

Aphylloraceous wood-inhabiting fungi on *Abies alba* in Italy

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Abstract 190 species representing 101 genera of aphylloraceous fungi growing on *Abies alba* in Italy are given. *Ceriporia aurantiocarnescens* is reported as new to Italy. *Fomitopsis labyrinthica* has previously been described as a new species from this substrate, while many species identified are considered rare in Italy.

Key words lignicolous fungi, diversity, coniferous forests

Introduction

In parallel with previous reports on Italian lignicolous fungi (Bernicchia 2000, Mayrhofer et al. 2001, Pérez Gorjón et al. 2006), we have compiled a list of aphylloraceous fungi growing on Silver Fir (*Abies alba* Mill.) in Italy. The full area covered (Figure 1) extends from the montane forests of Central Europe from the Pyrenees and adjacent mountains in northern Spain, east and south through the Italian Alps and Apennines, and east into Macedonia and the lowland forests of western France and eastern Poland (see also Chater 1964).

The two *Abies* species in Italy are *A. nebrodensis*, restricted to the Madonie Mountains of Sicily, and *A. alba*, extending from the Alps and Apennines to the north to Aspromonte in the south. *A. alba* has suffered a recent decline due to natural and/or anthropogenic causes (Bernetti 1998). Italy has a typically Mediterranean climate except for the Continental and highest zones in the interior with lower temperatures where coniferous forests of *Abies*, *Larix*, *Picea* and *Pinus* are common.

A. alba is about as resistant to low winter temperatures as *Picea* and its other climatic requirements generally resemble those of *Fagus sylvatica* and *Picea abies*, but *A. alba* requires higher summer temperatures to ripen the seeds, is more tolerant to spring frosts, and avoids areas with high humidity.

Materials and methods

During the last 25 years, fungi have been collected in the 26 localities listed below. Samples were taken to the laboratory for microscopical examination and identification following Eriksson & Ryvarden (1973, 1975, 1976), Eriksson et al. (1978, 1981, 1984), Burdsall (1985), Hjortstam et al. (1988), Kõljalg (1995), Ryvarden & Gilbertson (1993, 1994) and Bernicchia (2005). All the specimens are kept in Herbarium HUBO. The list is partially referred to Bernicchia (1995, 2001), Onofri (2005) and the nomenclature to Donk (1984), Parmasto (1997), Hjortstam (1998), Kirk et al. (2001) and CBS (2007).

Collection localities (see also Figure 2): The collections have been undertaken in the following sites. They are numerically arranged by Italian regions, from north to south, and from west to east in the wider part of the country.

(1) Valle d'Aosta, Aosta, Castel Savoia; (2) Piemonte, Verbano-Cusio-Ossola, Macugnaga; (3) Piemonte, Vercelli, Val Sermenza; (4) Trentino-Alto Adige, Trento, Adamello Brenta Natural Park; (5) Trentino-Alto Adige, Bolzano, Favogna di Sopra; (6) Trentino-Alto Adige, Bolzano, Tiosels forest; (7) Veneto, Belluno, Dolomiti Bellunesi National Park, Cansiglio forest; (8) Veneto, Belluno, Dolomiti Bellunesi National Park, Cajada forest; (9) Friuli Venezia Giulia, Pordenone, Cansiglio forest; (10) Veneto, Treviso, Cansiglio forest; (11) Emilia-Romagna, Bologna, Bologna's Apennines; (12) Emilia-Romagna, Bologna, La Martina Park; (13) Emilia-Romagna, Bologna, Mount Cavallo; (14) Emilia-Romagna, Bologna, Como alle Scale Park; (15) Emilia-Romagna, Bologna, Mount Piella; (16) Emilia-Romagna, Forli-Cesena, Badia Prataglia State Reserve; (17) Emilia-Romagna, Forli-Cesena, Campigna State Reserve; (18) Emilia-Romagna, Forli-Cesena, Mount Fumaiolo State Reserve; (19) Emilia-Romagna, Forli-Cesena, Sasso Fratino State Reserve; (20) Toscana, Arezzo, Camaldoli State Reserve; (21) Toscana, Arezzo, Campigna State Reserve; (22) Toscana, Grosseto, Mount Amiata; (23) Toscana, Siena, Mount Amiata; (24) Basilicata, Potenza, Monticchio; (25) Calabria, Reggio Calabria, Calabria National Park; (26) Calabria, Reggio Calabria, Abbruschiata pine forest.

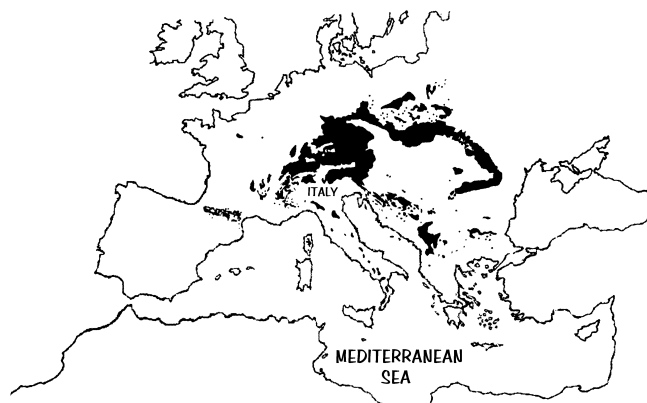
Results

Our survey of 536 specimens collected on *Abies alba* represents 190 species and 101 different genera of aphyllporaceous wood-inhabiting fungi. Of these, *Ceriporia aurantiocarnescens* (Henning) M. Pieri & B. Rivoire is new to Italy. Especially rare or uncommon species include

