

Checklist of aphylophoroid fungi (Basidiomycota) of the Ekenäs Archipelago National Park, Southern Finland

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ABSTRACT

This is the first checklist of aphylophoroid fungi (Basidiomycota) of the Ekenäs Archipelago National Park on the Finnish south coast. The focus is on wood-dwelling polypores and corticioids. The material was collected in the years 1989, 1990, 2010 and 2012, respectively, during one or a few days each year. The field work was carried out on the two largest islands: Älgö and Jussarö. The number of species detected was 150, which is 20% of all the Finnish polypores and corticioids. Eight of the species are nationally or regionally threatened.

KEY WORDS

aphylophorales; corticioids; fungal diversity; polypores; species richness.

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INTRODUCTION

For the polypores and corticioids the term aphylophorales is used solely for pragmatic reasons. Both of the groups are highly diverse and polyphyletic (Hibbett et al., 2014). In this study we concentrated on species which are saprobes, parasites or mycorrhizal, but for instance the clavarioid taxa and soil dwelling hydneous fungi (e.g., *Bankera* Coker & Beers ex Pouzar, *Hydnellum* P. Karst., *Hydnum* Linnaeus) are excluded.

In the checklist of Kotiranta et al. (2009) 756 corticioids and polypores are reported from Finland, and 489 of them occur on the southwestern coast of Finland where our study islands are situated. After this Finnish checklist numerous papers have been published with new records of aphylophoroid fungi (e.g., Kunttu et al., 2010; 2012; Kotiranta & Shiryaev, 2013; Spirin et al., 2013a). There is only one earlier large scale biogeographical study of

aphylophorales from the Finnish southern archipelago (Kunttu et al., 2015).

The Ekenäs Archipelago National Park was founded in 1989. One part of the national park was former Jussarö Strict Nature Reserve which was established in 1956. The national park contains a few hundreds of islands or skerries, and the land area is 844 hectares and sea area 4577 hectares (Nordström & Tainio, 2012). It is also a part of the large Natura 2000 conservation area, dominated by sea and archipelago landscapes (Nordström & Tainio, 2012).

The national park is situated in the Gulf of Finland (approx. 59° N, 23° E) in the hemiboreal vegetation zone (Ahti et al., 1968) in section 1b (see e.g., Kotiranta et al., 2009, p. 7 or Rassi et al., 2010, p. 27). It belongs to the Uusimaa biogeographical province (Hansen & Knudsen, 1997).

The national park extends from larger forested islands near the mainland out to rugged skerries and

open seascapes of the Gulf of Finland. The park is divided into inner, middle and outer archipelago zones (Häyren, 1948). The larger islands inhabit also old-growth forests suitable for pretentious wood-decayers. Small islands have been saved from intense forestry but household use for building, fodder for domestic animals and collecting of firewood have occurred. Small islands are mainly poor, rocky Scots pine (*Pinus sylvestris* Linnaeus) dominated, and in general the forests are mainly barren *Cladina*-, *Calluna*-, *Empetrum-Vaccinium*- and *Myrtillus*-site-type heath forests with only some patches of herb-rich forests (Bonn & Routasuo, 1997; Nordström & Tainio, 2012).

As a whole, the national park contains high biodiversity with rare and threatened species and habitat types, like 13 Natura 2000-habitat types according to the European Union's Habitat Directive, and 61 threatened or near-threatened species (Nordström & Tainio, 2012; Metsähallitus, 2014).

MATERIAL AND METHODS

This study was carried out on the two largest islands of the national park: Älgö (698 hectares) and Jussarö (134 hectares). Inventories were concentrated in the southern parts of Älgö (48 hectares) and the western parts of Jussarö (66 hectares). Heikki Kotiranta (HK) surveyed and collected material during the autumns 1989 and 1990, Panu Kunttu (PK) 2010 and Jorma Pennanen (JP) 2012. Altogether these inventories contained eight days of field work.

