



Updates to Finnish aphylloroid funga (Basidiomycota): new species and range extensions

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Abstract

The knowledge of Finnish aphylloroid funga has increased substantially in recent years. In this article we present six species new to Finland: *Cristinia* (cf.) *rhenana* Grosse-Brauckm., *Hyphodontiella hauerlevii* K.H. Larss. & Hjortstam, *Leptosporomyces montanus* (Jülich) Ginns & M.N.L. Lefebvre, *Osteina obducta* (Berk.) Donk, *Sebacina helvelloides* (Schwein.) Burt, and *Tulasnella brinkmannii sensu lato* Bres. The finding of *Osteina obducta* is the first record in Northern Europe. The article also contributes new records of 56 nationally rare species (maximum ten previous records in Finland). Additionally, we list 110 regionally new species, found for the first time from a certain subzone of the boreal vegetation zones in Finland. Every record is enclosed with notes on the substrate. Furthermore, the ecology and distribution of rare species are discussed.

Key words – aphyllorales – biogeography – clavarioids – corticioids – polypores – wood-inhabiting fungi

Introduction

Aphylloroid fungi are a non-gilled, ecological form group of the Basidiomycota. They comprise of morphologically varied fungal sub-groups, such as corticioids, polypores, clavarioids and tremelloids. These groups are taxonomically highly diverse and polyphyletic (Hibbett et al. 2014). In Finland, 87 % of the aphylloroid fungal species grow in various kinds of forests, and 75 % of the species are decayers (Kotiranta et al. 2009). In addition to wood decayers, aphylloroid fungi also include litter decayers, ectomycorrhizal species, parasitic fungi and mycoparasites (Kotiranta et al. 2009).

The aphylloroid fungi, as wood-decaying fungi in general, play the key ecological role in forest ecosystems. Through decomposition processes they are responsible for the carbon and nutrient cycles of the forest ecosystem (Boddy et al. 2008). Fungi also provide microhabitats and nutrition for wide range of invertebrates, slime moulds and parasitic fungi (Jonsell et al. 2001, Dudka & Romanenko 2006, Schigel 2009). Due to their often narrow substrate requirements, the

aphyllophoroid fungi are also used as indicators of ecological value in boreal forests (e.g. Kotiranta & Niemelä 1996, Nitare 2000).

The Finnish aphylophoroid funga comprises 1034 species. The majority of the species are corticioids and polypores (Kotiranta et al. 2009, Kunttu 2016, Niemelä 2016). A large body of knowledge of aphylophoroid species' occurrence and distribution has been accumulated after the first Finnish checklist (Kotiranta et al. 2009), especially on polypores and corticioids, but some also on clavarioids (e.g. Juutilainen et al 2011, Kunttu et al. 2011, 2015, 2016a, Kotiranta & Shiryaev 2013, Kunttu 2016, Juutilainen 2016, Niemelä 2016).

However, the occurrence and distribution of many aphylophoroid species are still inadequately known in Finland. Thus, there are large gaps in knowledge of their ecology, biogeography, substrata and habitat requirements. The main reasons behind this gap are time-consuming sampling, inconspicuous basidiomata which are tricky to find, narrow ecological niches (substratum), unstable taxonomy and challenges in species identification.

In this article we present new records of aphylophoroid fungi in Finland. We consider three kinds of records: species new to Finland, rare or seldom collected species with maximum ten previous records in Finland, and species which are new to certain subzone (section) of the boreal vegetation zone in Finland.

Materials & Methods

The records in this article were mainly obtained during the years 2015 to 2017 but include some older records as well. The majority of the records derive from field studies conducted in different parts of Finland, but also sporadic records were included. The inventory methods varied to some extent.

Many records were made in nature conservation areas in species diversity inventories. Some records were made along with other outdoor activities or nature inventories as a result of random sampling of species, like inventories for the Finnish Atlas of Fungi (<http://www.sieniatlas.fi>) or nature inventories for the planning in the Kainuu region. Also surveys of species assemblages or biogeographical research were carried out in certain areas. Some records were made in Pallas-Yllästunturi National Park during a BioBlitz nature inventory event in August 2016. For 24 hours a group of scientists and volunteers conducted an intensive field work to record species from the National Park area. An often-used inventory method was opportunistic sampling of species (Stokland & Sippola 2004), but for example on the island of Örö in the Baltic Sea, the inventory method was a systematic survey of certain number of drift wood logs.

The collections of K.J. are part of a large dataset published e.g. in Juutilainen et al. (2011, 2014). A novel and thorough inventory method was used to collect fungal data from four coniferous and three deciduous boreal forest types. The hierarchical sampling method comprised of three 10 × 10 m sampling plots inside of which four smaller 2 × 2 m corner plots were established. All dead wood material with the minimum diameter of 2 cm was inventoried from the whole sampling plot. Additionally, from each corner plot also minor branches, twigs, and conifer cones – basically every dead wood unit larger than a coniferous needle – was counted and inspected for fungal fruit bodies. A more detailed description of the sampling method can be found in Juutilainen (2016).

In presented records, we use three levels for the names of the sites: a municipality, a village / large nature conservation area and a topographical name. For coordinates, we use the Finnish National Uniform Coordinate System (UCS, 27° E) according to Heikinheimo & Raatikainen (1981). The biogeographical provinces (at the beginning of each record) are according to Knudsen & Vesterholt (2008), the Latin province names are presented on the website of the Finnish Museum of Natural History (Anonymous 2014). The map showing the forest vegetation zones and their subzones (Fig. 1) was modified from Rassi et al. (2010). In accordance with the above-mentioned sources, the names of the subzones are presented in English (e.g. Ostrobothnia), contrary to the Latin names of the biogeographical provinces (e.g. Ostrobotnia).

Followed taxonomy and nomenclature are mainly according to Hjortstam & Ryvarde (2009), Kotiranta et al. (2009), Niemelä (2016), but in case of some species Bernicchia & Gorjón (2010)

were used. The Finnish national red-list evaluation of the IUCN standard is according to Kotiranta et al. (2010). The decay stage classification (1–5) of dead wood is according to Renvall (1995), where stage 1 means hard dead wood and stage 5 means completely decayed wood. The diameter of dead wood was measured at breast height if the trunk was complete, and from the middle if the trunk was broken. We use the term “kelo” referring to dead and old-growth trunks of Scots pine (*Pinus sylvestris* L.) with a grey 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 record details. The most often mentioned researchers are referred to the following abbreviations: TH = Teppo Helo, KJ = Katja Juutilainen, TK = Tapio Kekki, HK = Heikki Kotiranta, MK = Matti Kulju and PK = Panu Kunttu. The collector is also the identifier unless otherwise stated. The code after the collector’s name or abbreviation is a personal sampling number of the specimen. In some cases, also the reference number of the herbarium is given. Voucher specimens are deposited in the herbaria of the universities of Helsinki (H), Oulu (OULU), Turku (TUR), and/or in the private reference herbarium of Teppo Helo (T.H.), Pekka Helo (P.H.), Katja Juutilainen (K.J.) or Heikki Kotiranta (H.K.).

The following abbreviations are used for spores: L = mean spore length, W = mean spore width, Q = quotients of the mean spore length and mean spore width (L/W ratio).

Results

Cristinia (cf.) *rhenana* Grosse-Brauckm., *Hyphodontiella hauerlevii* K.H. Larss. & Hjortstam, *Leptosporomyces montanus* (Jülich) Ginns & M.N.L Lefebvre, *Osteina obducta* (Berk.) Donk, *Sebacina helvelloides* (Schwein.) Burt, *Tulasnella brinkmannii* s.l. Bres. are presented from Finland for the first time. New records (localities) of 56 rare or infrequently collected species (in total 108 records). The second Finnish record derived the following species: *Aphanobasidium* cf. *subnitens*, *Athelia singularis*, *Botryobasidium ellipsosporum*, *Crustoderma efibulatum*, *Hyphoderma incrustatum*, *Tulasnella deliquescens*, *Tulasnella fuscoviolacea*, *Xenasma pruinatum*, and *Xenasmatarella insperata*.

Altogether, 129 records of 110 species are reported as new to a certain subzone (section) of the boreal forest vegetation zone in Finland. The numbers of records new to subzones are: Hemiboreal, oak zone (1b) 1; Southern boreal, Southwestern Finland and Southern Ostrobothnia (2a) 1; Southern boreal, lake district (2b) 38; Middle boreal, Ostrobothnia (3a) 15; Middle boreal, Northern Carelia – Kainuu (3b) 48; Middle boreal, Southwestern Lapland (3c) 6; Northern boreal, Kuusamo district (4a) 7; Northern boreal, North Ostrobothnia (4b) 7; Northern boreal, Forest Lapland (4c) 6.

The species presented here divide into following red-listed categories: Critically Endangered (1 species), Endangered (4), Vulnerable (4), Near Threatened (6), Data Deficient (3), and Not Evaluated (2). If status of the species is Least Concern, it is not mentioned.

List of species

Species are listed in alphabetic order.

Amylostereum laevigatum (Fr.) Boidin

Specimen examined: Ostrobothnia kajanensis, Sotkamo, Parkua, Känttjä, UCS 7103379:3547232, on dead branch of *Juniperus communis* (diam. 3 cm, decay stage 1) in juniper stand next to meadow, 21 Sep 2015, leg. Pekka Helo 2826 (P.H.), det. TH.

New to Middle boreal, Northern Carelia – Kainuu (3b). Several collections have been made after this record and this species seems to be common, but its host tree *Juniperus communis* has not been surveyed before in the subzone 3b.

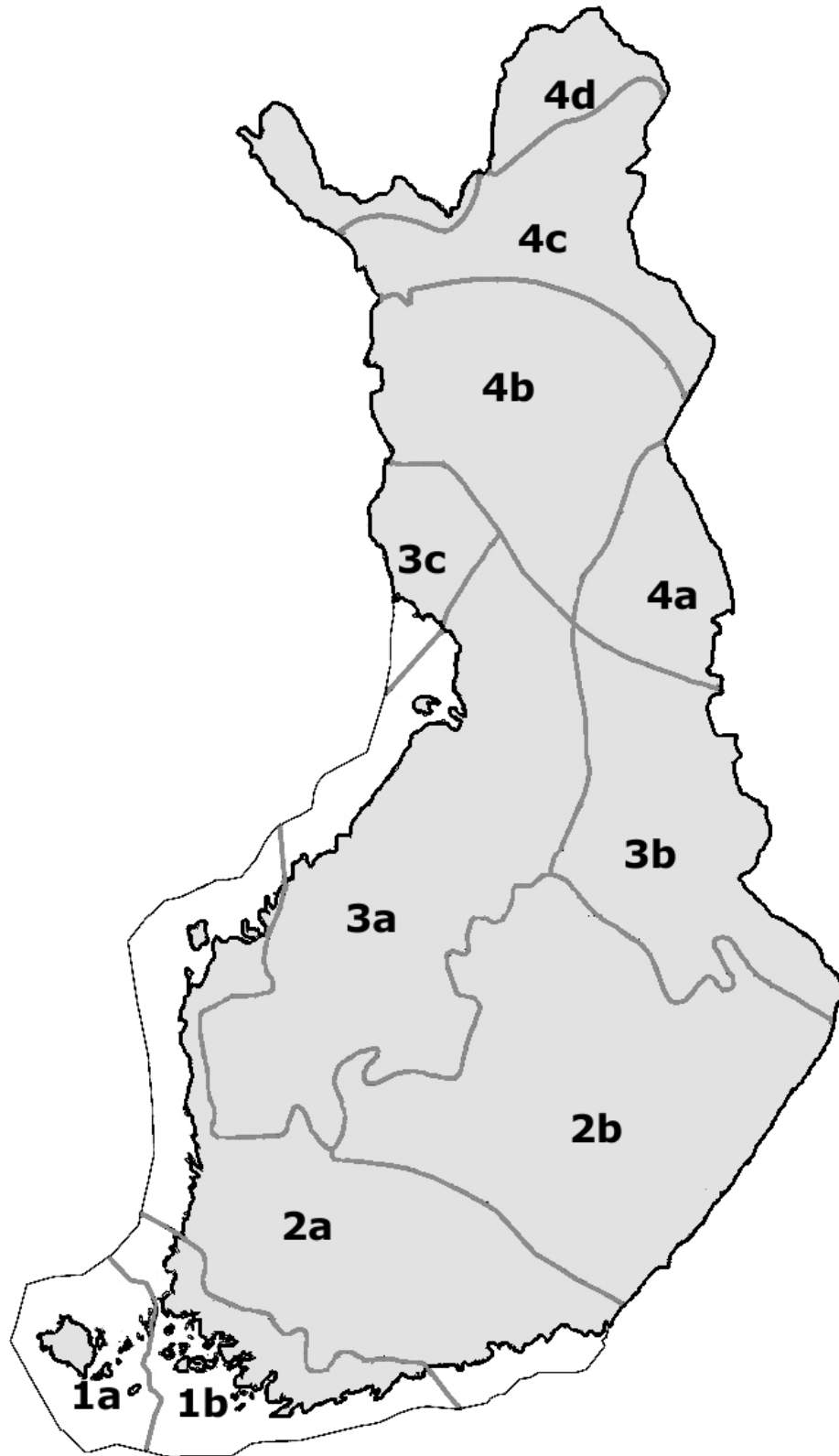


Figure 1 – Boreal forest vegetation zones (1–4) and their subzones in Finland. 1a Hemiboreal, Åland. 1b Hemiboreal, oak zone. 2a Southern boreal, Southwestern Finland and Southern Ostrobothnia. 2b Southern boreal, lake district. 3a Middle boreal, Ostrobothnia. 3b Middle boreal, Northern Carelia – Kainuu. 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.

Amyloenasma allantosporum (Oberw.) Hjortstam & Ryvarden

Fig. 2

Specimens examined – Tavastia australis, Jyväskylä, Korpilahti, Oittila, UCS 6870834:3433926, on unidentified hardwood branch (diam. 1.9 cm, decay stage 2) in near natural herb-rich forest, 30 Aug 2007, leg. KJ 1013 (K.J.); Ostrobothnia kajanensis, Kajaani, Purola, Pyykönpuro UCS 71249:35334, on fallen trunk of *Alnus incana* (diam. 2 cm, decay stage 3) in deciduous thicket forest with high amount of dead wood, 3 Oct 2017, leg. & det. TH 20170038 (T.H., OULU), conf. MK, HK; Suomussalmi, Koisti, UCS 7177:3600, on fallen trunk of *Pinus sylvestris* (diam. 20 cm, decay stage 2) in very old pine-dominated mesic heath forest with very high amount of dead wood, 17 Sep 2017, leg. & det. TH 20170037 (T.H., OULU), conf. MK, HK.

These are the 7th–9th records in Finland. The previous records are from Tammisaari (1b), Helsinki (1b, two sites), Kuhmoinen (2b), Toivakka (2b) and Lieksa (3b) (Kotiranta et al. 2009, Miettinen 2012).



Figure 2 – *Amyloenasma allantosporum* in Suomussalmi (TH 20170037). Photo: Teppo Helo

Amyloenasma grisellum (Bourdot) Hjortstam & Ryvarden

Specimens examined – Ostrobothnia kajanensis, Kajaani, Pöllyvaara, UCS 7126:3535, on fallen trunk of *Alnus incana* (diam. 40 cm, decay stage 4) in spruce-dominated mesic heath forest, 20 Sep 2017, leg. & det. TH 20170036 (T.H., OULU), conf. HK; Kajaani, Ensilä, Maitoniemi, UCS 71264:35344, on fallen trunk of *Alnus incana* (diam. 13 cm, decay stage 3) in deciduous riverside thicket forest with high amount of dead wood, 17 Oct 2017, leg. & det. TH 20170039 (T.H., OULU), conf. HK.