Amphinema diadema K.H. Larss. & Hjortstam, *Antrodia alpina* (Litsch.) Gilb. & Ryvarden, *Antrodiella parasitica* Vampola, *Flavophlebia sulfureoisabellina* (Litsch.) K.H. Larss. & Hjortstam, *Coronicium gemmiferum* (Bourdot & Galzin) J. Erikss. & Ryvarden, *Cystostereum murrayi* (Berk. & M.A. Curtis) Pouzar, *Dentipellis fragilis* (Pers.) Donk, *Fomitopsis labyrinthica* Bernicchia & Ryvarden, *Galzinia incrustans* (Höhn. & Litsch.) Parmasto, *Lobulicium occultum* K.H. Larss. & Hjortstam, *Metulodontia nivea* (P. Karst.) Parmasto, *Oligoporus cerifluus* (Berk. & M.A. Curtis) Gilb. & Ryvarden, *O. lowei* (Pilát ex Pilát) Gilb. & Ryvarden, *O. simani* (Pilát) Bernicchia, *Paullicorticium pearsonii* (Bourdot) J. Erikss., *Phlebia georgica* Parmasto, *P. queletii* (Bourdot & Galzin) M.P. Christ., *Pycnoporellus fulgens* (Fr.) Donk, *Repetobasidium mirificum* J. Erikss. and *Tylospora asterophora* (Bonord.) Donk.

While many of these species can grow on other substrata, some of them typically fruit on *Abies*, such as *Bondarzewia montana* (Quél.) Singer, *Ganoderma carnosum* Pat., *Hymenochaete cruenta* (Pers.) Donk, *Phellinus hartigii* (Allesch. & Schnabl) Pat., and *Podofomes trogii* (Fr.) Pouzar. Species typical of deciduous substrata found also growing on *Abies* include *Abortiporus biennis* (Bull.) Singer, *Hapalopilus nidulans* (Fr.) P. Karst., *Inonotus dryadeus* (Pers.) Murrill, *Oligoporus tephroleucus* (Fr.) Gilb. & Ryvarden, *Polyporus badius* (Pers.) Schwein., *Trametes hirsuta* (Wulfen) Pilát, and *Trametes pubescens* (Schumach.) Pilát.

Figure 1. Map of approximate distribution of *Abies alba* in Europe.



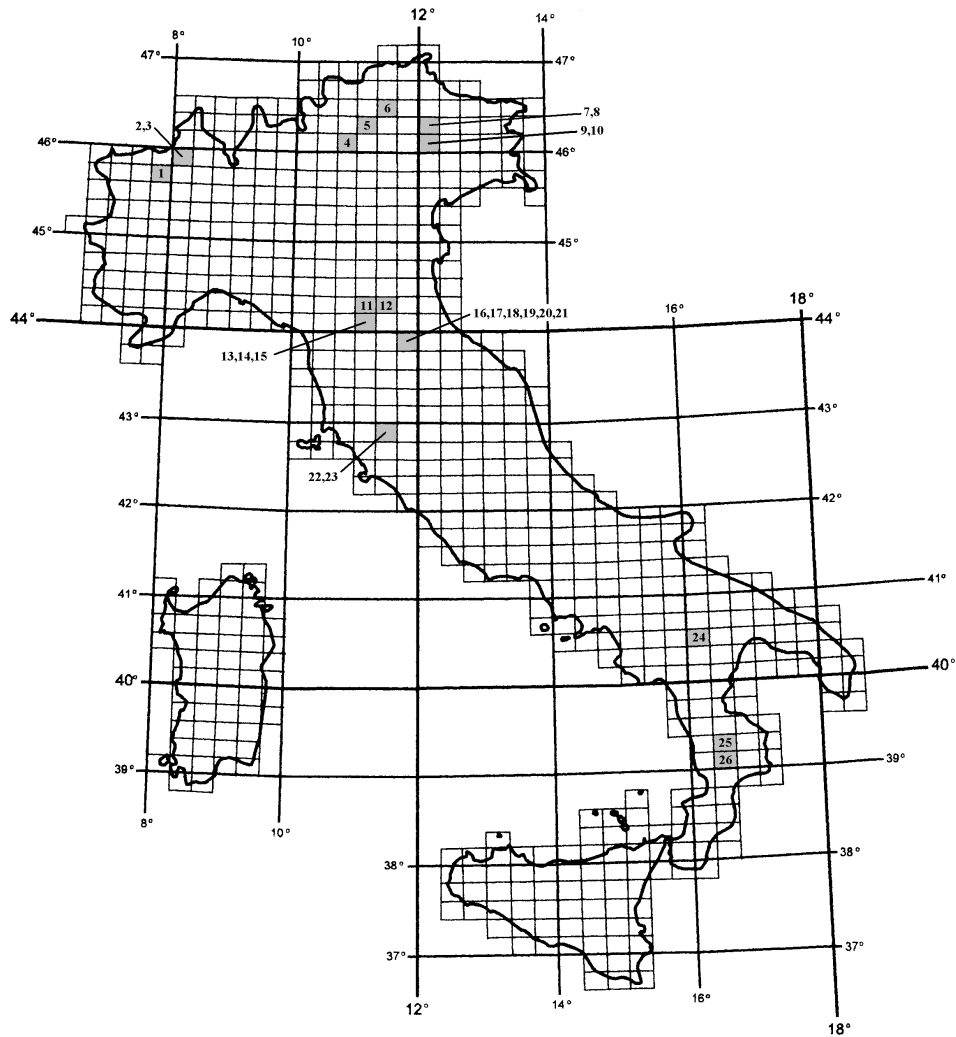


Figure 2. Map of Italy with the collecting sites. Scale 1:50000.