The authors PK and JP used the inventory methods according to Junninen (2009), which is widely used in polypore inventories in the state owned forests. The focus was on rare, red-listed and old-growth forest indicators. HK sampled extensively both polypores and corticioids, but PK and JP concentrated more on polypores and collected corticioids only occasionally and selectively (large, hydroid species). PK and JP made most of their inventories in the forest stands with the highest volume of dead wood, and generally these were Norway spruce, *Picea abies* (Linnaeus) H. Karsten, dominated forests.

The island of Älgö is located on the northern boundary of the national park (Fig. 1). It is the largest island of the park with some small lakes, and

is mostly covered with coniferous forests intermixed with deciduous trees, like birches (*Betula* spp. Linnaeus) and aspen (*Populus tremula* Linnaeus) (Fig. 2). On the stony shores and other wet places black alder (*Alnus glutinosa* (Linnaeus) Gaertner) is common. Selectively loggings in spruce forests were made 40 years ago but part of these forests have been restored recently (Nordström & Tainio, 2012).

The island of Jussarö is located on the eastern boundary of the national park (Fig. 1), and is the second largest in the park. Such forested inlands are unusual in the outer archipelago zone. It is divided into two parts: the western part is dominated by old-growth forests with up 150 years old spruces (Fig. 3), and it has been untouched for decades, and the eastern side is strongly affected by mining, which was practised over hundred years until 1960's (Nordström & Tainio, 2012).

The specimens were identified by the authors themselves. Voucher specimens are deposited in the herbaria of Universities of Turku (TUR), Helsinki (H) and/or private collections of the authors HK and JP. The nomenclature follows mainly Kotiranta et al. (2009), but of the genus *Hyphodontia* sensu lato Hjortstam & Ryvarden (2009). Some recent combinations are according to Miettinen & Larsson (2011), Miettinen et al. (2012) and Spirin et al. (2013b). The Finnish national red-listing evaluation of the IUCN red list categories is according to Kotiranta et al. (2010).

RESULTS

A total of 150 species are listed in Table 1 in alphabetic order regardless of their systematic position. This is ca. 20% of all known species of these species groups in Finland and ca. 30% of species found from the hemiboreal oak zone (section 1b). The list comprises 66 polypores, 83 corticioids and one wood inhabiting hydnoeous species (*Mucronella bresadolae*). It is a matter of taste whether one species belongs to polypores or corticioids. For instance *Schizopora paradoxa* and the poroid *Trechispora* species are here included in corticioids. The most species-rich genera are *Phellinus* (9 species), *Peniophora* (7 species), *Postia* (7 species), *Skeletocutis* (5 species) and *Trechispora* (5 species).

Following red-listed species were found: *Amylocorticium subincarnatum* (VU), *Skeletocutis stellae* (VU), *Aporpium canescens* (NT, RT), *Fomitopsis rosea* (NT, RT), *Onnia tomentosa* (NT), *Phlebia centrifuga* (NT, RT), *Sidera lenis* (NT, RT) and *Skeletocutis odora* (NT, RT). All these species grow almost solely in old-growth forests, and nowadays their survival is dependent on protected areas.

The list of species contains three virgin forest indicators (VFI) and 11 old-growth forest indicators (OFI) of pine and spruce dominated forests (Table 1). According to the classification of old-growth forest indicators by Kotiranta & Niemelä (1996) these two forest areas reach 13 points for spruce dominated forests and 10 points for pine dominated forests.

DISCUSSION

The number of species (150) found in the Ekenäs Archipelago National Park is an expected number of species in Southern Finland if compared to the consumed time and studied area (ca. 10% of the whole land area of the national park). It is well known that fungi do not fruit every year (Straatsma et al., 2001) and species occupying narrow ecological niches may have been overlooked (Juutilainen et al., 2011). So, many more species could be found with more intensive field work, because the forests of the national park offer wide range of tree species, diversity of habitats and high volume of dead wood. Especially the corticioids are under-represented in this material and quite common species, like *Amphinema byssoides* (Pers.: Fr.) J. Eriksson, are lacking from our list. For example, from the near-situated Archipelago Sea National Park 303 polypores and corticioids were listed (Kunttu et al., 2015).