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

Antrodia mappa (Overh. & J. Lowe) Miettinen & Vlasák

Fig. 3

Specimen examined – Ostrobothnia kajanensis, Sotkamo, Naulavaara, Korkeakoskenpuro, UCS 70893:35582, on fallen trunk of *Populus tremula* (diam. 10 cm, decay stage 2) in moist old-growth spruce-dominated forest, 13 Sep 2012, leg. & det. TH (OULU GAJ.5451), conf. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). This is the 6th record in Finland. The previous records are from Nauvo (1b), Korpilahti (2b) and Savonranta (2b), Puolanka (3a) and Kankaanpää (3a) (Kotiranta et al. 2009, Kunttu et al. 2011). Endangered.



Figure 3 – *Antrodiella mappa* in Sotkamo, ex situ. Photo: Teppo Helo

Antrodiella niemelaei Vampola & Vlasák (*Antrodiella Americana* Ryvarden & Gilb. sensu auct.)

Specimen examined – Ostrobothnia kajanensis, Kajaani, Ensilä, UCS 71265:35345, on fallen trunk of *Salix caprea* (diam. 8 cm, decay stage 3) which was decayed by *Hydnoporia tabacina*, in deciduous riparian thicket with high amount of dead wood, 21 Oct 2016, leg. & det. TH 20160101 (T.H.).

New to Middle boreal, Northern Carelia – Kainuu (3b). Near Threatened.

Aphanobasidium cf. subnitens (Bourdot & Galzin) Jülich

Specimen examined – Tavastia australis, Luhanka, Onkisalo Island, Molikko, UCS 6850082:3431504, on deciduous tree twig (diam. 0.4 cm) in near natural herb-rich forest, 12 Oct 2007, leg. KJ 2571 (K.J.).

This is the 2nd record in Finland. The 1st record is from Porvoo (2a) (Kotiranta et al. 2009). Not Evaluated.

Athelicium hallenbergii Yurchenko & Kotiranta

Specimen examined – Tavastia borealis, Petäjävesi, Suolahti, UCS 6911151:3405740, on twig of *Betula* (diam. 0.4 cm) in young birch-dominated afforested field, 2 Oct 2012, leg. KJ 5811 (K.J.); Viitasaari, Niinilahti, Pitkämäki, UCS 6981071:3443904 and 6981203:3443835, on two *Betula* twigs (diam. 0.6 cm and 0.8 cm) in young birch-dominated afforested field, 10/25 Oct 2012, leg. KJ 5957, 6224 (K.J.).

These are the 3rd–4th records in Finland. The previous records are from Lammi (2a) and Oulu (3a) (Kunttu et al. 2012). Not Evaluated.

Athelia sibirica (Jülich) J. Erikss. & Ryvarden

Specimen examined – Ostrobothnia ouluensis, Oulu, Kalimeenoja, Halosenharju, UCS 7221795:3431931, on stump of *Pinus sylvestris* (diam. 24 cm, decay stage 1), 18 Oct 2016, MK 80/16 & Esteri Ohenoja (OULU), det. MK, conf. HK.

New to Middle boreal, Ostrobothnia (3a). This is the 3rd record in Finland. The previous records are from Lammi (2a) and Kittilä (4b) (Kotiranta et al. 2009).

Athelia singularis Parmasto

Fig. 4

Specimens examined – Ostrobothnia kajanensis, Kajaani, Pirunvaara, UCS 71270:35307, on fallen branch of *Pinus sylvestris* (diam. 5 cm, decay stage 2, kelo tree) in old-growth xeric heath forest, 3 Oct 2015, leg. TH (OULU GAJ.5441), det. MK, and in the same site on fallen branch of *Pinus sylvestris* (diam. 3 cm, decay stage 3), 3 Oct 2016, leg. TH (OULU), det. MK; Suomussalmi, Hossa, Pahamaailma, UCS 7263:3621, on fallen trunk of *Pinus sylvestris* (diam. 20 cm, decay stage 4) in old-growth xeric heath forest with high amount of dead wood, 16 Oct 2015, leg. TH (OULU GAJ.5458), det. MK, conf. HK.; Ostrobothnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, Teeripäri, UCS 7357885:3414533, on fallen kelo branch of *Pinus sylvestris* (diam. 10 cm, decay stage 2) in dry and rocky heath forest, 19 Sep 2016, leg. & det. MK 21/16 (OULU).

New to Middle boreal, Northern Carelia – Kainuu (3b) and Northern boreal, Kuusamo District (4a). These are the 2nd–3rd records in Finland. The record from Rovaniemi (3c) was found in the same site as the first Finnish record (Kunttu et al. 2016b).



Figure 4 – *Athelia singularis* in Suomussalmi. Photo: Teppo Helo

Athelopsis lembospora (Bourdot) Oberw.

Specimen examined – Tavastia australis, Jyväskylä, Korpilahti, Oittila, UCS 6827097:3433861, on unidentified hardwood (diam. 2 cm, decay stage 2) in near natural herb-rich forest, 24 Aug 2007, leg KJ 527 (K.J.).

New to Southern boreal, Lake District (2b).

Athelopsis subinsconspicua coll. (Litsch.) Jülich

Specimen examined – Tavastia borealis, Viitasaari, Niinilahti, Pitkämäki, UCS 6981071:3443904, on *Betula* branch (diam. 1 cm) in young birch-dominated afforested field, 10 Oct 2012, leg KJ 5965 (K.J.).

New to Southern boreal, Lake District (2b).

Basidioidendron eyrei (Wakef.) Luck-Allen

Specimens examined – Ostrobothnia kajanensis, Kajaani, Suvantola, UCS 71268:35343, on fallen branch of *Betula* sp. (diam. 7 cm, decay stage 3) in riparian thicket forest with high amount of dead wood, 26 Oct 2015, leg. & det. TH 20150101 (T.H.); Kajaani, Ensilä, UCS 71264:35344, on fallen trunk of deciduous tree (diam. 10 cm, decay stage 3) in deciduous riparian thicket forest with high amount of dead wood, 17 Oct 2017, leg. & det. TH 20170028 (OULU), conf. MK.

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

Basidioidendron radians (Rick) P. Roberts

Fig. 5

Specimen examined – Ostrobothnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 71461:35142 on charred root plate of *Pinus sylvestris* (diam. 30 cm, decay stage 4) in old-growth xeric heath forest with high amount of dead wood, 6 Oct 2016, leg. & det. TH (OULU GAJ.5438), conf. MK & HK.

New to Middle boreal, Ostrobothnia (3a). This is the 4th record in Finland. Previous records are from Lohja (1b), Kirkkonummi (1b) and Padasjoki (2a) (Kotiranta et al. 2009).



Figure 5 – *Basidioidendron radians* in Paltamo. Photo: Teppo Helo

Basidioidendron rimosum (H.S. Jacks & G.W. Martin) Luck-Allen

Specimen examined – Tavastia borealis, Toivakka, Vuorilamminvuoret, UCS 6884857:3456738, on twig of *Pinus sylvestris* (diam. 0.2 cm) in old-growth near natural spruce-dominated forest, 17 Oct 2007, leg KJ 2731 (K.J.).

New to Southern boreal, Lake District (2b). This is the 3rd record in Finland. The previous records are from Finnström (1a), Geta (1a) and Kirkkonummi (1b) (Kotiranta et al. 2009).

Boletopsis leucomelaena (Pers.: Fr.) Fayod

Specimen examined – Lapponia kittilensis, Kolari, Äkäsjokisuu, UCS 7488292:3356921, in calciferous coniferous forest under *Picea abies* near river bank, 3 Sep 2016, leg. & det. TK 2524 (H 6064737).

New to Northern boreal, North Ostrobothnia (4b). Vulnerable.

Botrybasidium conspersum J. Erikss.

Specimen examined – Ostrobothnia ouluensis, Oulu, Oinaansuo, UCS 7221016:3432115, on snag of *Betula* sp. (diam. 8 cm, decay stage 3) in spruce mire, 6 Sep 2017, leg. MK 93/17 & Iita Tiusanen (OULU), det. MK.

New to Middle boreal, Ostrobothnia (3a).

Botrybasidium elliposporum Holubová-Jechová

Fig. 6

Specimens examined – Ostrobothnia kajanensis, Puolanka, Paljakka, Mustakumpu, UCS 71724:35506, on fallen trunk of *Picea abies* (diam. 7 cm, decay stage 2) in old-growth spruce-dominated moist heat forest with high amount of dead wood, 13 Oct 2017, leg. TH 20170001 (H, H.K.), det. HK, and in the same site on fallen trunk of *Picea abies* (diam. 15–20 cm, decay stage 1–2), 13 Oct 2017 Jari Julkunen 1026 (H), det. HK.

New to Middle boreal, Northern Carelia – Kainuu (3b). This is the 2nd record in Finland. The previous record is from Lammi (2a) (Kotiranta et al. 2009). The specimen was an anamorph like the first Finnish collection.



Figure 6 – *Botrybasidium elliposporum* in Puolanka (TH 20170001). Photo: Teppo Helo

Botryobasidium laeve (J. Erikss.) Parmasto

Specimen examined – Ostrobothnia kajanensis, Paltamo, Hakasuo, UCS 71451:35247, on fallen trunk of *Alnus incana* (diam. 7 cm, decay stage 3) in alder thicket between the road and spruce-dominated mesic heath forest, 29 Aug 2017, leg. & det. TH 20170005 (T.H.).

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

Botryobasidium medium J. Erikss.

Specimen examined – Ostrobothnia ouluensis, Oulu, Oinaansuo, UCS 7220867:3432304, on snag of *Betula* sp. (diam. 5 cm, decay stage 2) in spruce mire, 6 Sep 2017, leg. MK 90/17 & Iita Tiusanen (OULU), det. MK.

New to Middle boreal, Ostrobothnia (3a).

Byssocorticium pulchrum (S. Lundell) M.P. Christ.

Specimen examined – Ostrobothnia kajanensis, Sotkamo, Naulavaara, UCS 708637:355807, on fallen trunk of *Populus tremula* (diam. 10 cm, decay stage 2) in mesic old-growth spruce-dominated forest, 13. Sep 2012, leg. & det. TH N213C (T.H.).

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

Byssomerulius jose-ferreirae (D.A. Reid) Zmitr.

Specimens examined – Tavastia borealis, Jyväskylä, Tourujoki, UCS 6905628:3435436, on *Sorbus* twig (diam. 0,7 cm) in near natural herb-rich forest, 11 Oct 2007, leg. KJ 2484 (K.J.), and later in the same site: UCS 6905621:3435418, on unidentified hardwood (diam. 7 cm, decay stage 2) in near natural herb-rich forest, 18 Oct 2007, leg. KJ 2774 (K.J.) and UCS 6905570:3435388, on *Salix caprea* snag (diam. 25 cm, decay stage 2) in near natural herb-rich forest, 25 Oct 2007, leg. KJ 2938b (K.J.); Toivakka, Lappila, UCS 6902242:3460412, on twig of *Salix* sp. (diam. 0.5 cm) in young birch-dominated afforested field, 16 Sep 2013, leg. KJ 6801 (K.J.).

These are the 6th–7th records in Finland. The previous records are from Lammi (two sites, 2a), Kankaanpää (2a), Lapinlahti (2b) and Keminmaa (3c) (Kotiranta et al. 2009). Near Threatened.

Ceraceomyces tessulatus (W.B. Cooke) Jülich

Specimen examined – Ostrobothnia ouluensis, Oulu, Pikkarala, Hangaskangas, UCS 7201794:3442451, on fallen trunk of *Pinus sylvestris* (diam. 5 cm, decay stage 2) in dry heath forest, 21 Oct 2016, leg. & det. MK 86/16 (OULU); Oulu, Hietasaari, UCS 7214960:3426432, on fallen trunk of *Prunus padus* (diam. 4 cm), 14 Oct 2001, leg. Lassi Kalleinen (OULU), det. MK.

New to Middle boreal, Ostrobothnia (3a).

Clavaria amoenoides Corner, Thind & Anand.

Specimens examined – Ostrobothnia ultima, Tervola, Loue, UCS 73483: 34073, on sandy dirt road near limestone quarry, 19 Aug 2016, leg. & det. TK 2347 (OULU); Lapponia kittilensis Muonio, Pallastunturi, UCS 7550912:3381128, on dry meadow with *Empetrum nigrum*, 5 Aug 2016, leg. Kaisa Junninen and TK 2308, det. TK (OULU).

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

Clavaria argillacea Pers.: Fr.

Specimen examined: – Lapponia sompiensis, Savukoski, Tulppio, UCS 75219: 35937, on ground in sandpit with young *Pinus sylvestris*, 26 Aug 2016, leg. & det. TK. 2415 (OULU).

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

Clavaria incarnata Weinm.

Specimen examined – Ostrobothnia kajanensis, Kajaani, Variskangas, Tilhitie, UCS 712378:353753, on lawn with *Sorbus aucuparia*, 25 Aug 2016, leg. & det. TH (OULU GAJ.5435).

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

Clavulina coralloides (L.: Fr.) Schröt.

Specimen examined – Lapponia kittilensis Muonio, Pallastunturi, Pyhäjoki, UCS 7551544:3381229, on ground in mesic *Picea abies* dominated forest, 4 Sep 2016, leg. & det. TK 2550 (OULU).

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

Clavulinopsis corniculata (Schaeff.: Fr.) Corner

Specimen examined – Lapponia kittilensis, Kittilä, Mustavaara, UCS 7506137: 3432870, on ground in herb-rich *Picea abies* dominated forest, 2 Sep 2016, leg. & det. TK 2471 (OULU).

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

Clavulinopsis fusiformis (Sowerby.: Fr.) Corner

Specimen examined – Lapponia sompiensis, Savukoski, Tulppio, UCS 75226: 35934, on dry meadow, 26 Aug 2016, leg. & det. TK 2414 (OULU).

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

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

Fig. 7

Specimens examined – Tavastia borealis, Jyväskylä, Tourujoki, UCS 6905570:3435388, on unidentified hardwood twig (diam. 2 cm) in near natural herb-rich forest, 25 Oct 2007, leg. KJ 2923b (K.J.); Ostrobothnia ouluensis, Oulu, Kalimeenoja, Halosenharju, UCS 7221801:3431907, on *Peniophorella praetermissa*, on fallen trunk of *Pinus sylvestris* (diam. 5 cm, decay stage 1), 18 Oct 2016 MK 81/16 & Esteri Ohenoja (OULU), det. MK; Ostrobothnia kajanensis, Kajaani, Ensilä, Maitoniemi, UCS 71264:35344, on fallen trunk of *Alnus incana* with *Peniophorella praetermissa* (diam. 10 cm, decay stage 3) in deciduous riparian thicket forest with high amount of dead wood, 17 Oct 2017, leg. & det. TH 20170006 (T.H., OULU).

New to Southern boreal, Lake District (2b), Middle boreal, Ostrobothnia (3a) and Middle boreal, Northern Carelia – Kainuu (3b). These are the 11th–13th records in Finland. All previous records are from the southwestern archipelago or the south coast (subzones 1a and 1b) (Kotiranta et al. 2009, Kunttu et al. 2009, 2012, 2015, 2016a, Miettinen 2012).