Checklist of collected Aphylophorales

Abortiporus biennis (Bull.) Singer

(19) coll. 7099, a widespread species in Europe and common on deciduous wood, but in Sasso Fratino Reserve it occurs on *Abies* as well.

Aleurodiscus amorphus Rabenh.

(16) coll. 7519; (19) coll. 6017, also recorded on *Picea* in Italy.

Amphinema byssoides (Pers.) J. Erikss.

(6) coll. 3681; (16) coll. 5520; (22) coll. 5143, common and widespread in coniferous forests; in Italy also collected on *Acacia*,

- Alnus*, *Betula*, *Cistus*, *Cornus*, *Erica*, *Eucalyptus*, *Juniperus*, *Pinus*,
Picea and *Polystichum*.
- Amphinema diadema* K.H. Larss. & Hjortstam
(22) coll. 5058, very rare species in Europe; it is the only collection in Italy.
- Amylostereum chailletii* (Pers.) Boidin
(9) coll. 4415, 4799; (12) coll. 1871, 1875, 6014; (14) coll. 848, 849, 6897; (15) coll. 2682, 2977; (20) coll. 7177; (22) coll. 6425; (24) coll. 2456; (25) coll. 5705, common species on *Abies* and *Picea*; in Italy also recorded on *Cupressus* and *Pinus*.
- Antrodia alpina* (Litsch.) Gilb. & Ryvarden
(1) coll. 7343; (2) coll. 7738, 7759, species present in North America, and in Europa only in the Alps; in Italy it is a rare species with a limited distribution in the Alpine zone of Piemonte, Valle d'Aosta and Trentino Alto Adige; it can grow on *Larix decidua*, *Picea abies* and *Pinus cembra* too.
- Antrodia gossypium* (Speg.) Ryvarden
(12) coll. 6013; (26) coll. 4895, 4954, sporadically distributed on *Abies*, while is more frequently recorded on *Cupressus* and *Pinus*.
- Antrodia ramentacea* (Berk. & Broome) Donk
(14) coll. 6415, widespread species, more common on other conifers.
- Antrodia serialis* (Fr.) Donk
(25) coll. 4887, common species in European conifer forests; in Italy it prefers *Picea*.
- Antrodia xantha* (Fr.) Ryvarden
(16) coll. 7245, common species in North Europe conifer forests, sporadic in Italy, where it has been collected on *Douglasia*, *Larix*, *Picea*, *Pinus* and *Populus*.
- Antrodiella parasitica* Vampola
(20) coll. 7114, rare species recorded only in some European countries; it is the only one record in Italy, growing on *Trichaptum abietinum*.
- Athelia acrospora* Jülich
(9) coll. 4465, its distribution is not completely known due to the confusion with the *Athelia epiphylla*-complex; in Italy it seems to be a common species.
- Athelia decipiens* (Höhn. & Litsch.) J. Erikss.
(9) coll. 4808; (14) coll. 4378; (16) coll. 6494; (19) coll. 5926, common species in coniferous zones.
- Athelia epiphylla* Pers.
(17) coll. 6287, widespread species recorded on both hardwoods and conifers.
- Athelia fibulata* M. P. Christ.
(19) coll. 5963, uncommon species in Italy, also recorded on *Fagus* and *Larix*.
- Athelopsis glaucina* (Bourdot & Galzin) Oberw. ex Parmasto

- (9) coll. 4487; (14) coll. 6667, species with a scattered distribution; in Italy also collected on *Fagus*, *Picea* and *Quercus*.
- Auriscalpium vulgare* Gray
(26) coll. 4897, common species growing on coniferous cones.
- Basidioradulum radula* (Fr.) Nobles
(4) coll. 5581; (12) coll. 6010; (14) coll. 6099, 7209; (15) coll. 2962; (20) coll. 7739, widely distributed species, more common on deciduous wood.
- Bjerkandera adusta* (Willd.) P. Karst.
(16) coll. 8084, rare on coniferous wood.
- Boidinia furfuracea* (Bres.) Stalpers & Hjortstam
(9) coll. 4509; (12) coll. 6321; (13) coll. 2638; (16) coll. 6741; (19) coll. 6526, common species.
- Bondarzewia montana* (Quél.) Singer
(19) coll. 6810, 7570, 7942, species presents in Central Europe, following natural stands of *Abies*; very rare in Italy.
- Botryobasidium candicans* J. Erikss.
(19) coll. 5863, not a frequent species in Italy, also collected on *Cistus*, *Erica*, *Fagus*, *Picea* and *Pinus*.
- Botryobasidium intertextum* (Schwein.) Jülich & Stalpers
(19) coll. 5706, 4693, 5534, uncommon species, growing on coniferous substrata.
- Botryobasidium laeve* (J. Erikss.) Parmasto
(19) coll. 4686, uncommon species also collected on *Helichrysum*, *Quercus* and *Rubus*.
- Botryobasidium medium* J. Erikss.
(3) coll. 6396, not common species also collected on *Fagus* and *Pinus*.
- Botryobasidium subcoronatum* (Höhn. & Litsch.) Donk
(2) coll. 5005; (5) coll. 5832; (9) coll. 4412, 4425; (12) coll. 6050; (19) coll. 5514, 5564, 5846, widespread species in all kinds of forests.
- Botryohypochnus isabellinus* (Fr.) J Erikss.
(16) coll. 8085, frequent in a very restricted area.
- Byssocorticium atrovirens* (Fr.) Bondartsev & Singer ex Singer
(19) coll. 5489, scattered species in Italy.
- Ceraceomyces borealis* (Romell) J. Erikss. & Ryvarden
(16) coll. 7877, 6280, rare species in Italy.
- **Ceriporia aurantiocarnescens* (Henning) M. Pieri & B. Rivoire.
(19) coll. 7825, is the first record in Italy.
- Ceriporiopsis gilvescens* (Bres.) Doma_ski
(16) coll. 7027, widespread species in Europe with a sporadic distribution in Italy, but locally it may be frequent, particularly on *Populus* and *Quercus*.
- Ceriporiopsis mucida* (Pers.) Gilb. & Ryvarden
(2) coll. 7746; (9) coll. 4428, 4476, common species with a wide distribution in Europe.
- Chondrostereum purpureum* (Pers.) Pouzar

