluteus* (e.g. Renvall et al. 1991, Ylläsjärvi et al. 2011).

The distribution of corticioids is still inadequately known in many regions of Finland, especially on the Åland Islands and in Lapland, as shown in this article. Both Åland and Lapland are not very easy to reach by researchers, who mainly live in the southern part of the country. It is obvious that dozens of species can still be found in these areas, so that the ranges of the species could be less fragmented (on a large scale) than what is seen from the distribution maps (Kotiranta et al. 2009). Most likely there are numerous sites where many of these little collected species occur between the scattered current records. To establish which species are truly rare, more effort should be put into inventories. Of course a certain portion of aphyllophoroid fungi are truly rare, for example because of their specialisation in a certain habitat or substrate. The fungal communities occupying the smallest fractions of coarse woody debris seems to be very poorly known. Species inhabiting this substrate have often been overlooked due to their tiny size and the need of a huge amount of work both in the field and in the laboratory (Juutilainen et al. 2011, 2014).

Acknowledgements

We are indebted to the following persons who helped us compiling this article. Kaisa Junninen in Metsähallitus, Parks & Wildlife Finland, provided us with the results of many polypore inventories carried out in state-owned forests, Jorma Pennanen (Karjaa) kindly identified some specimens, Sanna-Mari Kunttu (Dalsbruk) compiled the map, Pekka Helo (Kajaani) provided three excellent photographs. Herbarium information of *Plicatura crispa* was supplied by Pertti Salo (Helsinki, H) and Jukka Vauras (Turku, TUR).

REFERENCES

ANONYMUS (2014): Eliömaakunnat [Biogeographical provinces of Finland]. – Finnish Museum of Natural History, http://www.luomus.fi/fi/eliomaakunnat. [accessed 23 April 2015; in Finnish]

BARRETT C.F., FREUDENSTEIN J.V., TAYLOR D.L., KÕLJALG U. (2010): Rangewide analysis of fungal associations in the fully mycoheterotrophic *Corallorhiza striata* complex (*Orchidaceae*) reveals extreme specificity on ectomycorrhizal *Tomentella* (*Thelephoraceae*) across North America. – Am. J. Bot. 97: 628-643. DOI: 10.3732/ajb.0900230.

BERNICCHIA A., GORJÓN S.P. (2010): *Corticiaceae* s. l. – Fungi Europaei, Vol. 12, Edizioni Candusso, Alassio.

HANIF M., KHALID A.N., SARWER S. (2012): Additions to the ectomycorrhizae associated with Himalayan cedar (*Cedrus deodara*) using rDNA-ITS. – Int. J. Agric. Biol. 14: 101–106.

HEIKINHEIMO O., RAATIKAINEN M. (1981): Ruutukoordinaattien ja paikannimien käyttö Suomessa [Grid references and names of localities in the recording of biological finds in Finland]. – Notulae Entomologicae 61: 133–154. [in Finnish with English summary]

HJORTSTAM K., RYVARDEN L. (2009): A checklist of names in *Hyphodontia* sensu stricto – sensu lato and *Schizopora* with new combinations in *Lagarobasidium*, *Lyomyces*, *Kneiffiella*, *Schizopora* and *Xylodon*. – Synopsis Fungorum 26: 33–55.

JUNNINEN K. (2009): Kääpäkartoitusten yleisohje [Guidelines for polypore inventories]. – Metsähallitus, Parks and Wildlife Finland, 3 pp. [Ms., depon. in Metsähallitus; in Finnish]

JUUTILAINEN K., HALME P., KOTIRANTA H., MÖNKKÖNEN M. (2011): Size matters in studies of dead wood and wood-inhabiting fungi. – Fungal Ecol. 4: 342–349. DOI: 10.1016/j.funeco.2011.05.004.

JUUTILAINEN K., MÖNKKÖNEN M., KOTIRANTA H., HALME P. (2014): The effects of forest management on wood-inhabiting fungi occupying dead wood of different diameter fractions. – Forest Ecol. Manag. 313: 283–291. DOI: 10.1016/j.foreco.2013.11.019.

KNUDSEN H., VESTERHOLT J., eds. (2008): Funga Nordica. Agaricoid, boletoid and cyphelloid genera. – Nordsvamp, Copenhagen.

KÕLJALG U. (1996): *Tomentella* (Basidiomycota) and related genera in Temperate Eurasia. – Synopsis Fungorum 9: 1–213.