Coronicium alboglaucum (Bourdot & Galzin) Jülich

Specimen examined – Tavastia borealis, Äänekoski, Aatula, UCS 6938588:3439737, on two *Betula* twigs (diam. 0.2 and 0.3 cm) in birch-dominated wood-pasture, 13 Sep 2013, leg. KJ 5123, KJ 5154a (K.J.); Tavastia australis, Luhanka, Moiskala, UCS 6854041:3430819, on *Betula* twig (diam. 0.3 cm) in birch-dominated wood-pasture, 27 Sep 2013, leg. KJ 5733 (K.J.). Additionally, corrigendum to the following record, which was published in Kotiranta et al. (2009), but the collection site was wrong there: Tavastia australis, Muurame, Kuusimäki, UCS 6902005:3421936, on three *Pinus* twigs and one *Betula* twig (diam. 0,3-1,9 cm) in near natural old growth spruce-dominated forest, 20 Sept. 2007, leg KJ 1999–2002 (K.J.).

These are the 3rd–4th records in Finland. The previous ones are from Lammi (2a) and Muurame (2b) (Kotiranta et al. 2009).

Coronicium alboglaucum (Bourdot & Galzin) Jülich

Specimen examined – Tavastia borealis, Äänekoski, Aatula, UCS 6938588:3439737, on two *Betula* twigs (diam. 0.2 and 0.3 cm) in birch-dominated wood-pasture, 13 Sep 2013, leg. KJ 5123, KJ 5154a (K.J.); Tavastia australis, Luhanka, Moiskala, UCS 6854041:3430819, on *Betula* twig (diam. 0.3 cm) in birch-dominated wood-pasture, 27 Sep 2013, leg. KJ 5733 (K.J.). Additionally, corrigendum to the following record, which was published in Kotiranta et al. (2009), but the collection site was wrong there: Tavastia australis, Muurame, Kuusimäki, UCS 6902005:3421936, on three *Pinus* twigs and one *Betula* twig (diam. 0,3-1,9 cm) in near natural old growth spruce-dominated forest, 20 Sept. 2007, leg KJ 1999–2002 (K.J.).

These are the 3rd–4th records in Finland. The previous ones are from Lammi (2a) and Muurame (2b) (Kotiranta et al. 2009).



Figure 7 – *Colacogloea peniophorae* grew on *Peniophorella pratermissa* in Kajaani (TH 20170006). Photo: Teppo Helo

Craterocolla cerasi (Schumach.) Bref.

Fig. 8

Specimen examined – Lapponia kittilensis, Kolari, Äkäslompolo, Kesänkijärvi, UCS 75043:33822, on fallen *Picea abies* in moist coniferous forest, 6 Aug 2016, leg. Kaisa Junninen and TK 2314, det. TK (H 6064778, as *C. insignis*).

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

Cristinia* (cf.) *rhenana Grosse-Brauckm.

Specimen examined – Tavastia australis, Jyväskylä, Korpilahti, Oittila, UCS 6827097:3433861, on unidentified hardwood (diam. 6 cm, decay stage 2) in near natural herb-rich forest, 24 Aug 2007, leg. KJ 635 (K.J.); Luhanka, Moiskala, UCS 6854041:3430819, on fallen trunk of *Alnus incana* (diam. 5 cm, decay stage 3) in birch-dominated wood-pasture, 28 Sep 2013, leg. KJ 5762 (K.J.).

New to Finland, hence new to Southern boreal, lake district (2b).

Crustoderma efibulatum Kotir. & Saaren.

Specimen examined – Tavastia australis, Kuhmoinen, Isojärvi National Park, Lortikka, UCS 6845333:3394188, on twig of *Pinus sylvestris* (diam. 0.7 cm) in near natural old-growth pine-dominated forest, 19 Sep 2007, leg. KJ 1973 (K.J.).

This is the 2nd record in Finland. The 1st one is from Porvoo (2a) (Kotiranta et al. 2009). Data Deficient.



Figure 8 – *Craterocolla cerasi* in Kolari (TK 2314). Photo: Tapio Kekki

***Dacrymyces ovisporus* Bref.**

Fig. 9

Specimen examined – Ostrobothnia kajanensis, Kajaani, Pöllyvaara, UCS 71263:35353, on fallen branch of *Pinus sylvestris* (diam. 4, decay stage 1), in spruce-dominated mesic heath forest, 13 Sep 2017, leg. & det. TH 20170033 (T.H., OULU), conf. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). This is the 3rd record in Finland. The previous records are from Turku (1b) and Regio kuusamoensis (4a) (Hansen & Knudsen 1997, Kotiranta et al. 2009).

***Dendrothele amygdalispora* Hjortstam**

Specimen examined – Tavastia borealis, Jyväskylä, Tourujoki, UCS 6905628:3435436, on fallen trunk of *Salix caprea* (diam. 19 cm, decay stage 2) in near natural herb-rich forest, 11 Oct 2007, leg. KJ 2525a (K.J).

New to Southern boreal, Lake District (2b).

***Exidia saccharina* (Alb. & Schwein.: Fr.) Fr.**

Specimen examined – Ostrobothnia ultima, Tervola, Pisavaara Strict Nature Reserve, UCS 7354241:3412062, on fallen trunk of *Picea abies* (diam. 20 cm, decay stage 1) in old-growth mesic heath forest, 26 Sep 2017, leg. & det. MK 56/17 (OULU); Rovaniemi, Marrasjärvi, UCS 741979:342391, on trunk of *Pinus sylvestris* in dry heath forest, 29 May 2011, leg. & det. TK (TUR); Rovaniemi, Apukka, UCS 738818:345688, on duckboard made of *Picea abies* logs in mesic coniferous forest, 18 May 2011, leg. & det. TK (TUR)

New to Middle boreal, Southwestern Lapland (3c) and Northern boreal, North Ostrobothnia (4b).

***Fibricium rude* (P. Karst.) Jülich**

Ostrobothnia kajanensis, Kajaani, Ilmarata, UCS 71268:35337, on fallen trunk of *Picea abies*

(diam. 10 cm, decay stage 1–2) in riparian thicket forest with high amount of dead wood, 9 Oct 2016, leg. & det. TH GAJ.5439 (OULU), conf. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). There are several collections from Kajaani area after this by the author TH.



Figure 9 – *Dacrymyces ovisporus* in Kajaani (TH 20170033). Photo: Teppo Helo

***Galzinia incrustans* Parmasto**

Specimen examined – Ostrobothnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 71460:35142, on fallen trunk of *Betula* sp. (diam. 18 cm, decay stage 2) in old-growth spruce-dominated forest, 6 Oct 2016, leg. & det. TH (OULU GAJ.5446), conf. MK.

New to Middle boreal, Ostrobothnia (3a).

***Gyrophanopsis polonensis* (Bres.) Stalpers & P.K. Buchanan**

Specimen examined – Tavastia borealis, Jyväskylä, Tourujoki, UCS 6905570:3435388, on unidentified hardwood (diam. 6 cm, decay stage 4) in near natural herb-rich forest, 25 Oct 2007, leg. KJ 2956 (K.J.).

New to Southern boreal, Lake District (2b).

***Helicogloea farinacea* (Höhn.) D. P. Rogers**

Fig. 10

Specimens examined – Ostrobothnia kajanensis, Kajaani, Suvantola, UCS 71268:35343, on fallen branch of *Prunus padus* (diam. 1 cm, decay stage 2), there are several other specimens collected close to this same site, so the number of occupied trunks is higher, in riparian thicket forest with high amount of dead wood, 24 Oct 2015, leg. & det. TH (OULU GAJ.5464), conf. MK & HK; Paltamo, Tololanmäki, UCS 71380:35512, on fallen branch of *Populus tremula* (diam. 6 cm, decay stage 1) in moist thicket forest with high amount of dead wood, 28 Sep 2016, leg. & det. TH 20160104 (T.H.).

New to Middle boreal, Northern Carelia – Kainuu (3b). These are the 5th–6th records in Finland. The previous records are from Karjalohja (1b), Helsinki (1b), Lempäälä (2a), Tampere (2a) (Kotiranta et al. 2009, Kunttu et al. 2013).



Figure 10 – *Helicogloea farinacea* in Paltamo (TH 20160104). Photo: Teppo Helo

Hydnellum auratile (Britz.) Maas Geest.

Fig. 11

Specimens examined – Tavastia australis, Hämeenlinna, Ahvenisto, UCS 6767571:3360233, rich *Picea abies* forest, 7 Oct 2007, leg. Hilkka Lahti, det. Mauri Lahti (H 6043318); Lapponia sompiensis, Pelkosenniemi, Suvanto, Kalkkivaara, UCS 7455328:3503905, south facing calcareous rocky slopes with *Pinus sylvestris*, 28 Aug 2016, leg. & det. TK 2452 (H 6064744).

New to Northern boreal, North Ostrobothnia (4b). These are the 3rd–4th records from Finland. The previous records are twice from Parainen (1a) (Kotiranta et al. 2009). Endangered.

Hyphoderma crassescens Laurila ex. K.H. Larss.

Fig. 12

Specimens examined – Ostrobothnia kajanensis, Paltamo, Kuuskanlahti N, Saukkovaara, UCS 7148459:3513242, on fallen trunk of *Pinus sylvestris* (diam. 27 cm, decay stage 3), 21 Oct 2012, Pekka Helo 2459 (OULU), det. HK; Paltamo, Teerivaara, UCS 7146:3514, on charred root plate of *Pinus sylvestris* (diam. 15 cm, decay stage 4) in old-growth dry heath forest, 6 Oct 2016, leg. TH (OULU), det. MK; Karelia borealis, Lieksa, Jäkäläkangas, UCS 7024049:3688079, on charred kelo trunk of *Pinus sylvestris*, (diam. 40 cm, decay stage 4), 6 Sep 2016, leg. Kaisa Junninen (OULU), det. MK.

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

Hyphoderma incrustatum K.H. Larss.

Specimens examined – Tavastia australis, Muurame, Kuusimäki, UCS 6905570:3435388, on downed *Betula* sp. (diam. 26 cm, decay stage unknown) in near natural old-growth spruce-dominated forest, 29 Aug 2007, leg KJ 945; Jyväskylä, Korpilahti, Oittila, UCS 6870834:3433926,



Figure 11 – *Hydnellum auratile* in Pelkosenniemi (TK 2452). Photo: Tapio Kekki



Figure 12 – *Hyphoderma crassescens* in Paltamo. Photo: Teppo Helo

on uprooted *Populus tremula* (diam. 65 cm, decay stage 1) in near natural herb-rich forest, 30 Aug 2007, leg. KJ 1034; *Tavastia borealis*, Rautalampi, Etelä-Konnevesi National Park, UCS 6941695:3484778, on fallen trunk of *Populus tremula* (diam. 35 cm, decay stage 5) in old-growth mesic heath forest, 16 Sep 2017, leg. & det. MK 48/17 (OULU), conf. HK.

New to Southern boreal, Lake District (2b). These are the 2nd–4th records from Finland. The first record is from Inari (4c) where it grew also on *Populus tremula* (Kotiranta et al. 2009). Data Deficient.

Hyphoderma medioburiense (Burt) Donk

Specimen examined – *Tavastia australis*, Jyväskylä, Korpilahti, Oittila, UCS 6870823:3433880, on unidentified hardwood (diam. 3 cm, decay stage 3) in near natural herb-rich forest, 24 Aug 2007, leg. KJ 604 (K.J.); Luhanka, Moiskala, UCS 6854030:3430852, on fallen *Betula* (diam. 2 cm, decay stage 2) in birch-dominated wood-pasture, 27 Sep 2013, leg. KJ 5794 (K.J.).

New to Southern boreal, Lake District (2b).

Hyphoderma nemorale K.H. Larss.

Specimen examined – *Tavastia borealis*, Viitasaari, Niinilahti, Pitkämäki, UCS 6981071:3443904, on two fallen *Betula* (diam. 2 and 2.5 cm, decay stage 2) in young birch-dominated afforested field, 11 Oct 2012, leg. KJ 6115, 6116 (K.J.).

New to Southern boreal, Lake District (2b).

Hyphoderma occidentale (D.B. Rogers) Boidin & Gilles

Specimen examined – *Tavastia australis*, Jyväskylä, Korpilahti, Oittila, UCS 6870823:3433880, on unidentified hardwood (diam. 3 cm, decay stage 2) in near natural herb-rich forest, 24 Aug 2007, leg. KJ 615 (K.J.).

New to Southern boreal, Lake District (2b).

Hyphoderma roseocremeum (Bres.) Donk

Specimen examined – *Tavastia borealis*, Viitasaari, Niinilahti, Pitkämäki, UCS 6981071:3443904, on fallen *Betula* sp. (diam. 2 cm, decay stage 2) in young birch-dominated afforested field, 10 Oct 2012, leg. KJ 5983 (K.J.); *Ostrobottnia kajanensis*, Kajaani, Teppana, UCS 71263:35362, on fallen trunk of deciduous tree (diam. 6 cm, decay stage 3) in small thicket forest area in spruce-dominated mesic heath forest with high amount of dead wood, 26 Sep 2017, leg. TH 20170032 (T.H., OULU), det. MK.

New to Southern boreal, Lake District (2b) and Middle boreal, Northern Carelia – Kainuu (3b).

Hyphodontiella hauerslevii K.H. Larss. & Hjortstam

Specimen examined – *Tavastia borealis*, Jyväskylä, Tourujoki, UCS 6905621:3435418, on twig of *Sorbus aucuparia* (diam. 0.9 cm) in near natural herb-rich forest, 18 Oct 2007, leg. KJ 2745 (K.J.); Petäjävesi, Suolahti, UCS 6911151:3405740, on twig of *Salix* sp. (diam. 0.4 cm) in young birch-dominated afforested field, 26 Sep 2012, leg. KJ 5597 (K.J.).

New to Finland and hence new to Southern boreal, Lake District (2b).

Hypochnicium geogenium (Bres.) J. Erikss

Specimen examined – *Ostrobottnia kajanensis*, Kajaani, Ilmarata, UCS 71268:35337, on fallen trunk of *Salix caprea* (diam. 4 cm, decay stage 3), in riverside thicket forest with high amount of dead wood, 9 Oct 2016, leg. & det. TH (OULU GAJ.5437), conf. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). There are several collections from the Kajaani area after this by the author TH.

Hypochnicium lundellii (Bourdot) J. Erikss.

Specimen examined – Ostrobothnia kajanensis, Kajaani, Paltaniemi, Kirkkoniemi, UCS 71323:35300, on fallen top of *Larix* sp. (diam. 3 cm, decay stage 2, thinning waste) in herb-rich larch forest with cultural impact, 23 Oct 2016, leg. & det. TH (OULU GAJ.5473), conf. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). There are several collections from the Kajaani area after this by the author TH.

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

Specimen examined – Tavastia australis, Jyväskylä, Korpilahti, Särkijärvi, UCS 6893755:3414170, on log of *Pinus sylvestris* (diam. 32 cm, decay stage 2) in old-growth near natural spruce-dominated forest, 10 Sep 2007, leg KJ 1593 (K.J.); Tavastia borealis, Petäjävesi, Suolahti, UCS 6911023:3405715, on two *Betula* twigs (diam. 1 and 0.4 cm) in young birch-dominated afforested field, 21 Sep 2012, leg KJ 5347, KJ 5370 (K.J.).

New to Southern boreal, Lake District (2b).

Kneiffiella alienata (S. Lundell) Jülich & Stalpers

Specimen examined – Tavastia australis, Muurame, Kuusimäki, UCS 6902060:3421978, on downed *Betula* sp. (diam. 25 cm, decay stage unknown) in near natural old-growth spruce-dominated forest, 29 Aug 2007, leg KJ 961 (K.J.).

New to Southern boreal, Lake District (2b). This is the 6th observation from Finland. The previous ones are from Kullaa (2a), Siikainen (2a), Suomussalmi (3b), Kittilä (4b), and Muonio (4c) (Kotiranta et al. 2009, Kunttu et al. 2014). Vulnerable.