- (14) coll. 6568, common species on deciduous wood.
Coniophora arida (Fr.) P. Karst.
(12) coll. 156; (22) coll. 5146, common species in all European forests.
- Conohypha albocrema* (Höhn. & Litsch.) Jülich
(16) coll. 7055; (17) coll. 6224, rare species, also collected on *Picea*.
- Coronicium gemmiferum* (Bourdot & Galzin) J. Erikss. & Ryvarden
(4) coll. 4186, rare species with only very few records.
- Cristinia helvetica* (Pers.) Parmasto
(14) coll. 2475; (19) coll. 6300, widespread species; in Italy it has been collected on *Carpinus*, *Clematis*, *Crataegus*, *Erica*, *Fagus*, *Juniperus*, *Picea* and *Quercus*.
- Cyphellopsis anomala* (Pers.) Donk
(7) coll. 4452.
- Cystostereum murrayi* (Berk. & M.A. Curtis) Pouzar
(16) coll. 6751, 6771, rare species with only one collecting area; typical of mature forests with a low anthropic influence.
- Cytidia salicina* (Fr.) Burt
(2) coll. 7752, this record represents an interesting substrate for a species usually associated to *Salix*.
- Dacryobolus sudans* (Alb. & Schwein.) Fr.
(9) coll. 4371, 4432, 4477; (19) coll. 5549, 5929; (25) coll. 4973, rare species restricted to conifer forests.
- Dentipellis fragilis* (Pers.) Donk
(16) coll. 7848, very rare species in Italy with only two collecting areas in neighbouring forests; also collected on *Fagus* and *Ulmus*.
- Fibulomyces fusioideus* Jülich
(19) coll. 6786, rare species in Italy with only three collecting localities, probably due to its small size.
- Fibulomyces mutabilis* (Bres.) Jülich
(19) coll. 5537.
- Flavophlebia sulfureoisabellina* (Litsch.) K.H. Larss. & Hjortstam
(16) coll. 6485, 6516, 7586, 7897; (19) coll. 6927, 6936; (20) coll. 6923, 7068, rare species in Italy, present only in a very restricted area, and always on *Abies*.
- Fomes fomentarius* (L.) J.J. Kickx
(19) coll. 5491, a common and cosmopolitan species widely distributed, especially on *Fagus*.
- Fomitopsis labyrinthica* Bernicchia & Ryvarden
(19) coll. 6497, 6595, very rare species, known only from the type locality and no more collected. For a detailed description and iconography see Bernicchia & Ryvarden (1996) and Bernicchia (2005).
- Fomitopsis pinicola* (Sw.) P. Karst.
(19) coll. 892, 1754, 1755, common species with a wide distribution.
- Galzinia incrustans* (Höhn. & Litsch.) Parmasto
(9) coll. 4513, rare species.

Ganoderma carnosum Pat.

(19) coll. 5501, 5567, species with a Central European distribution, rarer in the Mediterranean area; uncommon in Italy, though locally it can be frequent.

Gloeocystidiellum lactescens (Berk.) Boidin

(19) coll. 6825; (20) coll. 6959, common species collected on multiple substrata.

Gloeocystidiellum leucoxanthum (Bres.) Boidin

(19) coll. 5484, collected also on *Salix*.

Gloeophyllum abietinum (Bull.) P. Karst.

(20) coll. 7173, species with Central and Southern European distribution; in Italy it has been collected on *Larix*, *Juniperus*, *Picea* and *Pinus*.

Gloeophyllum odoratum (Wulfen) Imazeki

(16) coll. 6481, cosmopolitan species, with a wide distribution in Italy, in all conifer forests. It can be considered one of the most important wood decaying of coniferous stumps.

Gloeoporus taxicola (Pers.) Gilb. & Ryvarden

(19) coll. 7102, widely distributed species in Europe, not too frequent in Italy, but more common on *Pinus*.

Granulobasidium vellereum (Ellis & Cragin) Jülich

(19) coll. 5924, very common on *Ulmus*.

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

(16) coll. 7056, 7058. (19) coll. 6647, very rare species in Italy collected only in two closed forests.