We studied quite little barren and rocky Scots pine dominated forest habitats and therefore some specialist species living in kelo trees have not been found in our study. Kelos are dead and old age trunks of Scots pine, and their surface is grey, hard and decorticated. Scots pine can become kelo tree mainly on dry and barren forest habitats (Leikola, 1969; Niemelä et al., 2002). It is known that kelo trees sustain specific fungal diversity (Niemelä et al., 2002). Also a comprehensive inventory of black

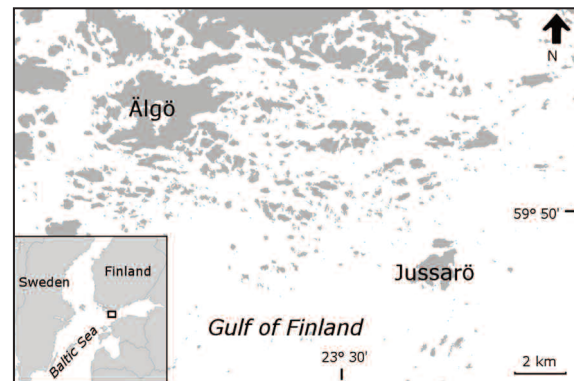


Figure 1. Location of the study islands: Ekenäs Archipelago National Park, Southern Finland.



Figure 2. Mixed forest near the shore on the island of Älgö.



Figure 3. Old-growth spruce forest on the island of Jussarö.