Lentaria byssiseda (Pers.: Fr.) Corner

Specimens examined – Ostrobothnia kajanensis, Puolanka, Paljakka, Mustakumpu, UCS 71723:35508, on trunk of *Sorbus aucuparia* (diam. 8 cm, decay stage 3), in old-growth spruce-dominated mesic heath forest with high amount of dead wood, 13 Oct 2017, leg. TH 2017007 & MK (T.H., OULU), det. TH; Lapponia kittilensis Muonio, Pallastunturi, Pyhäjoki, UCS 7551483:3380928, on twigs in mesic *Picea abies* dominated forest, 5 Aug 2016, leg. Päivi Paalamo & TK 2303, det. TK (OULU).

New to Middle boreal, Northern Carelia – Kainuu (3b) and Northern boreal, Forest Lapland (4c).

Lentaria dendroidea (Fr.) J.H. Petersen

Specimen examined – Lapponia kittilensis, Muonio, Pallastunturi, Pyhäjoki, UCS 755148:338092, on twigs in mesic *Picea abies* dominated forest, 5 Aug 2016, leg. Päivi Paalamo & TK 2304 (OULU), det. TK

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

Leptosporomyces montanus (Jülich) Ginns & M.N.L Lefebvre

Specimens examined – Tavastia australis, Luhanka, Molikko Nature Reserve, UCS 6850082:3431504, on twigs of *Betula* sp. (diam. 1–1.5 cm, decay stage 2) in grass-herb forest, 12 Oct 2007, leg. KJ 2578, 2579, 2580 (JYV), det. KJ, HK; Tavastia borealis, Viitasaari, UCS 6981071:3443904, on twigs of *Betula* sp. (diam. 0.8, 0.9, 1, 1.2 cm, decay stage 1) in afforested former field, 10 Oct 2012, leg. KJ 5956, 5974, 5973, 5982 (JYV), det. KJ, HK.

New to Finland, and hence new to Southern boreal, Lake District (2b).

Leucogyrophana sororia (Burt) Ginns

Specimen examined – Ostrobothnia kajanensis, Suomussalmi, Hossa, Valkeisenkangas, UCS 7268:3610, on fallen trunk of *Pinus sylvestris* (diam. 45 cm, decay stage 3) in old-growth xeric heath forest with high amount of dead wood, 18 Oct 2015, leg. & det. TH 20150102 (T.H.).

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

Litschauerella clematitidis (Bourdot & Galzin) J. Erikss. & Ryvarden

Specimen examined – Tavastia borealis, Jyväskylä, Ylistönrinne, UCS 6903388:3434987, on unidentified hardwood twig (diam. 0.7 cm) in near natural herb-rich forest, 26 Sep 2007, leg. KJ 2309 (K.J.).

New to Southern boreal, Lake District (2b). This is the 3rd record in Finland. The previous ones are from Tammissaari (1b) and Helsinki (1b) (Kotiranta et al. 2009).

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

Specimen examined – Tavastia borealis, Jyväskylä, Saarenmaa, UCS 6915570:3427898, on twig of *Picea abies* (diam. 0.4 cm) in mature managed spruce-dominated forest, 14 Sep 2007, leg. KJ 1733b (K.J.).

New to Southern boreal, Lake District (2b). This is the 7th record in Finland. The previous ones are from Eckerö (1a), Helsinki (1b), Tammissaari (1b), Kemiönsaari (1b), Hamina (2a), and Rovaniemi (3c) (Kotiranta et al. 2009, Kunttu et al. 2012, 2015, 2016a).

Lyomyces erastii Saaren. & Kotir.

Specimens examined – Altogether 13 observations from four localities in Tavastia borealis (two herb-rich forests, Ylistönrinne and Tourujoki, in Jyväskylä, and two birch-dominated afforested field sites, Petäjävesi and Viitasaari). The main substrata were unidentified hardwood or *Betula* twig/branch (diam. 0.2–2.5 cm). One record was from log of *Salix caprea* (diam. 11 cm, decay stage 2). All specimens are in the personal collection of K.J.

New to Southern boreal, Lake District (2b).

Mucronella bresadolae (Quél.) Corner

Specimen examined – Ostrobothnia kajanensis, Suomussalmi, Hossa, Pahamaailma, UCS 7263:3621, on charred fallen trunk of *Pinus sylvestris* (diam. 35 cm, decay stage 4) in xeric heath forest with high amount of dead wood, 16 Oct 2015, leg. Pekka Helo 2922 (P.H.), det. TH.

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

Oliveonia fibrillosa (Burt) Donk

Specimens examined – Regio aboënsis, Kemiönsaari, Morgonlandet UCS 6635:3258, on 25 Oct 2010, on five broken fallen trunks of *Populus tremula* (diam. 13 cm, decay stage 3, diam. 17 cm, decay stage 2, diam. 16 cm, decay stage 2, diam. 17, decay stage 4, diam. 19 cm, decay stage 3) leg. PK 7517a, 7518f, 7519a, 7524a, 7528a, det. MK; Kemiönsaari, Gärskär, UCS 6646057:3222267, on broken fallen trunk of *Betula* sp. (diam. 21 cm, decay stage 4) 24 Aug 2010, leg. PK 6889a, det. MK, conf. HK and on the same island: Gärskär UCS 6645:3222, on broken fallen trunk of *Sorbus aucuparia* (diam. 12 cm, decay stage 2), PK 6899a, det. MK, conf. HK; Tavastia borealis, Äänekoski, Aatula, UCS 6938645:3439579, on downed *Betula* sp. (diam. 2.5 cm, decay stage 2) in birch-dominated wood-pasture, 14 Sep 2013, leg. KJ 5225 (K.J.); Ostrobothnia kajanensis, Kajaani, Suvantola, UCS 71268:35342, on fallen trunk of deciduous tree (diam 10 cm, decay stage 3) in riverside thicket forest with high amount of dead wood, 8 Oct 2016, leg. & det. TH (OULU GAJ.5454), conf. HK.

New to Middle boreal, Northern Carelia – Kainuu (3b). These are the 3rd–6th records in Finland. The previous records are from Helsinki (1b) and Karjalohja (1b) (Kotiranta et al. 2009).

Oliveonia pauxilla (H.S. Jacks) Donk

Specimen examined – Tavastia borealis, Toivakka, Lappila, UCS 6902242:3460412, on branch of *Betula* sp. (diam. 1 cm) in young birch-dominated afforested field, 13 Sep 2013, leg. KJ 6677 (K.J.).

This is the 4th record in Finland. The previous ones are from Jomala (1a), Lammi (2a), and Jyväskylä (2b) (Kotiranta et al. 2009).

Osteina obducta (Berk.) Donk

Fig. 13

Specimen examined – Regio aboënsis, Parainen, Archipelago Sea National Park, Boskär (Storlandet), UCS 6669:3209, on ground next to big *Pinus sylvestris* trees in mixed heath/herb-rich forest, 11 Jul 2017, leg. Maritta Laukkanen (H, OULU, TUR), det. M. Laukkanen, MK & TH, conf. Tuomo Niemelä.

New to Finland, and hence new to 1b. The species is also new to Northern Europe.



Figure 13 – *Osteina obducta* in Parainen, ex situ. Photo: Maritta Laukkanen

Phanerochaete deflectens (P. Karst.) Hjortstam

Fig. 14

Specimens examined – Tavastia borealis, Äänekoski, Aatula, UCS 6938588:3439737, on two fallen *Betula* (both diam. 2.5 cm, decay stage 2) in birch-dominated wood-pasture, 13 Sep 2013, leg. KJ 5168, KJ 5171 (K.J.); Ostrobothnia kajanensis, Kajaani, Pöllyvaara, UCS 7126:3535, on fallen trunk of *Betula* sp. (diam. 4 cm, decay stage 3–4) in spruce-dominated mesic heath forest, 11 Sep 2017, leg. & det. TH 20170035 (T.H., OULU), conf. MK, HK.

New to Southern boreal, Lake District (2b) and Middle boreal, Northern Carelia – Kainuu (3b). Near Threatened.



Figure 14 – *Phanerochaete deflectens* in Kajaani (TH 20170035). Photo: Teppo Helo.

Peniophorella pubera (Fr.) P. Karst.

Ostrobottnia kajanensis, Kajaani, Teppana, Ämmänkoski, UCS 71258:35357, on fallen trunk of *Betula* sp. (diam. 45 cm, decay stage 3) in small spruce-dominated mesic heath forest area, 4 Nov 2014, leg. & det. TH (OULU GAJ.5461), conf. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). There are several collections from the Kajaani area after this by the author TH.

Phlebia femsioeensis (Litsch. & Lund.) J. Erikss. & Hjortstam

Fig. 15

Specimens examined – Ostrobottnia kajanensis, Suomussalmi, Koisti, UCS 71775:35999, on fallen kelo trunk of *Pinus sylvestris* (diam. 45 cm, decay stage 3) in very old pine-dominated mesic heath forest with very high amount of dead wood, 17 Sep 2017, leg. & det. TH 20170008 (T.H., OULU), conf. MK.; Kajaani, Pirunvaara, UCS 71270:35307, on fallen kelo trunk of *Pinus sylvestris* (diam. 8 cm, decay stage 3) in old xeric heath pine forests, 3 Oct 2016, leg. & det. TH 20160105 (T.H., OULU), conf. MK.

These are the 5th–6th records in Finland, both found in subzone 3b. Previous records are from Koski (2a), Hämeenlinna (2a), Pudasjärvi (3b), and Kuhmo (3b) (Kotiranta et al. 2009, Kunttu et al. 2013, 2015).

Phlebia firma J. Erikss. & Hjortstam

Specimen examined – Tavastia australis, Muurame, Kuusimäki, UCS 6901032:3424348, on log of *Sorbus aucuparia* (diam. 6 cm, decay stage unknown) in mature managed spruce-dominated forest, 22 Aug. 2007, leg KJ 446a (K.J.).

New to Southern boreal, Lake District (2b). Near Threatened.



Figure 15 – *Phlebia femsioeensis* in Kajaani (TH 20160105). Photo: Teppo Helo

Phlebia lilascens coll. (Bourdot) J. Erikss. & Hjortstam

Specimen examined – Ostrobothnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 71467:35140, on fallen trunk of *Pinus sylvestris* (diam. 12 cm, decay stage 3) in old-growth xeric heath forest with high amount of dead wood, 12 Oct 2015, leg. & det. TH (OULU GAJ.5485), conf. HK.

New to Middle boreal, Ostrobothnia (3a).

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

Fig. 16

Specimens examined – Ostrobothnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 71467:35140, on fallen trunk of *Pinus sylvestris* (diam. 15 cm, decay stage 2) in old-growth xeric heath forest with high amount of dead wood, 12 Oct 2015, leg. & det. TH (OULU GAJ.5483), conf. MK; Suomussalmi, Hossa, Valkeisenkangas, UCS 7268:3610, on fallen trunk of *Pinus sylvestris* (diam. 30 cm, decay stage 3) in old-growth xeric heath forest with high amount of dead wood, 18 Oct 2015, leg. & det. TH (OULU GAJ.5484), conf. MK.

New to Middle boreal, Ostrobothnia (3a). These are the 10th–11th records in Finland. The previous records derive throughout Finland (Kotiranta et al. 2009, Kunttu et al. 2015, 2016a). The species is found mainly on large trunks of *Pinus sylvestris*.

Physodontia lundellii Ryvar den & Solheim

Specimen examined – Ostrobothnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 7146762:3514105, on charred root plate of *Pinus sylvestris* (diam. 30 cm, decay stage 4) in old-growth xeric heath forest with high amount of dead wood, 12 Oct 2015, leg. Pekka Helo 2841 (P.H.), det. TH.

New to Middle boreal, Ostrobothnia (3a). Near Threatened.



Figure 16 – *Phlebia subcretacea* in Suomussalmi. Photo: Teppo Helo

Postia persicina Niemelä & Y.C. Dai

Fig. 17

Specimen examined – Regio kuusamoensis, Kuusamo, Oulanka National Park, Juuma, Hautaniitynvuoma, UCS 7354595:3610124, on fallen and unbarked trunk of *Picea abies* (diam. 25 cm) in herb-rich forest, 7 Sep 2017, Pekka Halonen 7 (OULU, H), det. MK & P. Halonen, conf. Viacheslav Spirin.

New to Northern boreal, Kuusamo district (4a). This is the 3rd record in Finland. The previous records are from Puolanka (3b) and Kolari (4b) (Niemelä 2016). Critically Endangered.

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

Specimens examined – Ostrobothnia kajanensis, Puolanka, Paljakka, Latvavaara, UCS 7178:3546, on fallen trunk of *Picea abies* (diam. 15 cm, decay stage 3) in very old-growth spruce-dominated mesic heath forests with high amount of dead wood, 2 Oct 2016, leg. & det. TH 20160102 (T.H.); Kajaani, Pöllyvaara, UCS 71263:353566, on fallen trunk of *Pinus sylvestris* (diam. 12 cm, decay stage 4) in spruce-dominated mesic heath forest, 11 Sep 2017, leg. & det. TH 20170129, conf. MK; Kajaani, Teppana, UCS 71262:353632, on fallen branch of *Picea abies* (diam. 3 cm, decay stage 3) in small spruce-dominated mesic heath forest area, 26 Sep 2017, leg. TH 20170030 (OULU), det. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). This seems to be quite common species in Kainuu region and several collections have been made in addition to these records by the author TH.

Pterula multifida (Chevall.) Fr.

Specimen examined – Ostrobothnia kajanensis, Paltamo, Saviranta, Antinmäki, UCS 71389:35486, in mesic eutrophic herb-rich forest with aspen and spruce, 8 Sep 2014, leg. & det. TH 20140101 (T.H., OULU).

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

Ramaricium albochraceum (Bres.) Jülich

Specimen examined: Tavastia borealis, Toivakka, Lappila, UCS 6902349:3460415, on six *Betula* twigs (diam. 0.1–1.2 cm) in young birch-dominated afforested field, 10 Sep 2013, leg. KJ 6539-41, 6548, 6561-62 (K.J.).

This is the 3rd record in Finland. The previous ones are from Jämsä (2b) and Kuusamo (4a) (Kotiranta et al. 2009). Vulnerable.



Figure 17 – *Postia persicina* in Kuusamo. Photo: Pekka Halonen

Sarcodon lundellii Maas Geest. & Nannf.

Specimen examined – Lapponia sompiensis, Pelkosenniemi, Suvanto, Kalkkivaara, UCS 7455307:3503916, south facing calcareous rocky slopes with *Picea abies* near river bank, 28 Aug 2016, leg. & det. TK 2448 (H 6064776).

New to Northern boreal, North Ostrobothnia (4b). This is the 5th record in Finland. The previous records are from Lohja (1b), Porvoo (2a), Hämeenlinna (2a) and Kälviä (3a) (Kotiranta et al. 2009). Vulnerable.

Scytinostroma praestans (H.S. Jacks) Donk

Specimen examined – Tavastia australis, Jyväskylä, Korpilahti, Särkijärvi, UCS 6893806:3414262, on four *Picea abies*, two *Pinus sylvestris* and two *Betula* sp. twigs/branches (diam. 0.2–1.5 cm) in old-growth near natural spruce-dominated forest, 9 Sep 2007, leg. KJ 1516-17, -19, -26, -33, -35, -37 (K.J.).

New to Southern boreal, Lake District (2b).