Hapalopilus nidulans (Fr.) P. Karst.

(7) coll. 4697; (19) coll. 5828; (22) coll. 5151, common species and with a wide distribution, especially on *Quercus*.

Hericium alpestre Pers.

(4) 6402, 7880; (18) coll. 5496; (19) coll. 5820, 5821, 6296, rare species with a sporadic distribution.

Heterobasidion abietinum Niemelä & Korhonen

(5) coll. 5824; (9) coll. 4524; (10) coll. 3602; (13) coll. 2684; (16) coll. 6870; (17) coll. 899, 900, 6465, 6492; (19) coll. 5669, 6813; (21) coll. 5373, widely distributed in all *Abies* forests.

Hymenochaete cinnamomea (Pers.) Bres.

(3) coll. 6400, common species.

Hymenochaete cruenta (Pers.) Donk

(2) coll. 7736; (8) coll. 6903; (25) coll. 4917, 4940, uncommon species in Italy, typical of *Abies* forests.

Hyphoderma argillaceum (Bres.) Donk

(9) coll. 4422, 4440, 4810; (13) coll. 2946; (17) coll. 6433; (19) coll. 5486, 5502, 6386, species locally common, widely distributed in Italy.

Hyphoderma clavigerum (Bres.) Donk

(9) coll. 4444, rare species with only one collecting locality.

Hyphoderma cremeoalbum (Höhn. & Litsch.) Jülich

- (16) coll. 6480, 7208; (19) coll. 5651; (22) coll. 5408.
Hyphoderma medioburiense (Burt) Donk
(25) coll. 4945, species with a scattered distribution; in Italy also collected on *Acacia*, *Castanea*, *Fagus*, *Helichrysum*, *Phillyrea*, *Pinus* and *Thymelaea*.
Hyphoderma obtusum J. Erikss.
(15) coll. 2640, rare species collected on *Larix* too.
Hyphoderma pallidum (Bres.) Donk
(9) coll. 4443, 4492; (16) coll. 4702; (17) coll. 6227; (19) coll. 5498; (22) coll. 5474, common species in coniferous forests.
Hyphoderma praetermissum (P. Karst.) J. Erikss. & Å. Strid
(4) coll. 5602; (12) coll. 121; (14) coll. 4533; (15) coll. 4122; (16) coll. 5518; (19) coll. 4694; (22) coll. 5138, 6430; (25) coll. 4915, common species collected on several substrata, both hardwoods and conifers.
Hyphoderma puberum (Fr.) Wallr.
(16) coll. 6486; (19) coll. 4682, 5483, 5506, 5540; (22) coll. 6423, frequently collected species.
Hyphoderma roseocremeum (Bres.) Donk
(25) coll. 4924, 5407, also collected on *Quercus* and *Pinus*.
Hyphoderma setigerum (Fr.) Donk
(5) coll. 5722; (9) coll. 4522; (14) coll. 4532; (15) Ryvarden 22308; (22) 5142, common species on deciduous trees, rarely on coniferous.
Hyphodontia abieticola (Bourdot & Galzin) J. Erikss.
(9) coll. 4418, 4423, rare species; in Italy also collected on *Picea*.
Hyphodontia alutacea (Fr.) J. Erikss.
(23) coll. 7778, not very frequent species in Italy.
Hyphodontia alutaria (Burt) J. Erikss.
(9) coll. 4427, 4483; (12) coll. 6002; (15) coll. 2672; (16) coll. 6491, 7053; (19) coll. 5494, 5927, 6509, 6790, common species on coniferous decayed wood.
Hyphodontia arguta (Fr.) J. Erikss.
(16) coll. 6759, very common species; in Italy also collected on *Alnus*, *Corylus*, *Cupressus*, *Juniperus*, *Pinus*, *Populus*, *Quercus*, *Robinia*, *Salix*, *Sambucus*, *Taxus*, *Ulmus* and *Viburnum*.
Hyphodontia aspera (Fr.) J. Erikss.
(9) coll. 4421, 4430, 4484; (19) coll. 5548, common species on coniferous wood.
Hyphodontia barba-jovis (Bull.) J. Erikss.
(4) coll. 5601; (9) coll. 4479, uncommon species, also collected on *Corylus*, *Fagus* and *Pinus*.
Hyphodontia breviseta (P. Karst.) J. Erikss.
(12) coll. 6345.
Hyphodontia crustosa (Pers.) J. Erikss.
(12) coll. 6353; (15) coll. 4118; (19) coll. 5516, 5560, 6220, widespread in Europe and well represented in Italy.
Hyphodontia nespori (Bres.) J. Erikss. & Hjortstam