KOTIRANTA H., HJORTSTAM K., MIETTINEN O., KULJU M. (2007): *Tubulicrinopsis* gen. nov. (Basidiomycota, Aphyllophorales) and notes on *Amauromyces pallidus*. – Ann. Bot. Fennici 44: 128–134.

KOTIRANTA H., JUNNINEN K., SAARENOKSA R., KINNUNEN J., KYTÖVUORI I. (2010): Aphyllophorales & Heterobasidiomycetes. – In: Rassi P., Hyvärinen E., Juslén A., Mannerkoski I., eds., The 2010 Red List of Finnish Species, p. 249–263. Ministry of the Environment & Finnish Environment Institute, Helsinki.

KOTIRANTA H., LARSSON K.-H. (2013): *Sistotrema luteoviride* sp. nov. (*Cantharellales*, Basidiomycota) from Finland. – Acta Mycol. 48: 219–222. DOI: 10.5586/am.2013.023.

KOTIRANTA H., LARSSON K.-H., SAARENOKSA R., KULJU M. (2011): *Tretomyces* gen. novum, *Byssocorticium caeruleum* sp. nova, and new combinations in *Dendrothele* and *Pseudomerulius* (Basidiomycota). – Ann. Bot. Fennici 48: 37–48.

KOTIRANTA H., NIEMELÄ T. (1996): Uhanalaiset käävät Suomessa [Threatened polypores in Finland]. – Finnish Environment Institute, Helsinki, 184 pp. [in Finnish with English summary]

KOTIRANTA H., SAARENOKSA R., KYTÖVUORI I. (2009): Aphyllophoroid fungi of Finland. A check-list with ecology, distribution, and threat categories. – Norrlinia 19: 1–223.

KOTIRANTA H., SHIRYAEV A. (2013): Notes on aphyllophoroid fungi (Basidiomycota) in Kevo, collected in 2009. – Kevo Notes 14: 1–22.

KUNTTU P., KOSONEN T., KULJU M., KOTIRANTA H. (2009): *Phlebia cremeoalutacea* new to Finland and new records of rare corticioid fungi (Basidiomycota). – Karstenia 49: 69–71.

KUNTTU P., KULJU, M. (2009): Tuorlan lehdon kääväkkäät [Aphyllophoroid fungi of Tuorla Nature Reserve]. – Lounais-Suomen urbaanit Natura 2000 -alueet, Kaarinan kaupungin ympäristönsuojelutoimi, 44 pp. [in Finnish]

KUNTTU P., KULJU M., KOTIRANTA H. (2012): New national and regional biological records for Finland 2. Contributions to the Finnish aphyllophoroid funga (Basidiomycota). – Memoranda Soc. Fauna Flora Fennica 88: 61–66.

KUNTTU P., KULJU M., PENNANEN J., KOTIRANTA H., HALME P. (2011): Additions to the Finnish aphyllophoroid fungi. – Folia Cryptogam. Est. 48: 25–30.

KUNTTU P., PENNANEN J., HELO T., KULJU M., SÖDERHOLM U. (2013): New national and regional biological records for Finland 4. Additions to the knowledge of Finnish aphyllophoroid funga (Basidiomycota). – Memoranda Soc. Fauna Flora Fennica 89: 119–124.

KUNTTU P., PENNANEN J., KULJU M., KEKKI T., SUOMINEN M. (2014): Noteworthy records of aphyllophoroid fungi in Finland (Basidiomycota). – Acta Mycol. 49(2): 221–235. DOI: 10.5586/am.2014.017.

LEIKOLA M. (1969): Havaintoja männyn paksuuskasvun loppumisesta ja puiden keloutumisesta Inarin Lapissa [On the termination of diameter growth of Scots pine in old age in northernmost Finnish Lapland]. – Silva Fenn. 3: 50–61. [in Finnish with English summary]

MARKKANEN A., HALME P. (2012): Polypore communities in broadleaved boreal forests. – Silva Fenn. 46: 317–331. DOI: 10.14214/sf.43.

MIETTINEN O. (2012): Orvakkalajistoselvitys Veräjämäen, Patolan ja Talin alueilla 2011 [The *Corticiaceae* survey of the forests in Veräjämäki, Patola and Tali 2011]. – Publications by City of Helsinki Environment Centre 6/2012: 1–24. [in Finnish]

MIETTINEN O., LARSSON E., SJÖKVIST E., LARSSON K.-H. (2011): Comprehensive taxon sampling reveals unaccounted diversity and morphological plasticity in a group of dimitic polypores (Basidiomycota, *Polyporales*). – Cladistics 28: 251–270. DOI: 10.1111/j.10960031.2011.00380.x.