Species and authors	Status
<i>Alutaceodontia alutacea</i> (Fr.) Hjortstam et Ryvardeen, 2002	
<i>Amylocorticiium subincarnatum</i> (Peck) Pouzar, 1959	VU
<i>Amylostereum chailletii</i> (Pers.) Boidin, 1958	
<i>Amylostereum laevigatum</i> (Fr.) Boidin, 1958	
<i>Antrodia serialis</i> (Fr.) Donk, 1966	
<i>Antrodia sinuosa</i> (Fr.) P. Karsten, 1881	
<i>Antrodia xantha</i> (Fr. : Fr.) Ryvardeen, 1973	
<i>Antrodiella pallescens</i> (Pilát) Niemelä et Miittinen, 2006	
<i>Antrodiella serpula</i> (P. Karst.) Spirin et Niemelä, 2006	
<i>Aphanobasidium pseudotsugae</i> (Burt) Boidin et Gilles, 1989	
<i>Aporpium canescens</i> (P. Karst.) Bondartsev et Singer, 1944	NT, RT
<i>Asterodon ferruginosus</i> Patouillard, 1894	OFI
<i>Athelia acrospora</i> Jülich, 1972	
<i>Athelia arachnoidea</i> (Berk.) Jülich, 1972	
<i>Athelia epiphylla</i> Persoon, 1822	
<i>Basidioradulum radula</i> (Fr.) Nobles, 1967	
<i>Bjerkandera adusta</i> (Willd.: Fr.) P. Karsten, 1879	
<i>Botryobasidium botryosum</i> (Berk. et M.A. Curtis) J. Eriksson, 1958	
<i>Botryobasidium subcoronatum</i> (Höhn. et Litsch.) Donk, 1931	
<i>Bulbillomyces farinosus</i> (Bres.) Jülich, 1974	
<i>Byssomerulius corium</i> (Fr.) Parmasto, 1967	
<i>Ceraceomyces eludens</i> K.H. Larsson, 1998	
<i>Ceriporiopsis balaenae</i> Niemelä, 1985	
<i>Cerrena unicolor</i> (Bull.: Fr.) Murrill, 1903	
<i>Chondrostereum purpureum</i> (Pers.: Fr.) Pouzar, 1959	
<i>Cinereomyces lindbladii</i> (Berk.) Jülich, 1982	
<i>Climacocystis borealis</i> (Fr.) Kotlaba et Pouzar, 1958	
<i>Conferticiium ochraceum</i> (Fr.: Fr.) Hallenberg, 1980	
<i>Coniophora arida</i> (Fr.) P. Karsten, 1868	
<i>Coniophora olivacea</i> (Pers.: Fr.) P. Karsten, 1879	
<i>Coniophora puteana</i> (Schumach.: Fr.) P. Karsten, 1868	
<i>Corticium roseum</i> Persoon, 1794	
<i>Cylindrobasidium evolvens</i> (Fr.) Jülich, 1974	
<i>Cytidia salicina</i> (Fr.) Burt, 1924	
<i>Daedaleopsis confragosa</i> (Bolton: Fr.) J. Schröter, 1888	
<i>Datronia mollis</i> (Sommerf.) Donk, 1966	
<i>Eichleriella deglubens</i> (Berk. et Broome) D.A. Reid, 1970	
<i>Exidiopsis calcea</i> (Pers.: Fr.) K. Wells, 1962	
<i>Fomes fomentarius</i> (L.: Fr.) Fr., 1849	
<i>Fomitopsis pinicola</i> (Sw.: Fr.) P. Karsten, 1881	
<i>Fomitopsis rosea</i> (Alb. et Schwein.: Fr.) P. Karsten, 1881	NT,RT, OFI
<i>Galzinia incrustans</i> (Höhn. et Litsch.) Parmasto, 1965	
<i>Ganoderma applanatum</i> (Pers.) G.F. Patouillard, 1887	
<i>Ganoderma lucidum</i> (M.A. Curtis: Fr.) P. Karsten, 1881	
<i>Globulicium hiemale</i> (Laurila) Hjortstam, 1973	
<i>Gloeocystidiellum porosum</i> (Berk. et M.A. Curtis) Donk, 1931	
<i>Gloeophyllum odoratum</i> (Wulfen: Fr.) Imazeki, 1943	
<i>Gloeophyllum sepiarium</i> (Wulfen: Fr.) P. Karsten, 1882	
<i>Gloeoporus dichrous</i> (Fr.: Fr.) Bresadola, 1912	
<i>Heterobasidion parviporum</i> Niemelä et Korhonen, 1998	
<i>Hymenochaete fuliginosa</i> (Pers.) Bresadola, 1846	
<i>Hymenochaete tabacina</i> (Sowerby) Léveillé, 1846	
<i>Hyphodontia alutaria</i> (Burt) J. Eriksson, 1958	
<i>Hyphodontia arguta</i> (Fr.) J. Eriksson, 1958	
<i>Hyphodontia pallidula</i> (Bres.) J. Eriksson, 1958	
<i>Hypochnicium albostramineum</i> (Bres.) Hallenberg, 1985	
<i>Hypochnicium bombycinum</i> (Sommerf. et Fr.) J. Eriksson, 1958	
<i>Hypochnicium multiforme</i> (Berk. et Broome) Hjortstam, 1998	
<i>Inonotus obliquus</i> (Pers.: Fr.) Pilát, 1942	
<i>Inonotus radiatus</i> (Sowerby: Fr.) P. Karsten, 1881	
<i>Ischnoderma benzoinum</i> (Wahlenb.: Fr.) P. Karsten, 1879	
<i>Junghuhnia nitida</i> (Pers.: Fr.) Ryvardeen, 1972	
<i>Laxitextum bicolor</i> (Pers.: Fr.) Lentz, 1956	
<i>Leptoporus mollis</i> (Pers.: Fr.) Quélet, 1886	OFI
<i>Leptosporomyces galzinii</i> (Bourdot) Jülich, 1972	
<i>Leucogyrophana romellii</i> (Fr.) Ginns, 1978	
<i>Lobulicium occultum</i> K.H. Larsson et Hjortstam, 1982	
<i>Megalocystidium leucoxanthum</i> (Bres.) Boidin, 1978	