- (14) coll. 6095; (19) coll. 5544; (22) coll. 6422, rare species in North Europe, more frequent in Italy.
- Hyphodontia nudiseta* Warcup & P.H.B. Talbot
(19) coll. 6955, it is the only collection in Italy.
- Hyphodontia pallidula* (Bres.) J. Erikss.
(12) coll. 6338; (16) coll. 4689; (17) coll. 6288; (22) coll. 5137; (25) coll. 4914, 4931, frequent species in all conifer forests.
- Hyphodontia pruni* (Lasch) Svr_ek
(19) coll. 5845, more frequent on deciduous trees.
- Hyphodontia subalutacea* (P. Karst.) J. Erikss.
(9) coll. 4376, 4448, 4486, common species on coniferous wood in all parts of Europe.
- Hypochniciellum ovoideum* (Jülich) Hjortstam & Ryvarde
(19) coll. 6942.
- Hypochniciellum subillaqueatum* (Litsch.) Hjortstam
(16) coll. 6495, rare species with only two collecting areas.
- Hypochnicium bombycinum* (Sommerf.) J. Erikss.
(16) coll. 8088; (22) coll. 5140, frequent species in North Europe, scanty in Italy.
- Hypochnicium erikssonii* Hallenb. & Hjortstam
(12) coll. 6003; (14) coll. 6100; (19) coll. 5493; (22) coll. 5113, frequently collected on several coniferous and deciduous substrata.
- Hypochnicium geogenium* (Bres.) J. Erikss.
(22) coll. 5145, unfrequent species, also collected on *Larix* and *Pinus*.
- Hypochnicium punctulatum* (Cooke) J. Erikss.
(12) coll. 155; (19) coll. 5841; (20) coll. 5888, widely distributed species.
- Inonotus dryadeus* (Pers.) Murrill
(16) coll. 5510; (19) coll. 5507, 6679, widely distributed species, though in Italy it is not very common. Typical of *Quercus* it has been collected on *Abies* in Italy and ex Yugoslavia; it has been found recently on new substrata (Krug *et al.* 2004).
- Ischnoderma benzoinum* (Wahlenb.) P. Karst.
(16) coll. 7870, (19) coll. 1757, 6781, widely distributed species in Europe, except in the Northern part; in Italy it has a distributional pattern in few Northern and Central regions only.
- Jaapia ochroleuca* (Bres.) Nannf. & J. Erikss.
(9) coll. 4525, 4451; (13) Ryvarde 22331, it seems to be a rare species, collected on *Abies* and *Picea* in Italy.
- Junghuhnia lacera* (P. Karst.) Niemelä & Kinnunen
(20) coll. 6924, it seems to be an unfrequent species in Europe, very rare in Italy.
- Kavinia himantia* (Schwein.) J. Erikss.
(22) coll. 5173, frequent species in Italy, collected on *Helichrysum*, *Juniperus*, *Populus*, *Quercus* and *Rosmarinus* too.
- Leptosporomyces septentrionalis* (J. Erikss.) Krieglst.
(9) coll. 4372 ; (19) coll. 5517, 6373, 6515, 6551, uncommon species.

- Leucogyrophana mollusca* (Fr.) Pouzar
(17) coll. 5420, 6295; (19) coll. 5853, 5854, 7100, frequently collected on many coniferous wood.
- Leucogyrophana pinastri* (Fr.) Ginns & Weresub
(2) coll. 7749; (20) coll. 6930, 6954, 7067, uncommon species, with only sporadic records.
- Leucogyrophana romelli* Ginns
(26) coll. 4978, sporadically distributed.
- Leucogyrophana sororia* (Burt) Ginns
(14) coll. 8091, uncommon species.
- Litschauerella clematidis* (Bourdot & Galzin) J. Erikss. & Ryvarde
(19) coll. 5934; (22) coll. 6427, it seems to be a rare species, also collected on *Arbutus*, *Clematis* and *Juniperus*.
- Lobulicium occultum* K.H. Larss. & Hjortstam
(19) coll. 5861, very rare species known only from two collecting localities in Italy.
- Meruliopsis corium* (Pers.) Ginns
(22) coll. 5475, very common fungus in Italy, but more frequent on *Castanea*, *Carpinus*, *Ceratonia*, *Cistus*, *Corylus*, *Crataegus*, *Fagus*, *Ficus*, *Fraxinus*, *Malus*, *Phillyrea*, *Prunus*, *Quercus* and *Salix*.
- Metulodontia nivea* (P. Karst.) Parmasto
(16) coll. 6740, 7084, very rare species, collected on *Abies* and *Pinus*, from an unique locality.
- Mucronella calva* (Alb. & Schwein.) Fr.
(12) coll. 5962; (19) coll. 7098, rare species, with a restricted distribution and growing only on *Abies* in Italy.
- Mucronella flava* Corner
(20) coll. 6939, 7189, rare species, as *Mucronella calva*, present only in one locality and difficult to find due to its very small size.
- Mycoacia aurea* (Fr.) J. Erikss. & Ryvarde
(22) coll. 5467, typical of deciduous wood.
- Mycoacia nothofagi* (C. Cunn.) Ryvarde
(16) coll. 8086, rare species, with only few records.
- Mycoacia uda* (Fr.) Donk
(22) coll. 6426, frequent on deciduous wood, rarer on conifers.
- Oligoporus caesius* (Schröd.) Gilb. & Ryvarde
(5) coll. 5713, (12) coll. 6009, (13) coll. 2609, 2610; (14) coll. 1563; (16) 5545; (22) coll. 5147; (25) coll. 4980, common and widely distributed species in all Italian regions.
- Oligoporus cerifluus* (Berk. & M.A. Curtis) Gilb. & Ryvarde
(16) coll. 6482; (19) coll. 6797, very rare species, sporadic in Europe, with only a few localities in Italy, collected on *Pinus* too.
- Oligoporus floriformis* (Qué.) Gilb. & Ryvarde
(12) coll. 5175; (16) coll. 6758, 6899, 6901, 7144, 7865, 7895; (20) coll. 7064; (22) coll. 5447, with a restricted distribution in Italy, widely represented in other European countries; collected also on other coniferous wood.