Sebacina epigaea (Berk. & Broome) Neuhoff

Specimen examined – Tavastia australis, Luhanka, Onkisalo island, Molikko, UCS 6850044:3431528, on fallen *Betula* sp. (diam. 5 cm, decay stage 3) in near natural herb-rich forest, 24 Sep 2007, leg. KJ 2217b (K.J.).

New to Southern boreal, Lake District (2b). This is the 3rd observation from Finland. The previous ones are from Kankaanpää (3a) and Kuusamo (4a) (Kotiranta et al. 2009).

Sebacina helvelloides (Schwein.) Burt

Specimen examined – Tavastia australis, Luhanka, Onkisalo island, Molikko, UCS 6850023:3431556, on *Populus tremula* twig (diam. 0.4 cm) in near natural herb-rich forest, 12 Oct 2007, leg. KJ 2553 (K.J.).

New to Finland and hence new to Southern boreal, Lake District (2b).

Sistotrema autumnale Ryvarden & Solheim

Fig. 18

Specimens examined – Tavastia borealis, Viitasaari, Niinilahti, Pitkämäki, UCS 6981203:3443835, on *Betula* twig (diam. 0.4 cm) in young birch-dominated afforested field, 25 Oct 2012, leg. KJ 6272 (K.J.); Ostrobothnia kajanensis, Puolanka, Paljakka, Latvavaara, UCS 7178:3546, on fallen trunk of *Populus tremula* (diam. 30 cm, decay stage 3) in very old spruce-dominated mesic heath forests, 2 Oct 2016, leg. & det. TH (GAJ.5419 OULU), TH, conf. MK; Puolanka, Latvavaara, UCS 7178880:3546834, on fallen trunk of *Populus tremula* (diam. 25 cm, decay stage 1) in very old spruce-dominated mesic heath forests with high amount of dead wood, 15 Oct 2017, leg. & det. MK 123/17, (OULU); Puolanka, Latvavaara, UCS 7178:3546, on fallen trunk of *Populus tremula* (diam. 35 cm, decay stage 3) in very old spruce-dominated mesic heath forests with high amount of dead wood, 15 Oct 2017, leg. & det. TH 20170016, (T.H.); Puolanka, Kettukallio, UCS 7185376:3525476, on fallen trunk of *Betula* sp. (diam. 22 cm, decay stage 3) in very old pine-dominated mesic heath forests with high amount of dead wood, 14 Oct 2017, leg. & det. MK 118/17 (OULU); Puolanka, Mustakumpu, UCS 7172331:3551073, on fallen trunk of *Betula* sp. (diam. 20 cm, decay stage 4) in very old spruce-dominated mesic heath forests with high amount of dead wood, 13 Oct 2017, leg. & det. MK 107/17 (OULU); Puolanka, Mustakumpu, UCS 7172:3551, on fallen trunk of *Betula* sp. (diam. 30 cm, decay stage 3) in very old spruce-dominated mesic heath forests with high amount of dead wood, 13 Oct 2017, leg. & det. TH 20170017 (T.H.); Kajaani, Pyykönpuro, UCS 71250:35333, on fallen trunk of *Salix caprea* (diam. 2 cm, decay stage 2) in deciduous thicket forest with high amount of dead wood, 3 Oct 2017, leg. & det. TH 20170018 (T.H.); Kajaani, Ensilä, Maitoniemi, UCS 71264:35344, on the fallen trunk of deciduous tree (diam. 4 cm, decay stage 2) in deciduous riparian thicket forest with high amount of dead wood, 17 Oct 2017, leg. & det. TH 20170019 (T.H.).

New to Southern boreal, Lake District (2b). These are the 3rd–8th records from Finland. The previous records are from Padasjoki (2a) and Kajaani (3b) (Kotiranta et al. 2009, Kunttu et al. 2016a).

Sistotrema confluens Pers.: Fr.

Specimen examined – Ostrobothnia ultima, Kemi, Ajos, Kalasatama, UCS 7288881:3386345, on ground in *Populus tremula* dominated deciduous forest, 23 Sep 2016, leg & det. TK 2758 (H 6064705).

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

Sistotrema coroniferum (Höhn. & Litsch.) Donk

Specimen examined – Tavastia borealis, Toivakka, Soimamäki, UCS 6887650:3441087, on three *Pinus sylvestris* twigs/branches (diam. 0.4 – 2.3 cm) in old-growth near natural pine-dominated forest, 4 Sep 2007, leg. KJ 1268, 1275, 1276 (K.J.).

New to Southern boreal, Lake District (2b).

Sistotrema diademiferum (Bourdot & Galzin) Donk

Specimens examined – Tavastia australis, Muurame, Muuratharju, UCS 68905:34297, on two twigs of *Pinus sylvestris* (diam. 0.2 and 0.7 cm) in mature managed pine-dominated forest, 23/27 Aug 2007, leg. KJ 472, KJ 598 (K.J.); Jyväskylä, Korpilahti, Vaaru, UCS 6870493:3432769, on

twig of *Pinus sylvestris* (diam. 0.3 cm) in mature managed spruce-dominated forest, 31 Aug 2007, leg. KJ 1134 (K.J.); Joutsa, Leivonmäki National Park, Ahvenlampi, UCS 6872458:3448823, on twig of *Pinus sylvestris* (diam. 0.5 cm) in mature managed pine-dominated forest, 15 Oct 2007, leg. KJ 2634 (K.J.); Joutsa, Leivonmäki National Park, Keskisenkangas, UCS 6870162:3448414, on twig of *Picea abies* (diam. 0.9 cm) in mature managed spruce-dominated forest, 16 Oct 2007, leg. KJ 2680b (K.J.); Jämsä, Riutanmäki, UCS 6882756:3410666, on two *Picea abies* twigs (diam. 0.2 and 0.4 cm) in old-growth near natural spruce-dominated forest, 29 Oct 2007, leg. KJ 3018, -19 (K.J.); Kuhmoinen, Isojärvi National Park, Lortikka, UCS 6845370:3394181, on *Pinus sylvestris* twig (diam. 0.5 cm) in old-growth near natural pine-dominated forest, 18 Sep 2007, leg. KJ 1861 (K.J.); Mänttä-Vilppula, Huhtijärvi, UCS 6886037:3366580, on twig of *Betula* sp. (diam. 0,5 cm) in young birch-dominated afforested field, 4 Oct 2013, leg. KJ 7479 (K.J.); Tavastia borealis, Toivakka, Soimamäki, UCS 6887705:3441106, on branch of *Pinus sylvestris* (diam. 0.8 cm) in old-growth near natural pine-dominated forest, 6 Sep 2007, leg. KJ 1415(2) (K.J.); Jyväskylä, Tourujoki, UCS 6905628:3435436, on *Salix caprea* log/crown (diam. 14 cm, decay stage 2) in near natural herb-rich forest, 11 Oct 2007, leg. KJ 2499 (K.J.); Petäjävesi, Suolahti, UCS 6911151:3405740, on twig of *Betula* sp. (diam. 0.4 cm) in young birch-dominated afforested field, 26 Sep 2012, leg KJ 5593 (K.J.); Toivakka, Lappila, UCS 6902242:3460412, on fallen *Betula* (diam. 4 cm, decay stage 2) in young birch-dominated afforested field, 13 Sep 2013, leg KJ 6693 (K.J.); Toivakka, Haukanmaa, UCS 68868:34389, on four twigs of *Pinus sylvestris* (diam. 0.2–0.5 cm) in old growth near natural pine-dominated forest, 17/25 Sep 2007, leg KJ 1774, 1806, 2251, 2286 (K.J.).



Figure 18 – *Sistotrema autumnale* in Puolanka. Photo: Teppo Helo

These are the 7th–18th record in Finland. The previous ones are from Helsinki (1b), Lammi (2a), Padasjoki (2a), Kesälahti (2b), Suomussalmi (3b), and Rovaniemi (3c) (Kotiranta et al. 2009, Kunttu et al. 2011).

Sistotrema efibulatum (J. Erikss.) Hjortstam

Specimen examined – Regio aboënsis, Salo, Orjanperä, Korkianiemenkallio, UCS 66842:33220, on corticated branches of *Picea abies* (diam. 1.5 cm, decay stage 1) in clear cut area, 10 May 2010, leg. & det. HK 22661 (H, H.K.); Tavastia australis, Luhanka, Moiskala, UCS 6854056:3430810, on four *Pinus sylvestris* and two *Betula* sp. twigs (diam. 0.2–0.4 cm) in birch-dominated wood-pasture, 5 Oct 2013, leg. KJ 5858-63 (K.J.); Tampere, Multisilta, UCS 68193:33267, on fallen trunk of *Picea abies*, 28 Apr 2017, leg. & det. Unto Söderholm 5056 (OULU), conf. MK.

New to Southern boreal, SW Finland and Southern Ostrobothnia (2a) and Southern boreal, lake district (2b). These are the 3rd–5th records from Finland. The previous records are from Finström (1a) where it grew on *Picea abies* and Utsjoki (4d) where it grew on *Juniperus communis* (Kotiranta et al. 2009, Kotiranta & Shiryaev 2013).

Sistotremastrum niveocremeum (Höhn. & Litsch.) J. Erikss.

Specimens examined – Ostrobothnia kajanensis, Kajaani, Ensilä, UCS 71264:35344, on fallen trunk of deciduous tree (diam. 4 cm, decay stage 3), in deciduous riparian thicket forest with high amount of dead wood, 17 Oct 2017, leg. TH 20170025 (OULU), det. MK; Kajaani, Teppana, UCS 71262:353632, on fallen branch of *Picea abies* (diam 5 cm, decay stage 2), in small spruce-dominated mesic heath forest area, 26 Sep 2017, leg. & det. TH 20170027 (OULU), conf. MK; Sotkamo, Parkua, Kivimäki, UCS 71056:35470, on fallen trunk of deciduous tree (diam. 4, decay stage 2), in small deciduous thicket forest area in spruce-dominated mesic heath forest, overgrown old house yard, 29 Sep 2017, leg. & det. TH 20170026 (OULU), conf. MK.

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

Skeletocutis delicata Miettinen & Niemelä

Specimen examined – Ostrobothnia ultima, Tervola, Pisavaara Strict Nature Reserve, UCS 7353575:3415497, on fallen trunk of *Picea abies* (diam. 20 cm) in spruce mire, 23 Sep 2000, leg. & det. MK 241/00 (OULU);

New to Middle boreal, Southwestern Lapland (3c). This species is lately described, separated from other *Skeletocutis*-species (Niemelä 2016). According to Finnish herbaria's collection management system Kotka (Luonnontieteellinen keskusmuseo 2018), Niemelä (2016), there are at least ca. 25 records all over Finland, from subzones 1b, 2a, 2b, 3b, 4a and 4b.

Sparassis crispa (Wulfen) Fr.

Specimen examined – Ostrobothnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, Teeripäri, UCS 7357991:3415042, on fallen trunk of *Pinus sylvestris* (diam. 30 cm) in mesic heath forest, 19 Sep 2016, leg. & det. Saija Ahonen & MK 27/16 (OULU).

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

Stereopsis vitellina (Plowr.) D.A. Reid

Specimen examined – Ostrobothnia kajanensis, Suomussalmi, Hossa, Pahamaailma, UCS 7263080:3622452, under fallen kelo trunk of *Pinus sylvestris* (diam 15 cm, decay stage 4) in very old pine-dominated xeric heath forest with high amount of dead wood, 17 Oct 2015, leg. & det. TH 20150103 (T.H.).

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

Stypella subgelatinosa (P. Karst.) P. Roberts

Specimens examined – Tavastia borealis, Petäjävesi, Suolahti, UCS 6911023:3405715, on fallen *Betula* (diam. 4cm, decay stage 3) in young birch-dominated afforested field, 21 Sep 2012, leg KJ 5413 (K.J.) and later on the same site: UCS 6911151:3405740, on *Betula* branch (diam. 2.5 cm, decay stage 3) in young birch-dominated afforested field, 2 Oct 2012, leg. KJ 5796 (K.J.).

This is the 5th observation from Finland. The previous ones are from Kangasala (2a), Luhanka (2a), Tammela (2b), and Oulu (3a) (Kotiranta et al. 2009, Kunttu et al. 2012). Near Threatened.

Stypella vermiformis (Berk. & Broome) D. A. Reid

Fig. 19

Specimen examined – Ostrobothnia kajanensis, Suomussalmi, Koisti, UCS 71777:35999, on fallen kelo trunk of *Pinus sylvestris* (diam. 45 cm, decay stage 3) in old pine-dominated mesic heath forest with very high amount of dead wood, 17 Sep 2017, leg. & det. TH 20170014 (T.H., OULU).

This is the 5th record in Finland. The previous records are from Kemiönsaari (1b), Lieksa (two sites, 3b), and Inari (4c) (Kotiranta et al. 2009, Kunttu et al. 2016a).



Figure 19 – *Stypella vermiformis* in Suomussalmi (TH 20170014). Photo: Teppo Helo

Suillosporium cystidiatum (D.P. Rogers) Pouzar

Fig. 20

Specimen examined – Ostrobothnia kajanensis, Puolanka, Kettukallio, UCS 71855:35255, on fallen kelo trunk of *Pinus sylvestris* with *Tylospora fibrillosa* (diam. 50 cm, decay stage 4) in very old pine-dominated mesic heath forest with high amount of dead wood, 14 Oct 2017, leg. & det. TH 20170004 (H.K., OULU), conf. HK.

New to Middle boreal, Northern Carelia – Kainuu (3b). This is the 3rd record in Finland. The previous records are from Lammi (2a) and Korpilahti (2b) (Kotiranta et al. 2009). Data Deficient.

Thanatephorus fusisporus (J. Schröt.) P. Roberts & Hauerslev

Specimens examined – Ostrobothnia kajanensis, Kajaani, Suvantola, UCS 71269:35343, on fallen trunk of *Salix caprea* (diam. 12 cm, decay stage 3), in riparian thicket forest with high amount of dead wood, 8 Oct 2016, leg. & det. TH (OULU GAJ.5463), conf. MK; Suomussalmi, Hossa, UCS 71630:36237, on fallen trunk of *Populus tremula* (diam. 13 cm, decay stage 4), in old-growth forest with high amount of dead wood, 17 Oct 2015, leg. Pekka Helo 2948 (OULU, H.K.),

det. HK. This latter record has previously reported from false subzone (3b) (Kunttu et al. 2016a), but it should be 4a.



Figure 20 – *Suillosporium cystidiatum* in Puolanka (TH 20170004) with *Tylosporium fibrillosum*. Photo: Teppo Helo

New to Middle boreal, Northern Carelia – Kainuu (3b) and Northern boreal, Kuusamo district (4a). There are several collections from the Kajaani area after this by the author TH.

Thelephora caryophyllea Schaeff.: Fr.

Specimen examined – Ostrobothnia kajanensis, Paltamo, Melalahti, UCS 714718:353281, in grassland at sandy road shoulder, 28 Aug 2017, leg. & det. TH 20170009 (T.H.).

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

Thelephora palmata Scop.: Fr.

Specimen examined – Ostrobothnia kajanensis, Paltamo, Melalahti, Myllymäki, UCS 71450:35324, in spruce-dominated mesic eutrophic herb-rich forest, 4 Aug 2015, leg. & det. TH 20150104 (T.H.).

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

Tomentella bryophila (Pers.) M.J. Larsen

Specimen examined – Ostrobothnia kajanensis, Paltamo, Teerivaara, UCS 71460:35142, on fallen trunk of *Betula* sp. (diam. 25, decay stage 3) in old spruce-dominated mesic heath forest, 6 Oct 2016, leg. & det. TH 20160103 (T.H.), conf. MK.

New to Middle boreal, Ostrobothnia (3a).