<i>Meruliopsis taxicola</i> (Pers.: Fr.) Bondartsev, 1959	OFI	<i>Postia fragilis</i> (Fr.) Jülich, 1982	
<i>Mucronella bresadolae</i> (Quél.) Corner, 1970		<i>Postia leucomallella</i> (Murrill) Jülich, 1982	OFI
<i>Oligoporus rennyi</i> (Berk. et Broome) Donk, 1971		<i>Postia ptychogaster</i> (F. Ludw.) Vesterholt, 1996	
<i>Oligoporus sericeomollis</i> (Romell) Bondartsev, 1983	OFI	<i>Postia stiptica</i> (Pers.: Fr.) Jülich, 1982	
<i>Onnia tomentosa</i> (Fr.) P. Karsten, 1889	NT	<i>Postia tephroleuca</i> (Fr.) Jülich, 1982	
<i>Peniophora cinerea</i> (Pers.: Fr.) Cooke, 1879		<i>Pseudotomentella mucidula</i> (P. Karst.) Svrček, 1958	
<i>Peniophora incarnata</i> (Pers.: Fr.) P. Karsten, 1889		<i>Pycnoporellus fulgens</i> (Fr.) Donk, 1971	OFI
<i>Peniophora limitata</i> (Chaillet ex Fr.) Cooke, 1879		<i>Pycnoporus cinnabarinus</i> (Jacq.: Fr.) P. Karsten, 1881	
<i>Peniophora nuda</i> (Fr.) Bresadola, 1950		<i>Radulomyces confluens</i> (Fr.: Fr.) M.P. Christensen, 1960	
<i>Peniophora pithya</i> (Pers.) J. Eriksson, 1950		<i>Resinicium bicolor</i> (Alb. et Schwein.: Fr.) Parmasto, 1968	
<i>Peniophora polygonia</i> (Pers.: Fr.) Bourdot et Galzin, 1928		<i>Resinicium furfuraceum</i> (Bres.) Parmasto, 1968	
<i>Peniophora violaceolivida</i> (Sommerf.) Masee, 1890		<i>Rigidoporus populinus</i> (Schumach.: Fr.) Pouzar, 1966	
<i>Peniophorella praetermissa</i> (P. Karst.) K.H. Larsson, 2007		<i>Schizopora paradoxa</i> (Schrad.: Fr.) Donk, 1967	
<i>Peniophorella pubera</i> (Fr.) P. Karsten, 1889		<i>Scytinostroma odoratum</i> (Fr.) Donk, 1956	
<i>Phaeolus schweinitzii</i> (Fr.) Patouillard, 1900	OFI	<i>Scytinostroma portentosum</i> (Berk. et M.A. Curtis) Donk, 1956	
<i>Phanerochaete sanguinea</i> (Fr.) Pouzar, 1973		<i>Serpula himantioides</i> (Fr.: Fr.) P. Karsten, 1885	
<i>Phanerochaete velutina</i> (DC.: Fr.) P. Karsten, 1968		<i>Sidera lenis</i> (P. Karst.) Miettinen, 2011	NT, RT, VFI
<i>Phellinus alni</i> (Bondartsev) Parmasto, 1976		<i>Sistotrema sernanderi</i> (Litsch.) Donk, 1956	
<i>Phellinus cinereus</i> (Niemelä) Parmasto, 1976		<i>Skeletocutis amorpha</i> (Fr.) Kotlaba et Pouzar, 1958	
<i>Phellinus conchatus</i> (Pers.: Fr.) Quélet, 1886		<i>Skeletocutis biguttulata</i> (Romell) Niemelä, 1998	
<i>Phellinus ferrugineofuscus</i> (P. Karst.) Bourdot, 1932	OFI	<i>Skeletocutis carneogrisea</i> A. David, 1982	
<i>Phellinus igniarius</i> (L.: Fr.) Quélet, 1886		<i>Skeletocutis odora</i> (Sacc.) Ginns, 1984	NT, RT, OFI
<i>Phellinus laevigatus</i> (P. Karst.) Bourdot et Galzin, 1928		<i>Skeletocutis stellae</i> (Pilát) Jean Keller, 1979	VU, VFI
<i>Phellinus pini</i> (Brot.: Fr.) A. Ames, 1913	OFI	<i>Spongiporus undosus</i> (Peck) A. David, 1980	
<i>Phellinus punctatus</i> (P. Karst.) Pilát, 1942		<i>Stereum hirsutum</i> (Willd.: Fr.) Gray, 1800	
<i>Phellinus tremulae</i> (Bondartsev) Bondartsev et Borisov, 1953		<i>Stereum rugosum</i> Pers.: Fr., 1794	
<i>Phlebia centrifuga</i> P. Karsten, 1881	NT, RT, VFI	<i>Stereum sanguinolentum</i> (Alb. et Schwein.: Fr.) Fr., 1838	
<i>Phlebia radiata</i> Fr., 1821		<i>Subulicystidium longisporum</i> (Pat.) Parmasto, 1968	
<i>Phlebia tremellosa</i> (Schrad.: Fr.) Nakasone, 1984		<i>Trametes hirsuta</i> (Wulfen: Fr.) Pilát, 1939	
<i>Phlebiella</i> cf. <i>subnites</i> (Bourdot et Galzin) K.H. Larsson et Hjortstam, 1987		<i>Trametes ochracea</i> (Pers.) Gilbertson et Ryvarden, 1987	
<i>Phlebiella sulphurea</i> (Pers.: Fr.) Ginns et Lefebvre, 1993		<i>Trametes pubescens</i> (Schumach.: Fr.) Pilát, 1939	
<i>Phlebiella tulasnelloidea</i> (Höhn. et Litsch.) Ginns et Lefebvre, 1993		<i>Trametes velutina</i> (Fr.) G. Cunningham, 1965	
<i>Piloderma fallax</i> (Liberta) Stalpers, 1984			
<i>Piptoporus betulinus</i> (Bull.: Fr.) P. Karsten, 1881			
<i>Polyporus brumalis</i> (Pers.: Fr.) Fr., 1818			
<i>Postia alni</i> Niemelä et Vampola, 2001			
<i>Postia caesia</i> (Schrad.: Fr.) P. Karsten, 1881			