- Oligoporus fragilis* (Fr.) Gilb. & Ryvarden
(14) coll. 6097, 6104, 6461, 6543; (17) coll. 5436; (19) coll. 5087, 5932, 6302, 6312, 7179, common species growing on many coniferous wood.
- Oligoporus leucomallellus* (Murrill) Gilb. & Ryvarden
(12) coll. 1847; (13) coll. 2676, 2967, 2968, frequent, collected in many coniferous forests, and on some other different substrata.
- Oligoporus lowei* (Pilát ex Pilát) Gilb. & Ryvarden
(22) coll. 5050, rare species in Europe, and very rare in Italy, reported only from this locality.
- Oligoporus simanii* (Pilát) Bernicchia
(14) coll. 6462, very rare species with only few collecting localities in Italy, it has also been collected on *Arbutus*, *Pinus* and *Sorbus*.
- Oligoporus stipticus* (Pers.) Gilb. & Ryvarden
(12) coll. 5177, 6326; (14) coll. 6896; (19) coll. 6513, widely distributed in European tempered zones, and on different coniferous substrata.
- Oligoporus tephroleucus* (Fr.) Gilb. & Ryvarden
(11) coll. 4545; (14) coll. 6544; (16) coll. 7135, common species, especially on hardwoods, but it is not uncommon on *Abies* in Northern Apennines.
- Oligoporus undosus* (Peck) Gilb. & Ryvarden
(22) coll. 5107 unfrequent species in Europe, very rare in Italy.
- Paulliticium pearsonii* (Bourdot) J. Erikss.
(14) coll. 4540, 6563, very rare species.
- Peniophora piceae* (Pers.) J. Erikss.
(19) coll. 5552; (22) coll. 5052, 6418, locally frequent species in continental Europe.
- Phaeolus schweinitzii* (Fr.) Pat.
(2) coll. 7750; (13) coll. 2929; (25) coll. 4913, cosmopolitan and common species in Europe, growing in all conifer forests.
- Phanerochaete galactites* (Bourdot & Galzin) J. Erikss. & Ryvarden
(16) coll. 7507, rare species, collected on *Abies*, *Juniperus* and *Populus* in Italy.
- Phanerochaete laevis* (Fr.) J. Erikss. & Ryvarden
(9) coll. 4460, frequent species collected on both coniferous and deciduous substrata.
- Phanerochaete sordida* (P. Karst.) J. Erikss. & Ryvarden
(13) coll. 2963; (14) coll. 4531, 6108; (19) coll. 5550; (25) coll. 4930, common and widely distributed species, more frequent on deciduous wood.
- Phellinus hartigii* (Allesch. & Schnabl) Pat.
(4) coll. 5607; (19) coll. 4816, 5187, widely distributed in Europe, though not very common; it follows *Abies* presence.
- Phlebia georgica* Parmasto
(19) coll. 6765, rare species, also collected on *Quercus* and *Taxus* in Italy.

- Phlebia livida* (Pers.) Bres.
(16) coll. 4701, common and frequent species, found in all forested parts of Europe.
- Phlebia queletii* (Bourdot & Galzin) M.P. Christ.
(14) coll. 842, 847; (15) coll. 2602, very rare species.
- Phlebia radiata* Fr.
(19) coll. 5546, common on deciduous wood.
- Phlebia subcretacea* (Litsch.) M.P. Christ.
(17) coll. 7632; (19) coll. 6805, 6826, uncommon species, also collected on *Juniperus* and *Picea*.
- Phlebiella allantospora* (Oberw.) K.H. Larss. & Hjortstam
(21) coll. 6392, uncommon species.
- Phlebiella grisella* (Bourdot) K.H. Larss. & Hjortstam
(19) coll. 5925, rare species with only one known locality.
- Phlebiopsis gigantea* (Fr.) Jülich
(9) coll. 4424, 4469; (12) coll. 151; (14) coll. 6098, 6367, common and widespread species in European coniferous forest.
- Physisporinus vitreus* (Pers.) P. Karst.
(7) coll. 4474, (16) coll. 6865, (20) coll. 6922, 7090, widely distributed in Europe, while it is not so common in Italy, and only located in the Central and Northern areas.
- Piloderma bicolor* (Peck) Jülich
(9) coll. 4416; (14) coll. 6562; (19) coll. 7771, 7216, uncommon species.
- Piloderma lanatum* (Jülich) J. Erikss. & Hjortstam
(12) coll. 6317, rare species.
- Piloderma olivaceum* (Parmasto) Hjortstam
(14) coll. 8092, rare species.
- Podofomes trogii* (Fr.) Pouzar
(16) coll. 6888, 7129; (19) coll. 518, 5850; 6951, 7898, 7899, 7908; (22) coll. 5046, 5172, 5174, 5382, rare species in Central and Southern Europe, with only a few collecting areas in Italy, always on *Abies*. It grows at the base of trunk and on surfacing roots.
- Polyporus badius* (Pers.) Schwein.
(16) coll. 7128; (19) coll. 6779, widely distributed species in Europe, sporadic in Italy, rarely collected on *Abies*.
- Poria lindbladii* (Berk.) Cooke
(14) coll. 6559, widespread species in North Europe, rarer in the Mediterranean area; in Italy it has been found only in some regions where, locally, it can be frequent.
- Pseudomerulius aureus* (Fr.) Jülich
(8) coll. 6405, uncommon species, collected on *Juniperus* too.
- Pseudotomentella flavovirens* (Höhn. & Litsch.) Svr_ek
(9) coll. 4417, 4472; (19) coll. 5495.
- Pseudotomentella mucidula* (P. Karst.) Svr_ek
(9) coll. 4411; (16) coll. 6752, rare species but widely distributed in Europe, but not common.