Tomentella coerulea (Bres.) Höhn. & Litsch

Specimens examined – Ostrobothnia kajanensis, Kajaani, Teppana, UCS 71262:35363, on

Fig. 21

fallen trunk of *Picea abies* (diam. 3 cm, decay stage 3) in spruce-dominated mesic heath forest, 26 Sep 2017, leg. TH 20170010 (T.H., OULU), det. MK; Kajaani, Pöllyvaara, UCS 7126:3535, on fallen branch of deciduous tree (diam. 3) in spruce-dominated mesic heath forest, 12 Sep 2017, leg. TH 20170031 (T.H., OULU), det. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). This is the 7th record in Finland. The previous records are from Parainen (1b), Kemiönsaari (two sites, 1b), Rautalampi (2b), Rovaniemi (3c), and Enontekiö (4c) (Kotiranta et al. 2009, Kunttu et al. 2012, 2013, 2014)



Figure 21 – *Tomentella coerulea* in Kajaani (TH 20170010). Photo: Teppo Helo

Tomentella crinalis (Fr.) M.J. Larsen

Specimens examined – Tavastia australis, Jyväskylä., Korpilahti, Oittila, UCS 6870823:3433880, on four unidentified hardwood (diam. 2.5–10 cm, decay stage 2–3) and *Alnus incana* log (diam. 18 cm, decay stage 4) in near natural herb-rich forest, 30 Aug 2007, leg. KJ 1080, -82, 79, -78, -35 (K.J.).

New to Southern boreal, Lake District (2b).

Tomentella radiosa (P. Karst.) Rick

Specimens examined – Ostrobothnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 7146671:3513985, on charred root plate of *Pinus sylvestris* (diam. 35 cm, decay stage 3–4) in old-growth dry heath forest, 2 Sep 2012, leg. Pekka Helo 2305 (OULU), det. MK; Puolanka, Kettukallio, UCS 7185464:3525490, on charred root plate of *Pinus sylvestris* (diam. 33 cm, decay stage 1) in old-growth mesic heath forest, 14 Oct 2017, leg. & det. MK 114/17 (OULU).

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

Tomentella stuposa (Link) Stalpers

Specimen examined – Ostrobothnia kajanensis, Kajaani, Pöllyvaara, UCS 71263:35356, on

fallen trunk of *Picea abies* (diam. 8 cm, decay stage 2) in spruce-dominated mesic heath forest, 11 Sep 2017, leg. & det. TH 20170020 (T.H.), conf. MK.

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

Tomentella subclavigera Litsch.

Fig. 22

Specimens examined – Tavastia australis, Mänttä-Vilppula, Huhtijärvi, UCS 6886037:3366580, on three *Betula* twigs (diam. 0.2–0.6 cm) in young birch-dominated afforested field, 18/29 Sep 2013, leg. KJ 7008b, KJ 7055b, KJ 7371 (K.J.); Ostrobothnia kajanensis, Sotkamo, Parkua, Kivimäki, UCS 71056:35470, on fallen trunk of *Salix caprea* (diam. 20 cm, decay stage 3) in spruce-dominated mesic heath forests, 29 Sep 2017, leg. & det. TH 20170011 (T.H., OULU); Kajaani, Pyykönpuro, UCS 71250:35333, on fallen trunk of *Salix caprea* (diam. 4 cm, decay stage 3) in deciduous riparian thicket forest with high amount of dead wood, 1 Oct 2017, leg. TH 20170012 (T.H., OULU), det. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). These are the 7th–9th records in Finland. The previous records are from Helsinki (three sites, 1a), Tammela (2a), Savonranta (2b), and Rovaniemi (3c) (Kotiranta et al. 2009, Kunttu et al. 2016a).

Tomentella sublilacina coll. (Ellis & Holw.) Wakef.

Specimen examined – Ostrobothnia kajanensis, Puolanka, Latvavaara, UCS 7178880:3546834, on fallen trunk of *Populus tremula* (diam. 25 cm, decay stage 1) in spruce-dominated mesic heath forests with high amount of dead wood, 15 Oct 2017, leg. & det. MK 122/17 (OULU).

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

Tomentellopsis echinospora (Ellis) Hjortstam

Specimen examined – Ostrobothnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 71467:35140, on charred piece of fallen trunk of *Pinus sylvestris* (decay stage 4) in old-growth xeric heath forest with high amount of dead wood, 12 Oct 2015, leg. & det. TH (OULU GAJ.5480), conf. MK.

New to Middle boreal, Ostrobothnia (3a). There are several collections from the same area after this record by the author TH.

Trechispora cohaerens (Schwein.) Jülich & Stalpers

Specimen examined – Ostrobothnia ouluensis, Oulu, Oinaansuo, UCS 7221013:3431986, on snag of *Betula* sp. (diam. 10 cm, decay stage 3) in spruce mire, 6 Sep 2017, MK 88/17 & Iita Tiusanen (OULU), det. MK.

New to Middle boreal, Ostrobothnia (3a).

Trechispora praefocata (Bourdot & Galzin) Liberta

Specimen examined – Tavastia borealis, Jyväskylä, Ylistönrinne, UCS 6903388:3434987, on nine unidentified hardwood twigs (diam. 0.2–0.7 cm), one hardwood and one *Betula* branch (diam. 1.4 and 1.9 cm), and one fallen hardwood (diam. 3 cm, decay stage 3) in near natural herb-rich forest, 21 Sep 2007, leg. KJ (K.J.).

New to Southern boreal, Lake District (2b).

Trechispora stellulata (Bourdot & Galzin) Liberta

Specimens examined – Tavastia australis, Joutsa, Leivonmäki National Park, Keskipenkangas, UCS 6870162:3448414, on two *Picea abies* twigs (diam. 0.2 and 0.3 cm) in mature managed spruce-dominated forest, 16 Oct 2007, leg. KJ 2702, -01 (K.J.); Tavastia borealis, Viitasaari, Niinilahti, Pitkämäki, UCS 6981203:3443835, on *Betula* twig (diam. 0.6 cm) in young birch-dominated afforested field, 25 Oct 2012, leg. KJ 6184 (K.J.); Ostrobothnia kajanensis, Kajaani, Ensilä, Maitoniemi, UCS 71265:35345, on fallen branch of old *Pinus sylvestris* (diam. 5 cm, decay

stage 3) in area between hayfield and deciduous riparian thicket forest, 21 Oct 2016, leg. & det. TH (OULU GAJ.5469), conf. MK.

New to Southern boreal, Lake District (2b) and Middle boreal, Northern Carelia – Kainuu (3b).



Figure 22 – *Tomentella subclavigera* in Sotkamo (TH 20170011). Photo: Teppo Helo

Trechispora stevensonii (Berk. & Broome) K.H. Larss.

Specimen examined – Tavastia borealis, Jyväskylä, Ylistönrinne, UCS 6903388:3434987, on unidentified hardwood branch (diam. 2 cm, decay stage 2) in near natural herb-rich forest, 26 Sep 2007, leg. KJ 2328 (K.J.).

New to Southern boreal, Lake District (2b).

Trechispora verruculosa (G. Cunn.) K.H. Larss.

Specimen examined – Ostrobothnia kajanensis, Sotkamo, Laakajärvi, Viltonvaara, UCS 7083879:3561330, on fallen trunk of *Picea abies* (decay stage 2) in old-growth dry heath forest, 25 Oct 2011, leg. Pekka Helo 2133 (OULU), det. MK, conf. HK.

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

Tremella indecorata Sommerf.

Specimen examined – Ostrobothnia ultima, Rovaniemi, Pullinranta, UCS 73801:34448, on *Diatrype bullata* on deciduous thicket of *Salix* sp., 27 May 2015, leg. & det. TK 1744 (TUR).

New to Northern boreal, North Ostrobothnia (4b). This is the 5th record in Finland. The previous records are from Asikkala (2a), Lempäälä (2a), Tammela (2a), and Oulu (3a) (Kotiranta et al. 2009).

Tretomyces microsporus Kotir. & Saaren. & K.H. Larss.

Specimens examined – Ostrobothnia ouluensis, Oulu, Pikkarala, Hangaskangas, UCS

Fig. 23

7201508:3441746, on fallen trunk of *Pinus sylvestris* (diam. 5 cm, decay stage 3) in dry heath forest, 9 Oct 2016, leg. & det. MK 68/16 & Tiiu Tenno (OULU), conf. HK; Ostrobothnia kajanensis, Suomussalmi, Hossa, Valkeisenkangas, UCS 7268:3610, on fallen branch of *Pinus sylvestris* (diam. 4 cm, decay stage 3) in old-growth xeric heath forest with high amount of dead wood, 18 Oct 2015, leg. TH (OULU GAJ.5047), det. MK.

Northern boreal, Kuusamo district (4a). These are the 3rd–4th records in Finland. The previous records are from Paltamo (3a) and Lieksa (3b) (Kotiranta et al. 2009, Kunttu et al. 2015).



Figure 23 – *Tretomyces microsporus* in Suomussalmi. Photo: Teppo Helo

Tubulicrinis accedens (Bourdot & Galzin) Donk

Specimens examined – Tavastia australis, Kuhmoinen, Isojärvi National Park, Lortikka, UCS 6845370:3394181, on log of *Pinus sylvestris* (diam. 15 cm, decay stage 3) in old-growth near natural pine-dominated forest, 18 Sep 2007, leg. KJ 1831 (K.J.); Ostrobothnia kajanensis, Paltamo, Kuuskanlahti, Teerivaara, UCS 71461:35142, on charred fallen trunk of *Pinus sylvestris* (diam. 30 cm, decay stage 4) with *Leptosporomyces galzinii*, in old-growth xeric heath forest with high amount of dead wood, 6 Oct 2016, leg. TH (OULU GAJ.5425), det. TH, conf. MK.

New to Southern boreal, Lake District (2b) and Middle boreal, Ostrobothnia (3a).

Tubulicrinis hirtellus (Bourdot & Galzin) J. Erikss.

Specimen examined – Ostrobothnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, Teeripäri, UCS 7357857:3414538, on fallen trunk of *Pinus sylvestris* (diam. 25 cm, decay stage 4) in dry and rocky heath forest, 19 Sep 2016, leg. & det. MK 23/16 (OULU).

This is the 4th record from Finland. The previous are from Lammi (2a), Kuhmo (3b), and Tervola (3c) (Kotiranta et al. 2009, Kunttu et al. 2016a).

Tubulicrinis sororius (Bourdot & Galzin) Oberw.

Specimen examined – Ostrobothnia kajanensis, Kajaani, Pöllyvaara, UCS 7126:3535, on

fallen branch of *Picea abies* (diam. 2 cm, decay stage 3) in spruce-dominated mesic heath forest, 26 Sep 2017, leg. & det. TH 20170013 (T.H., OULU), conf. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). There are several collections from the same area after this. All the findings are from the thin spruce branches that are under the big trees.

Tulasnella albida Bourdot & Galzin

Fig. 24

Specimens examined – Tavastia australis, Kuhmoinen, Isojärvi National Park, Lortikka, UCS 68453:339418, on three *Pinus sylvestris* twigs (diam. 0.2–0.6 cm) in old-growth near natural pine-dominated forest, 18/19 Sep 2007, leg. KJ 1839b, 1859, 1962 (K.J.); Jyväskylä, Korpilahti, Haapajoki, UCS 6874863:3446345, on *Betula* branch (diam. 1.8 cm, decay stage 2) in birch-dominated wood-pasture, 9 Oct 2012, leg. KJ 5926 (K.J.); Tavastia australis, Joutsa, Kivijärvi, UCS 6874653:3454712, on *Betula* branch (diam. 2.5 cm, decay stage 3) in birch-dominated wood-pasture, 19 Oct 2012, leg. KJ 5294 (K.J.); Mänttä-Vilppula, Huhtijärvi, UCS 6886037:3366580, on *Betula* twig (diam. 0.7 cm) in young birch-dominated afforested field, 20 Sep 2013, leg. KJ 7147 (K.J.); Luhanka, Moiskala, UCS 6854030:3430852, on *Alnus incana* stump (diam. 3.5 cm, decay stage 3) in birch-dominated wood-pasture, 27 Sep 2013, leg. KJ 5671 (K.J.); Tavastia borealis, Jyväskylä, Ylistörinne, UCS 6903364:3434987, on unidentified hardwood (diam. 2.5 cm, decay stage 3) in near natural herb-rich forest, 21 Sep 2007, leg. KJ 2125 (K.J.); Toivakka, Haukanmaa, UCS 6886886:3438974, on *Pinus* twig (diam. 0.4 cm) in old growth near natural pine-dominated forest, 25 Sep 2007, leg. KJ 2287 (K.J.); Jyväskylä, Tourujoki, UCS 6905621:3435418, on unidentified hardwood (diam. 4.5 cm, decay stage 2) in near natural herb-rich forest, 18 Oct 2007, leg. KJ 2771b (K.J.); Viitasaari, Niinilahti, Pitkämäki, UCS 6981071:3443904/6981203:3443835, on four *Betula* branches (diam. 1–1.3 cm) and one log (diam. 7 cm, decay stage 2) in young birch-dominated afforested field, 11/25 Oct 2012, leg. KJ 6072-74, 6105, 6235 (K.J.); Petäjavesi, Suolahti, UCS 6911151:3405740, on two *Betula* twigs (diam. 0.3 and 0.6 cm) and five branches (diam. 1–2.5 cm) in young birch-dominated afforested field, 26 Oct 2012, leg. KJ 5518, -34b, -73, -94, 5637-38, -53a (K.J.); Ostrobothnia kajanensis, Kajaani, Suvantola, UCS 71268:35343, on *Fomes fomentarius* which grew on fallen trunk of *Betula* sp. (diam. 35 cm, decay stage 4) in riparian thicket forest with high amount of dead wood, 4 Nov 2015, leg. TH (OULU GAJ.5457), det. MK, conf. HK.

New to Middle boreal, Northern Carelia – Kainuu (3b) These are the 6th–16th records in Finland. The previous records are from Sipoo (2a), Padasjoki (2a), Pieksänmaa (2b), Oulu (3a), Inari (4c), and Utsjoki (4d) (Kotiranta et al. 2009, Kotiranta & Shiryaev 2013, Kunttu et al. 2015, 2016a).

Tulasnella allantospora Wakef. & A. Pearson

Fig. 25

Specimen examined – Tavastia australis, Muurame, Muuratharju, UCS 6890515:3429763, on twig of *Pinus sylvestris* (diam. 0.7 cm) in mature managed pine-dominated forest, 23 Aug 2007, leg. KJ 455(2)b (K.J.); Ostrobothnia kajanensis, Suomussalmi, Koisti, UCS 71777:35997, on fallen trunk of *Pinus sylvestris* (diam. 20 cm, decay stage 4, kelo tree) in old pine-dominated mesic heath forests with very high amount of dead wood, 15 Sep 2017, leg. & det. TH 20170015 (T.H., OULU).

New to Southern boreal, Lake District (2b) and Middle boreal, Northern Carelia – Kainuu (3b). These are the 4th–5th records in Finland. The previous records are from Lohja (1b), Kirkkonummi (1b), and Porvoo (2a) (Kotiranta et al. 2009).

Tulasnella brinkmannii s.l. Bres.

Fig. 26

Specimen examined – Savonia borealis, Suonenjoki, Viipero, Ilmakkämäki, UCS 6934168:3497418, inside *Steccherinum/Betula* (diam. 23 cm, decay stage 3) in managed mixed forest, 3 Jul 2016, leg. Jenna Purhonen 4018 (JYV), det. Viacheslav Spirin; Ostrobothnia kajanensis, Suomussalmi, Koisti, UCS 71777:5998, on saw top of *Pinus sylvestris* (diam. 35 cm,

decay stage 4) which has been left on the ground, in very old pine-dominated mesic heath forest with high amount of dead wood, 15 Sep 2017, leg. TH 20170002 (H, H.K.), det. HK.