Table 1/1. Aphylloroid fungi of the Ekenäs Archipelago National Park. Red list status in Finland: VU = Vulnerable, NT = Near Threatened, RT = Regionally Threatened. Indicator species: VFI = Virgin Forest Indicator, OFI = Old-growth Forest Indicator (continued).

Species and authors	Status
<i>Trechispora cohaerens</i> (Schw.) Jülich et Stalpers, 1980	
<i>Trechispora farinacea</i> (Pers.: Fr.) Liberta, 1966	
<i>Trechispora hymenocystis</i> (Berk. et Broome) K.H. Larsson, 1994	
<i>Trechispora mollusca</i> (Pers.: Fr.) Liberta, 1974	
<i>Trechispora subsphaerospora</i> (Litsch.) Liberta, 1973	
<i>Trichaptum abietinum</i> (Pers.: Fr.) Ryvardeen, 1972	
<i>Trichaptum fuscoviolaceum</i> (J.C. Schmidt: Fr.) Kreisel, 1972	
<i>Tubulicrinis accedens</i> (Bourdot et Galzin) Donk, 1956	
<i>Tylospora fibrillosa</i> (Burt) Donk, 1960	
<i>Vesiculomyces citrinus</i> (Pers.) E. Hagström, 1977	
<i>Vuilleminia comedens</i> (Nees: Fr.) Maire, 1902	
<i>Xylodon asperus</i> (Fr.) Hjortstam et Ryvardeen, 2009	
<i>Xylodon brevisetus</i> (P. Karst.) Hjortstam et Ryvardeen, 2009	

Table 1/2. Aphylloroid fungi of the Ekenäs Archipelago National Park. Red list status in Finland: VU = Vulnerable, NT = Near Threatened, RT = Regionally Threatened. Indicator species: VFI = Virgin Forest Indicator, OFI = Old-growth Forest Indicator.

alders could reveal more aphylloroid species, therefore that black alder hosts many rare or little collected species in Finland (Kunttu et al., 2011; 2012; 2014).

Based on the indicator points of Jussarö and Älgö, these are valuable in the view of nature conservation. Particularly on Jussarö, the spruce dominated old-growth forest is very valuable in the sense of forest biodiversity. It has been estimated to be one of the most representative old-growth forests on the south coast of Finland (Nordström & Tainio, 2012). Remote location and early protection in 1956 have saved forests of western Jussarö. Also in general, isolated location have saved some archipelago areas from large-scale intensive forestry and this explains why certain forests in the archipelago have a high degree of naturalness. Precisely 11% of land area of the Ekenäs Archipelago National Park is boreal natural forest according to Natura 2000-habitat type definition (Metsähallitus, 2014).