MIETTINEN O., LARSSON K.-H. (2011): *Sidera*, a new genus in *Hymenochaetales* with poroid and hydnoid species. – Mycol. Prog. 10: 131–141. DOI: 10.1007/s11557-010-0682-5.

NIEMELÄ T. (2005): Käävät, puiden sienet [Polypores, lignicolous fungi]. – Norrlinia 13: 1–319. [in Finnish with English summary]

NIEMELÄ T. (2012): Suomen kääpien määritysopas [Guide to the polypores of Finland]. – Bot. Bull. Univ. Helsinki 194: 1–118. [in Finnish, keys in English]

NIEMELÄ T., WALLENIUS T., KOTIRANTA H. (2002): The kelo tree, a vanishing substrate of specified wood-inhabiting fungi. – Polish Bot. J. 47: 91–101.

NITARE, J. (2000): Signalarter, indikatorer på skyddsvärd skog, flora över kryptogamer [Indicator species for assessing the nature conservation value of woodland sites – a flora of selected cryptogams]. – Skogstyrelsen, Karlshamn, 384 pp. [in Swedish with English summary]

PIPPOLA E., KOTIRANTA H. (2008): The genus *Tremella* (Basidiomycota, *Tremellales*) in Finland. – Ann. Bot. Fennici 45: 401–434.

RASSI P., HYVÄRINEN E., JUSLÉN A., MANNERKOSKI I., eds. (2010): The 2010 Red List of Finnish Species. – Ministry of the Environment & Finnish Environment Institute, Helsinki, 685 pp.

RENVALL P. (1995): Community structure and dynamics of wood-rotting Basidiomycetes on decomposing conifer trunks in Northern Finland. – Karstenia 35: 1–51.

RENVALL P., RENVALL T., NIEMELÄ T. (1991): Basidiomycetes at the timberline in Lapland 2. An annotated check-list of the polypores of northeastern Finland. – Karstenia 31: 13–28.

SAVOLA K. (1995): Vaskijärven luonnonpuiston ja Pukkipalon aarnialueen kääpälajisto [Polypores of Vaskijärvi Strict Nature Reserve and Pukkipalo virgin forest]. – Metsähallitus, Etelärannikon puistoalue, 35 pp. [Inventory report, depon. in Metsähallitus, Parks and Wildlife Finland; in Finnish]

SAVOLA K. (2015): Helsingin metsien kääpäselvityksen täydennys 2014 [The polypore survey of the forests in Helsinki. Supplement 2014]. – Publications by City of Helsinki Environment Centre 1/2015, 61 pp. [in Finnish]

SPIRIN V., MIETTINEN O., PENNANEN J., KOTIRANTA H., NIEMELÄ T. (2013): *Antrodia hyalina*, a new polypore from Russia, and *A. leucaena*, new to Europe. – Mycol. Prog. 12: 53–61. DOI: 10.1007/s11557-012-0815-0.

STOKLAND J., SIPPOLA A.-L. (2004): Monitoring protocol for wood-inhabiting fungi in the Alberta Biodiversity Monitoring Program. – Alberta Biodiversity Monitoring Program, 58 pp.

SVRČEK M. (1958): Příspěvek k taxonomii resupinátních rodů čeledi *Thelephoraceae* s. s. [Contribution to the taxonomy of the resupinate thelephoraceous fungi]. – Česká Mykol. 12: 66–77. [in Czech with English summary]

VAUHKONEN M., LAMMI E., ROUTASUO P., SAVOLA K. (2011): Porvoon kansallisen kaupunkipuiston luontoselvitykset 2010–2011 [Nature inventories of Porvoo National Urban Park 2010–2011]. – Enviro, 70 pp. [Inventory report, depon. in City of Porvoo, Office of Environmental Protection; in Finnish]

YLLÄSJÄRVI I., BERGLUND H., KUULUVAINEN T. (2011): Relationships between wood-inhabiting fungal species richness and habitat variables in old-growth forest stands in the Pallas-Yllästunturi National Park, northern boreal Finland. – Silva Fenn. 45: 995–1013. DOI: 10.14214/sf.83.

YURCHENKO E.O. (2006): Natural substrata for corticioid fungi. – Acta Mycol. 42(1): 113–124. DOI: 10.5586/am.2006.015.