New to Finland, and hence new to Southern boreal, lake district (2b) and Middle boreal, Northern Carelia – Kainuu (3b).



Figure 24 – *Tulasnella albida* in Kajaani. Photo: Teppo Helo

Tulasnella deliquescens (Juel) Juel

Fig. 27

Specimen examined – Tavastia australis, Jyväskylä, Korpilahti, Särkijärvi, UCS 6893755:3414170, on branch of *Pinus sylvestris* (diam. 1.3 cm) in old-growth near natural spruce-dominated forest, 10 Sep 2007, leg. KJ 1569b (K.J.); Ostrobothnia kajanensis, Puolanka, Kettukallio, UCS 7185:3525, on fallen kelo branch of *Pinus sylvestris* (diam. 5cm, decay stage 3-4) in very old pine-dominated mesic heath forest with high amount of dead wood, 14 Oct 2017, leg. & det. TH 20170040 (T.H., OULU); Suomussalmi, Koisti, UCS 71777:35997, on fallen top of *Pinus sylvestris* (diam. 12 cm, decay stage 4, thinning waste, kelo tree) in very old pine-dominated mesic heath forest with high amount of dead wood, 15 Sep 2017, leg. & det. TH 20170003 (H, H.K.), conf. HK.

New to Southern boreal, Lake District (2b) and Middle boreal, Northern Carelia – Kainuu (3b). These are the 2nd–4th records in Finland. The previous record is from Helsinki (1b) (Kotiranta et al. 2009).

Tulasnella eichleriana Bres.

Specimens examined – Tavastia borealis, Äänekoski, Aatula, UCS 6938588:3439737, on fallen *Juniperus communis* (diam. 4.5 cm, decay stage 1) in birch-dominated wood-pasture, 13 Sep 2013, leg. KJ 5175 (K.J.); Toivakka, Lappila, UCS 6902242:3460412, on *Betula* sp. branch (diam. 1.4 cm) in young birch-dominated afforested field, 24 Sep 2013, leg KJ 7185 (K.J.); Ostrobothnia ultima, Rovaniemi, Pisavaara Strict Nature Reserve, UCS 7357848:3414554, on fallen trunk of *Pinus sylvestris* (diam. 9 cm, decay stage 3) in dry and rocky heath forest, 19 Sep 2016, leg. & det. MK 24/16, (OULU), conf. HK.

New to Southern boreal, Lake District (2b) and Middle boreal, Southwestern Lapland (3c).



Figure 25 – *Tulasnella allantospora* in Suomussalmi (TH 20170015). Photo: Teppo Helo



Figure 26 – *Tulasnella brinkmannii* s.l. in Suomussalmi (TH 20170002). Photo: Teppo Helo



Figure 27 – *Tulasnella deliquescens* in Puolanka (TH 20170040). Photo: Teppo Helo

***Tulasnella fuscoviolacea* Bres.**

Specimens examined – Tavastia australis, Jyväskylä, Korpilahti, Särkijärvi, UCS 6893806:3414262, on one *Picea abies*, one *Pinus sylvestris* and two *Betula* sp. twigs (diam. 0, 3-2, 2 cm) in old-growth near natural spruce-dominated forest, 9 Sep 2007, leg. KJ 1524-25, KJ 1531, KJ 1540 (K.J.).

New to Southern boreal, Lake District (2b). This is the 2nd record in Finland. The first one is from Tammela (2a) (Kotiranta et al. 2009).

***Tulasnella permacra* P. Roberts**

Specimen examined – Ostrobothnia kajanensis, Puolanka, Paljakka, Mustakumpu, UCS 71724:35506, on fallen trunk of *Picea abies* (diam. 7 cm, decay stage 2) with *Botryobasidium ellipsosporum*, in old-growth spruce-dominated forest with high amount of dead wood, 13 Oct 2017, leg. & det. TH 20170001 (H, H.K.), conf. HK.

New to Middle boreal, Northern Carelia – Kainuu (3b). This is the 3rd record in Finland. The previous records are from Helsinki (1b) and Tammisaari (1b) (Kotiranta et al. 2009).

***Tulasnella thelephorea* (Juel) Juel**

Specimen examined – Ostrobothnia kajanensis, Kajaani, Ilmarata, UCS 71342:35201, on fallen trunk of *Alnus incana* (diam. 10 cm, decay stage 3) in riparian thicket forest with high amount of dead wood, 9 Oct 2016, leg. & det. TH (OULU GAJ.5431), conf. MK and HK.

This is the 5th record in Finland. The previous records are from Lohja (1b), Inkoo (1b), Lieksa (3b), and Utsjoki (4d) (Kotiranta et al. 2009).

***Tulasnella tomaculum* P. Roberts**

Specimens examined – Ostrobothnia kajanensis, Kajaani, Suvantola, UCS 71268:35342, on fallen trunk of deciduous tree (diam. 5 cm, decay stage 4) in riparian thicket forest with high amount of dead wood, 8 Oct 2016, leg. & det. TH (OULU GAJ.5432), conf. MK; Kajaani, Ensilä,

Fig. 28

UCS 71235:35343, on fallen trunk of *Alnus incana* (diam. 8 cm, decay stage 3) in mesic heath forest, 21 Oct 2016, leg. & det. TH (OULU), conf. MK; Kajaani, Kirkkoniemi, UCS 7132:3529, on fallen branch of *Pinus sylvestris* (diam. 5 cm, decay stage 3) in old-growth dry heath forest, 23 Oct 2016, leg. TH (OULU), det. MK, conf. HK.

New to Middle boreal, Northern Carelia – Kainuu (3b). This seems to be quite common species in Kainuu region. The author TH has collected several specimens during autumns 2016 and 2017. These are the 6th–8th records in Finland. The previous records are from Lemland (1a), Helsinki (1b), Padasjoki (2a), Luhanka (2b), Kuusamo (4a), and Inari (4c) (Kotiranta et al. 2009, Miettinen 2012).

Tylospora asterophora (Bonord.) Donk

Specimen examined – Ostrobothnia media, Raahe, Savolahti, Peiso, UCS 7169:3381, on fallen trunk of *Picea abies* (diam. 20 cm), 1 Oct 2003, leg. Jari Särkkä & Stefan Jakobsson (OULU), det. MK.

New to Middle boreal, Ostrobothnia (3a).

Vuilleminia erastii Ghob.-Nejh.

Specimen examined – Tavastia australis, Jyväskylä, Korpilahti, Haapajoki, UCS 6874897:3446231, on *Betula* branch (diam. 1 cm) in birch-dominated wood-pasture, 1 Oct 2012, leg. KJ 5778 (K.J.).

This is the 3rd record in Finland. The previous ones are from Kangaslampi (2b) and Sodankylä (4b) (Kunttu et al. 2012).

Xenasma pruinosum (Pat.) Donk

Fig. 29

Specimens examined – Tavastia australis, Jyväskylä, Korpilahti, Oittila, UCS 6870823:3433880, on unidentified hardwood branch (diam. 1.6 cm) in near natural herb-rich forest, 24 Aug 2007, leg. KJ 490 (K.J.); two more collections from the same site as the first Finnish record (Kotiranta et al. 2009): Luhanka, Onkisalo Island, Molikko, UCS 6850044:3431528, on downed *Betula* (diam. 5 cm, decay stage 3) and on two unidentified hardwood branches (diam. 1, 2 and 1, 3 cm) in near natural herb-rich forest, 24 Sep 2007, leg. KJ 2180–81 (K.J.); Ostrobothnia kajanensis, Kajaani, Suvantola, UCS 7126900:3534333, on dead branch of *Sorbus aucuparia* (diam. 4 cm, decay stage 1) in riparian thicket forest with high amount of dead wood, 26 Oct 2015, leg. Pekka Helo 3055 & TH (H, H.K.), det. TH, conf. HK, and in the same place on fallen dead branch of deciduous tree (diam. 4 cm, decay stage 3), 11 Oct 2016, leg. & det. TH (OULU GAJ.5430), conf. MK.

New to Middle boreal, Northern Carelia – Kainuu (3b). These are the 2nd–3rd records in Finland. The previous record is from Luhanka (2b) (Kotiranta et al. 2009).

Xenasmatella borealis (K.H. Larss. & Hjortstam) Duhem (syn. *Phlebiella borealis*)

Fig. 30

Specimens examined – Tavastia australis, Kuhmoinen, Isojärvi National Park, Lortikka, UCS 6845322:3394215, on twigs of *Betula* sp. and *Pinus sylvestris* (diam. 0.4–1 cm) in near natural old-growth pine-dominated forest, 19 Sep 2007, leg. KJ 1956, KJ 1931 (K.J.); Tavastia borealis, Petäjävesi, Suolahti, UCS 6911023:3405715, on *Betula* branch (diam. 1.3 cm) in young birch-dominated afforested field, 21 Sep 2012, leg. KJ 5340 (K.J.); Ostrobothnia kajanensis, Kajaani, Paltaniemi, Kirkkoniemi, UCS 71323:35299, on fallen dead branch of *Pinus sylvestris* (diam. 5 cm, decay stage 4, kelo tree) and on fallen top of *Pinus sylvestris* (diam. 9 cm, decay stage 3, kelo tree) in old cemetery with pine-dominated xeric heath forests, 23 Oct 2016, leg. TH (OULU GAJ.5460, GAJ.5462), det. TH, conf. MK and HK.

New to Southern boreal, Lake District (2b). These are the 4th–7th records in Finland. The previous records are from Helsinki (1b), Lieksa (3b), and Salla (4c) (Kotiranta et al. 2009).



Figure 28 – *Tulasnella tomaculum* in Kajaani. Photo: Teppo Helo



Figure 29 – *Xenasma pruinatum* in Kajaani. Photo: Teppo Helo



Figure 30 – *Xenasmatella borealis* in Kajaani. Photo: Teppo Helo

Xenasmatella insperata (H.S. Jacks.) Jülich (syn. *Phlebiella insperata*)

Fig. 31

Specimens examined – Tavastia borealis, Jyväskylä, Ylistönrinne, UCS 6903388:3434987, on fallen *Alnus incana* (diam. 3 cm, decay stage 2) in near natural herb-rich forest, 26 Sep 2007, leg. KJ 2326 (K.J.); Ostrobothnia kajanensis, Kajaani, Ensilä, Maitoniemi, UCS 71264:35344, on dead trunk of *Alnus incana* (diam. 2 cm, decay stage 3) in deciduous riverside thicket forest with high amount of dead wood, 17 Oct 2017, leg. & det. TH 20170034 (T.H., OULU), conf. MK, HK.

New to Southern boreal, Lake District (2b) and Middle boreal, Northern Carelia – Kainuu (3b). These are the 2nd–3rd records in Finland. The first record is from Tuusula (2a) (Kotiranta et al. 2009). Endangered.

Xenasmatella tulasnelloidea (Höhn. & Litsch.) Oberw. ex. Jülich (syn. *Phlebiella tulasnelloidea*)

Specimens examined – Tavastia borealis, Jyväskylä, Tourujoki, UCS 6905621:3435418, on two fallen *Alnus incana* (diam. 3/3.5 cm, decay stage 2 both) and one unidentified hardwood (diam. 2 cm, decay stage 3) in near natural herb-rich forest, 25 Oct 2007, leg. KJ 2944, -48, -64 (K.J.); Ostrobothnia kajanensis, Kajaani, Suvantola, UCS 7126:3534, on fallen trunk of *Salix caprea* (diam. 5 cm, decay stage 3), 4 Nov 2015, leg. & det. TH (OULU), conf. MK; Kajaani, Suvantola, UCS 71269:35343, on dead branch of deciduous tree (diam. 7 cm, decay stage 3) in riparian thicket forest with high amount of dead wood, 8 Oct 2016, leg. & det. TH (OULU GAJ.5424), conf. MK;

New to Southern boreal, Lake District (2b) and Middle boreal, Northern Carelia – Kainuu (3b). This seems to be quite a common species in the thicket forests of the Kajaani area. The author TH has collected several specimens during autumns 2016 and 2017.



Figure 31 – *Xenasmatella insperata* in Kajaani (TH 20170034). Photo: Teppo Helo

Discussion

Species new to Finland

We report here six species new to Finland. The most surprising species is *Osteina obducta*, which has not been found before from Northern Europe. *Osteina obducta* has a wide distribution in Central Europe mostly on dead gymnosperm, especially on *Larix* (Ryvarden & Gilbertson 1994). It is common on *Pseudotsuga menziesii* in North America (Gilbertson & Ryvarden 1987) and relatively common in natural forests of China, mainly in old-growth forests of *Larix*, sometimes also on e.g. *Picea* and *Pinus*, but rarely on angiosperm wood (Dai 2012). The fungus has been reported also on *Tsuga* in Japan (Aoshima & Furukawa 1963) and on *Larix* in Siberia (e.g. Kotiranta & Shiryaev 2016, Kotiranta et al. 2016) and Russian Far East (Lyubarsky & Vasilyeva 1975). The fungus mostly grows on roots or decayed buried wood (Cui et al. 2014).

Cristinia rhenana was described from Germany (Hjortstam & Grosse-Brauckmann 1993), and after that it has been reported from France, Italy, the Netherlands and United Kingdom (Bernicchia & Gorjón 2010). Our specimen does not fit exactly with the protologue and therefore we are not fully convinced of its identity. In outer appearance, it fits well with the description, and turns violet in KOH. The monomitic hyphal system consists mostly of clamped hyphae, and many hyphae in subiculum lack clamps. Also the basidia fit to the concept of *C. rhenana*, even if some of them are very long (even over 50 μm). The differences are in the shape and size of spores. Our specimen has broadly ellipsoid to subglobose spores, and the shape is somewhere between *C. eichleri* (Bres.) Nakasone and *C. helvetica* (Pers.) Parm. The thick-walled spores are cyanophilous, (4.2–)4.6–6(–6.8) X 3.7–4.4(–4.8) μm , L = 5.1 μm , W = 4.2 μm , Q = 1.2 (n = 30), sometimes with a prominent apiculus. According to Grosse-Brauckmann (Hjortstam & Grosse-Brauckmann 1993) the spores are globose to ovoid, (4–)5–6.5(–7) μm , thus differing somewhat in size and shape of our specimen.

The basidiomes of *Hyphodontiella hauerslevii* are very tiny, but it is still surprising that the first Finnish specimens were not collected before the year 2007. The two hitherto identified specimens grew on small twigs and were collected in a large ecological study (Juutilainen et al. 2016). *Hyphodontiella hauerslevii* is widely distributed in Europe (Bernicchia & Gorjón 2010), and probably not very rare, but easily overlooked.

Leptosporomyces montanus is a poorly known species and we have not seen any reference specimens of it. However, the description of Jülich (1972; as *Confertobasidium olivaceo-album* var. *montanum* Jülich var. nova) fits fairly well with our specimens, which all grew on small twigs. According to Jülich (1972), Bernicchia & Górgon (2010) *L. montanus* has been collected from France, the Netherlands, Russia and United States.

Sebacina helvelloides, like three previous species above, was found in an extensive ecological study where even the smallest woody particles were studied (Juutilainen et al. 2016). These small twigs are often overlooked by the corticologists and therefore it is not very surprising that this is the first record from Finland. *Sebacina helvelloides* seems, however, to be rarely collected also elsewhere, but it has been reported at least from Denmark, Russia, North America and India (Burt 1915, Wojewoda 1977).