Relatively many aphylloroid fungi found here have a preference, or are even depending on

old-growth forests. Many of these are today common only in protected areas in northern or eastern Finland (Renvall, 1995; Lindgren, 2001; Sippola et al., 2005). It is obvious that the distribution of these species has earlier covered almost the whole Finland, but as a result of forceful forestry with large clear-cuttings these species have viable populations nowadays only in the large protected areas in northern and eastern Finland. Small old-growth forest fragments are maybe not large enough to preserve the most pretentious virgin forest species. This is especially alarming since the dispersal ability of many fungal species with specialised resources and habitat requirements is weak; it affects the occurrences of these species in fragmented landscapes (Norros et al., 2012) and therefore colonization of species can be slow after disturbance (Kouki et al., 2011). The Finnish southern archipelago is far away from the present occurrence sites of these wood-inhabiting fungi with strict habitat requirements related to natural characteristics of forests and thus the returning of these species can be a long process.

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REFERENCES

- Ahti T., Hämet-Ahti L. & Jalas J., 1968. Vegetation zones and their sections in northwestern Europe. *Annales Botanici Fennici*, 5: 169–211.
- Bonn T. & Routasuo P. (Eds.), 1997. *Tammisaaren saariston kansallispuiston kasvillisuus ja kasvisto. Metsähallituksen luonnonsuojelujulkaisuja A 67.* Metsähallitus, Vantaa, 90 pp.
- Hansen L. & Knudsen H. (Eds.), 1997. *Nordic macro-mycetes 3. Heterobasidioid, aphylloroid and gastromycetoid basidiomycetes.* Nordsvamp, Copenhagen, 444 pp.
- Hibbett D.S., Bauer R., Binder M., Giachini A.J., Hosaka K., Justo A., Larsson E., Larsson K.H., Lawrey J.D., Miettinen O., Nagy L.G, Nilsson R.H. & Thorn R.G., 2014. *Agaricomycetes.* In: McLaughlin D.J. & Spatafora J.W. (Eds.) 2014. *The Mycota, A Compre-*