Tulasnella brinkmannii, like other *Tulasnellas*, is often invisible or almost invisible to the naked eye. The first Finnish collection grew inside *Steccherinum* sp., but the second was visible. The Finnish finds are probably new to the Nordic countries (Jülich 1984, Roberts & Hauerslev 1997, The Norwegian Mycological Database (NMD) 27 Jan 2017, Herbarium Catalogue (S) 25 Jan 2018). According to Roberts (1994) *T. brinkmannii* has been collected from Germany (holotype), Switzerland and United Kingdom, where it appears to be uncommon. There are some differences in the shape of spores between the collections, but because of the small number of specimens, Roberts (1994) was not sure if the variation is intraspecific, or if they represent some other taxon. The collection *J. Purhonen 4018* is relatively poor, but the other one (*TH 20170002*) is in good condition and shows spores similar to those of in Roberts 400 (see Roberts 1994, p. 1239).

Significant extensions of known distribution

Many of the regionally new records derived far away from their previously known localities. This is largely explained by the fact that little studied areas, habitats and substrates were now surveyed. For example, the author KJ studied fine and very fine woody debris in Central Finland, the author TH studied overlooked habitats, like thickets, in Kainuu region, the author PK studied driftwood logs on the shores of the Baltic Sea, and the author TK studied calcareous slopes in Northern Finland.

Hyphoderma incrustatum was found now from three localities (2b) in Central Finland, but the first Finnish record is from Inari (4c) in Northern Finland. The distance is roughly 700 km. *Colacogloea peniophorae* was found now from Jyväskylä (2b), Oulu (3a), and Kajaani (3b), but all previous records are from the southwestern archipelago or the south coast subzones 1a and 1b (Kotiranta et al. 2009, Kunttu et al. 2009, 2012, 2015, 2016a, Miettinen 2012).

The following species with small or inconspicuous basidioma were found now 200–400 km north from their previous known localities: *Basidiodendron radians*, *Botryobasidium ellipso sporum*, *Colacogloea peniophorae*, *Oliveonia fibrillosa*, *Trechispora stellulata*, *Tulasnella allantospora*, *Tulasnella deliquescens*, *Tulasnella permacra*, *Xenasmatella insperata*, and *Xenasmatella tulasnelloidea*. Furthermore, the known distribution extended 200–400 km north for these commonly overlooked species with rather easily detectable basidioma: *Clavaria amoenoides*, *Clavaria incarnata*, *Helicogloea farinacea*, *Hyphoderma roseocremeum*, *Phlebia deflectens*, *Suillosporium cystidiatum*, and *Xenasma pruinatum*

Autumn 2016 was a good year for mycorrhizal fungi in Northern Finland, which showed as many collections of e.g. rare *Cortinari*-species. This relates also to mycorrhizal polypores and hydneous fungi. The new record of *Boletopsis leucomelaena* was 300 km, *Sarcodon lundellii* 400 km and *Hydnum auratile* 700 km north of the old ones. The habitats were south facing calcareous rocky or sandy slopes near big rivers, which make circumstances ideal for thermophilic

or southern species. The habitats in Kolari and Pelkosenniemi have been quite frequently visited by mycologists, so it seems evident that these species produce basidiomata very seldom in North Finland.

One obvious explanation of the “expansion” of southern species to the north is increasing collecting activity in Northern and Eastern Finland. However, we cannot fully exclude the possibility that the climate change has also affected this phenomenon.

Little collected species, but probably not so rare as thought

Craterocola cerasi has been collected from Finland only a few times, and mainly from *Betula*. Earlier collections on *Picea abies* are by P. Karsten in 1866 (as *C. insignis*, www.laji.fi). These names are probably synonyms as *C. cerasi* grows also on *P. abies* (Oberwinkler et al. 2014). From Middle and Northern parts of Sweden there are quite many observations with the names *C. cerasi* from deciduous trees and *C. insignis* from coniferous trees (www.artportalen.se). *C. cerasi* is probably merely overlooked but not truly rare species in Finland.

Hyphoderma crassescens was reported by Bernicchia & Górzon (2010) from Finland, Norway, Sweden, Italy and Russia (see also Shiryayev & Kotiranta 2015, p. 47). In Finland there are tens of collections, and most of them grew on burned or charred pines in primeval forests. *H. crassescens* can locally be very common in burned boreal forests, but it is apparently rare in southern parts of Europe and in managed forests.

According to our records presented here and some so far unpublished findings we suspect that the following species, which have been considered as nationally rare, are not so rare in reality. They have been rarely collected, because their basidiomata are small and inconspicuous, and they are difficult to find or identify: *Colacogloea peniophorae*, *Oliveonia fibrillosa*, *Sistotrema autumnale*, *Sistotrema diademiferum*, *Tomentella coerulea*, and *Tulasnella tomaculum*.

Additionally, the following species new to Kainuu region (3b) are not so rare as previously thought, because their habitats and substrates have been neglected and, therefore, the collecting activity has been low: *Basidiodendron eyrei*, *Galzinia incrustans*, *Sistotremastrum niveocremeum*, *Thanatephorus fuisporus*, and *Xenasmattella tulasnelloidea*.

The distribution of many groups of aphylloroid fungi, like corticioids, clavarioids and tremelloids, is still inadequately known in many regions in Finland, especially in Northern and Eastern Finland. It is obvious that dozens of species – found now elsewhere in Finland – can still be found in these areas. Therefore, the little collected species’ range may be less fragmented than what is now displayed in the distribution maps (Kotiranta et al. 2009). Furthermore, the fungal communities occupying the smallest fractions of woody debris seems to be poorly known. Species inhabiting this substrate have commonly been overlooked due to their minuscule size and the need of a huge amount of work both in the field and in the laboratory (Juutilainen et al. 2011, 2014, 2016). In order to establish which species are truly rare, more effort should be allocated into inventories. Of course, a certain portion of aphylloroid fungal species are truly rare or geographically restricted, for example because of their specialisation in a certain habitat type or substrate.

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References

Anonymous 2014 – Eliömaakunnat [Biogeographical provinces of Finland]. Finnish Museum of Natural History. <http://www.luomus.fi/fi/eliomaakunnat>. (Accessed 6 Jan 2018)

- Aoshima K, Furukawa H. 1963 – A note on *Grifola obducta* (Berk.) Aoshima et Furukawa, comb. nov. *Transactions of the Mycological Society of Japan* 4, 91–93.
- Bernicchia A, Gorjón SP. 2010 – Corticiaceae s. l. *Fungi Europaei*. Vol. 12, Edizioni Candusso, Alassio. 1008 p.
- Boddy L, Frankland JC, van West P. 2008 – Ecology of saprotrophic basidiomycetes. Elsevier Academic Press, London. 386 p.
- Burt EA. 1915 –The Thelephoraceae of North America. V. Tremellodendron, Eichleriella, and Sebacina. *Annals of the Missouri Botanical Garden* 2(4), 731–770. <http://www.jstor.org/stable/2989955>
- Cui BK, Vlasák J, Dai YC. 2014 – The phylogenetic position of *Osteina obducta* (Polyporales, Basidiomycota) based on samples from Northern Hemisphere. *Chiang Mai Journal of Science*. 41 (4), 838–845.
- Dai YC. 2012 – Polypore diversity in China with an annotated checklist of Chinese polypores. *Mycoscience* 53, 49–80. DOI: 10.1007/s10267-011-0134-3
- Dudka IO, Romanenko KO. 2006 – Co-existence and interaction between myxomycetes and other organisms in shared niches. *Acta Mycologica* 41, 99–112.
- Gilbertson RL, Ryvarden L. 1987 – North American polypores 2. Megasporoporia – Wrightoporia. *Fungiflora*, Oslo.
- Hansen L, Knudsen H. 1997 – Nordic macromycetes 3, 1–444.
- Heikinheimo O, Raatikainen M. 1981 – Grid references and names of localities in the recording of biological finds in Finland. *Notulae Entomologicae* 61, 133–154. (In Finnish with English summary)
- Hibbett DS, Bauer R, Binder M, Giachini AJ et al. 2014 – 14 Agaricomycetes. In: *Systematics and Evolution*, 2nd Edition. Springer-Verlag, Berlin Heidelberg. Pp. 373–429.
- Hjortstam K, Grosse-Brauckmann H. 1993 – Two new species of *Cristinia* (Basidiomycotina, Aphyllophorales) and a survey of the genus. *Mycotaxon* 47, 405–410.
- 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.
- Jonsell M, Nordlander G, Ehnström B. 2001 – Substrate preferences of insects breeding in wood decaying fungi. *Ecological Bulletins* 49, 173–194.
- Jülich W. 1972 – Monographie der Athelieae (Corticiaceae, Basidiomycetes). *Willdenowia* 7 (Beiheft), 1–283.
- Jülich W. 1984 – Kleine Kryptogamenflora. Die Nichtblätterpilze, Gallertpilze und Bauchpilze. Gustav Fischer Verlag, Stuttgart, New York. 626 p.
- Juutilainen K. 2016 – Ecology, environmental requirements and conservation of corticioid fungi occupying small diameter dead wood. *Jyväskylä Studies in Biological and Environmental Science* 313, 1–55.
- Juutilainen K, Halme P, Kotiranta H, Mönkkönen M. 2011 – Size matters in studies of dead wood and wood-inhabiting fungi. *Fungal Ecology* 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 Ecology and Management* 313, 283–291. DOI: 10.1016/j.foreco.2013.11.019
- Juutilainen K, Mönkkönen M, Kotiranta H, Halme P. 2016 –The role of novel forest ecosystems in the conservation of wood-inhabiting fungi in boreal broadleaved forests. *Ecology and Evolution* 6, 6943–6954. DOI: 10.1002/ece3.2384
- 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*. Ministry of the Environment & Finnish Environment Institute, Helsinki. Pp. 249–263.
- Kotiranta H., Niemelä T. 1996 – Threatened polypores in Finland. 2nd revised edition. Finnish Environment Institute & Edita, Helsinki. 184 p. (in Finnish with English summary)

- Kotiranta H, Saarenoksa R, Kytövuori I. 2009 – Aphyllorphoroid fungi of Finland. A check-list with ecology, distribution, and threat categories. *Norrinia* 19, 1–223.
- Kotiranta H, Shiryayev A. 2013 – Notes on aphyllorphoroid fungi (Basidiomycota) in Kevo, collected in 2009. *Kevo Notes* 14, 1–22.
- Kotiranta H, Shiryayev A. 2016. – Aphyllorphoroid fungi (Basidiomycota) in Tunguska River basin, central East Siberia, Russia. *Karstenia* 55, 25–42.
- Kotiranta H, Shiryayev A, Spirin V. 2016. – Aphyllorphoroid fungi (Basidiomycota) of Tuva Republic, southern Siberia, Russia. *Folia Cryptogamica Estonica* 53, 51–64.
- Knudsen H, Vesterholt J. (eds.) 2008 – *Funga Nordica*. Agaricoid, boletoid and cyphelloid genera. Nordsvamp, Copenhagen.
- Kunttu P. 2016 – Dead-wood-associated aphyllorphoroid fungi: perspectives on the diversity, ecology and conservation biology of species and their habitats. *Dissertationes Forestales* 225. 66 p. DOI: 10.14214/df.225
- 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, Kekki T, Pennanen J et al. 2016a – Extensions of known geographic distribution of aphyllorphoroid fungi (Basidiomycota) in Finland. *Mycosphere* 7(3), 333–357. DOI: 10.5943/mycosphere/7/3/7
- Kunttu P, Kulju M, Kotiranta H. 2016b – *Athelia singularis* and *Leptosporomyces mundus* (Basidiomycota) new to Finland. *Mycobiota* 6, 29–37. DOI:10.12664/mycobiota.2016.06.03
- Kunttu P, Kulju M, Kotiranta H. 2012 – New national and regional biological records for Finland 2. Contributions to the Finnish aphyllorphoroid funga (Basidiomycota). *Memoranda Societas Fauna Flora Fennica*, 88, 61–66.
- Kunttu P, Kulju M, Kotiranta H. 2015. – Contributions to the Finnish aphyllorphoroid funga (Basidiomycota): new and rare species. *Czech Mycology* 67, 137–156.
- Kunttu P, Kulju M, Pennanen J, Kotiranta H, Halme P. 2011 – Additions to the Finnish aphyllorphoroid fungi. *Folia Cryptogamica Estonica* 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 aphyllorphoroid funga (Basidiomycota). *Memoranda Societas Fauna Flora Fennica* 89, 119–124.
- Kunttu P, Pennanen J, Kulju M, Kekki T, Suominen M. 2014 – Noteworthy records of aphyllorphoroid fungi in Finland (Basidiomycota). *Acta Mycologica* 49, 221–235. DOI: 10.5586/am.2014.017.
- Leikola M. 1969 – On the termination of diameter growth of Scots pine in old age in northernmost Finnish Lapland. *Silva Fennica* 3, 50–61. (In Finnish with English summary)
- Luonnontieteellinen keskusmuseo 2018 – Finnish herbaria's collection management system Kotka. Accessed at <https://wiki.helsinki.fi/display/digit/Manual+for+Kotka> (accessed 21 Jan 2018)
- Lyubarsky LV, Vasilyeva LN. 1975 – *Derevorazrushayushchie griby Dal'nego Vostoka*, Nauka, Novosibirsk.
- Miettinen O. 2012 – The Corticiaceae survey of the forests in Veräjämäki, Patola and Tali 2011. Publications by City of Helsinki Environment Centre 6/2012. 24 p. (in Finnish) <https://www.hel.fi/static/ymk/julkaisut/julkaisu-06-12.pdf>
- Niemelä T. 2016. – The polypores of Finland. *Norrinia* 31, 1–430. (In Finnish with English summary)
- Niemelä T, Wallenius T, Kotiranta H. 2002 – The kelo tree, a vanishing substrate of specified wood-inhabiting fungi. *Polish Botanical Journal* 47, 91–101
- Nitare J. 2000 – Indicator species for assessing the nature conservation value of woodland sites – a flora of selected cryptogams. *Skogstyrelsens förlag*, Karlshamn. (In Swedish with English summary)
- Oberwinkler F, Riess K, Bauer R, Garnica S. 2014 – Morphology and molecules: the Sebaciniales, a case study. *Mycological Progress* 13, 445–470.

- 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 p.
- Renvall P. 1995 – Community structure and dynamics of wood-rotting Basidiomycetes on decomposing conifer trunks in Northern Finland. *Karstenia* 35, 1–51.
- Roberts P. 1994 – Long-spored *Tulasnella* species from Devon, with additional notes on allantoid-spored species. *Mycological Research* 98, 1235–1244.
- Roberts P, Hauerlev K. 1997 – Tulasnellales. – In: Hansen L, Knudsen H. *Nordic Macromycetes* 3, 1–444.
- Ryvarden L, Gilbertson RL. 1994 – European polypores 2, *Synopsis Fungorum* 7, 394–743.
- Schigel DS. 2009 – Polypore assemblages in boreal old-growth forests, and associated Coleoptera. Academic dissertation. Publications in Botany from the University of Helsinki, 44 p.
- Shiryaev A, Kotiranta H. 2015 – Aphylophoroid fungi (Basidiomycota) of the middle part of Yenisei River basin, East Siberia, Russia. *Karstenia* 55, 43–59.
- Stokland J, Sippola AL. 2004 – Monitoring protocol for wood-inhabiting fungi in the Alberta Biodiversity Monitoring Program. Alberta Biodiversity Monitoring Program. 58 p.
- Wojewoda W. 1977 – Flora Polska. Grzyby (Mycota) VIII. Polska Akademia Nauk, Warszawa & Krakow. 332 p.