- hensive Treatise on Fungi as Experimental Systems for Basic and Applied Research. Vol. VII. Systematics and Evolution, 2nd Edition. Springer-Verlag, Berlin Heidelberg, 373–429.
- 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.
- Häyren E., 1948. Skärgårdens längzoner. In: Lindberg H. (Ed.) 1948. Skärgårdsboken. Nordenskiöld-Samfundet i Finland, Helsingfors, 242–256.
- Junninen K., 2009. Kääpäkartoitusten yleisohje. Metsähallitus Natural Heritage Services, 3 pp.
- 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
- Kotiranta H. & Niemelä T., 1996. Threatened polypores in Finland. 2nd revised edition. Finnish Environment Institute & Edita, Helsinki, 184 pp. (In Finnish with English summary)
- Kotiranta H. & Shiryayev A., 2013. Notes on Aphylloroid fungi (Basidiomycota) in Kevo, collected in 2009. *Kevo Notes*, 14: 1–22.
- Kotiranta H., Saarenoksa R. & Kytövuori, I., 2009. Aphylloroid fungi of Finland. A Check-list with ecology, distribution, and threat categories. *Norrinia*, 19: 1–223.
- Kotiranta H., Junninen K., Saarenoksa R., Kinnunen J. & Kytövuori I., 2010. Aphyllorales & Heterobasidiomycetes. In: 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, 249–263.
- Kouki J., Hyvärinen E., Lappalainen H., Martikainen P. & Similä M., 2011. Landscape context affects the success of habitat restoration: large-scale colonization patterns of saproxylic and fire-associated species in boreal forests. *Diversity and Distributions*, 18: 348–355. DOI: 10.1111/j.1472-4642.2011.00839.x
- Kunttu P., Kulju M. & Kotiranta H., 2010. Rare corticioid fungi in Finland - records of new and little collected species (Basidiomycota). *Karstenia*, 50: 35–44.
- Kunttu P., Kulju M. & Kotiranta H., 2012. New national and regional biological records for Finland 2. Contributions to the Finnish aphylloroid funga (Basidiomycota). *Memoranda Societas Fauna Flora Fennica*, 88: 61–66.
- Kunttu P., Kulju M. & Kotiranta H., 2015. Checklist of aphylloroid fungi (Basidiomycota) of the Archipelago Sea National Park, Southwest Finland. *Check List*, 11(2): 1587. DOI: 10.15560/11.2.1587.
- Kunttu P., Kulju M., Pennanen J., Kotiranta H. & Halme P., 2011. Additions to the Finnish aphylloroid fungi. *Folia Cryptogamica Estonica*, 48: 25–30.
- Kunttu P., Pennanen J., Kekki T., Kulju M. & Suominen M., 2014. Noteworthy records of aphylloroid 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)
- Lindgren M., 2001. Polypore (Basidiomycetes) species richness and community structure in natural boreal forests of NW Russian Karelia and adjacent areas in Finland. *Acta Botanica Fennica*, 170: 1–41.
- Metsähallitus 2014. Metsähallituksen selvitys Suomenlahden merikansallispuistojen täydentämistarpeista ja -mahdollisuuksista. Metsähallitus, Helsinki, 105 pp.
- Miettinen O. & Larsson K.-H., 2011. *Sidera*, a new genus in Hymenochaetales with poroid and hydroid species. *Mycological Progress*, 10: 131–141. DOI: 10.1007/s11557-010-0682-5
- Miettinen O., Spirin V. & Niemelä T., 2012. Notes on the genus *Aporpium* (Auriculariales, Basidiomycota), with a new species for temperate Europe. *Annales Botanici Fennici*, 49: 359–368. DOI: 10.5735/085.049.0607
- Niemelä T., Wallenius T. & Kotiranta H., 2002. The kelo tree, a vanishing substrate of specified wood-inhabiting fungi. *Polish Botanical Journal*, 47: 91–101.
- Nordström M. & Tainio E., 2012. Tammisaaren saariston ja Hangon itäisen saariston hoito- ja käyttösuunnitelma. Metsähallituksen luonnonsuojelujulkaisuja C 78. Metsähallitus, Jyväskylä, 144 pp.
- Norros V., Penttilä R., Suominen M. & Ovaskainen O., 2012. Dispersal may limit the occurrence of specialized wood decay fungi already at small spatial scales. *Oikos* 121: 961–974. DOI: 10.1111/j.1600-0706.2012.20052.x
- Rassi P., Hyvärinen E., Juslén A. & Mannerkoski I. (Eds.), 2010. The 2010 Red List of Finnish Species. Ministry of the Environment & Finnish Environment Institute, Helsinki, 685 pp.
- Renvall P., 1995. Community structure and dynamics of wood-rotting Basidiomycetes on decomposing conifer trunks in northern Finland. *Karstenia*, 35: 1–51.
- Sippola A.-L., Mönkkönen M. & Renvall P., 2005. Polypore diversity in the herb-rich woodland key habitats of Koli National park in eastern Finland. *Biological Conservation*, 126: 260–269. DOI: 10.1016/j.biocon.2005.06.002
- Spirin V., Vlasák J., Niemelä T. & Miettinen O., 2013b. What is *Antrodia* sensu stricto? *Mycologia*, 105: 1555–1576. DOI: 10.3852/13-039
- Spirin V., Miettinen O., Pennanen J., Kotiranta H. & Niemelä T., 2013a. *Antrodiahyalina*, a new polypore from Russia, and *A. leucaena*, new to Europe.

- Mycological Progress, 12: 53–56. DOI: 10.1007/s11557-012-0815-0
- Straatsma G., Ayer F. & Egli S., 2001. Species richness, abundance, and phenology of fungal fruit bodies over 21 years in a Swiss forest plot. *Mycological Research*, 105: 515–523. DOI:10.1017/S0953756201004154