- Pseudotomentella tristis* (P. Karst.) M.J. Larsen
(15) coll. 2953, common and widely distributed species.
- Pycnoporellus fulgens* (Fr.) Donk
(19) coll. 4892, 5118, 5202, 5371, 6525, 6802, 6952; (20) coll. 6941, 7816, typical of mature forests with a low anthropic influence; present only in some neighbouring Reserves of Casentinesi National Park, on standing and lying trunks, with only few records up to some years ago, now a little more frequent, but not found outside the Reserves.
- Radulomyces confluens* (Fr.) M.P. Christ.
(19) coll. 5922, very common species, collected both on deciduous and coniferous substrata.
- Repetobasidium mirificum* J. Erikss.
(9) coll. 4487, rare species; it has been also collected on *Abies* and *Picea*.
- Resinicium bicolor* (Alb. & Schwein.) Parmasto
(3) coll. 6397; (4) coll. 5588; (9) coll. 4447, 4812; (16) coll. 4688, 5523, 6285, 6487; (17) coll. 5427; (21) coll. 5889; (25) coll. 4909, 4950, very common and important species as an intense white wood-decaying fungus.
- Resinicium furfuraceum* (Bres.) Parmasto
(4) coll. 4194; (17) coll. 6303, not very common species in Italy.
- Rigidoporus sanguinolentus* (Alb. & Schwein.) Donk
(9) coll. 4374, 4473, 4528; (16) coll. 6867; (17) coll. 6792; (19) coll. 6743, 6829, 7038, 7188; (20) coll. 6929, widely distributed species, more frequent in the Northern Italy.
- Rigidoporus undatus* (Pers.) Donk
(16) coll. 6861, 7059, 7091, 7131; (19) coll. 6949, widely distributed in Europe but not very frequent in Italy.
- Schizopora paradoxa* (Schrad.) Donk
(22) coll. 6420, cosmopolitan species, very frequent on deciduous wood.
- Schizopora radula* (Pers.) Hallenb.
(19) coll. 4685, frequent species in Central and South Europe but its distribution is not clear due to the confusion with the *Schizopora paradoxa*-complex.
- Scopuloides rimosus* (Cooke) Jülich
(9) coll. 4527.
- Scytinostromella olivaceoalba* (Bourdot & Galzin) Ginns & M.N.L. Lefebvre
(16) coll. 7074, very rare species.
- Skeletocutis amorpha* (Fr.) Kotl. & Pouzar
(9) coll. 4436; (16) coll. 6299, widely distributed species in all European tempered coniferous forests.
- Skeletocutis carneogrisea* A. David
(19) coll. 6808, close to *Skeletocutis amorpha*, but with a more restricted and southern distribution; considered a rare species in Italy.
- Skeletocutis kuehneri* A. David

- (16) coll. 7142; (19) coll. 7127; (20) coll. 7060, 7065, 7109, 7124, 7125, 7126, 7806, uncommon species, reported only from some countries.
- Skeletocutis lenis* (P. Karst.) Niemelä
(12) coll. 6292; (15) coll. 6293, common species, widely represented even if its distribution is not clearly known, in fact in the past this species included *Skeletocutis vulgaris* (Fr.) Niemelä & Y.C. Dai (Niemelä & Y.C. Dai, 1997).
- Skeletocutis odora* (Peck ex Sacc.) Ginns
(20) coll. 7107, widely distributed species in Europe, very rare in Italy.
- Steccherinum fimbriatum* (Pers.) J. Erikss.
(13) coll. 2961, more common on decorticated deciduous wood, rarer on coniferous substrata.
- Stereum sanguinolentum* (Alb. & Schwein.) Fr.
(25) coll. 5380, common species on coniferous wood, especially on *Picea* and *Pinus*; in Italy it is the only record on *Abies*.
- Stromatoscypha fimbriata* (Pers.) Donk
(19) coll. 5555, cosmopolitan species, with a sporadic presence in Italy.
- Thanatephorus fusisporus* (J. Schröt.) Hauerslev & P. Roberts
(19) coll. 4700; (25) coll. 4916, with a scattered distribution in Europe; in Italy also collected on *Carpinus*, *Fagus*, *Juniperus* and *Taxus*.
- Tomentella badia* (Link) Stalpers
(19) coll. 5505, rather common and widely distributed species in Europe; not frequent in Italy.
- Tomentellopsis echinospora* (Ellis) Hjortstam
(25) coll. 4912, very common and widely distributed species.
- Trametes hirsuta* (Wulfen) Pilát
(16) coll. 8083, rare on conifers.
- Trametes pubescens* (Schumach.) Pilát
(16) coll. 8082, on lying trunk.
- Trametes versicolor* (L.) Pilát
(15) coll. 5967, cosmopolitan and very common species on deciduous wood.
- Trechispora cohaerens* (Schwein.) Jülich & Stalpers
(13) coll. 2632, common on deciduous wood; in Italy it has also been collected on *Acer*, *Eucalyptus*, *Quercus*, *Juniperus*, *Larix*, *Phillyrea*, *Populus*, *Pinus*, *Taxus* and mosses.
- Trechispora farinacea* (Pers.) Liberta
(12) coll. 1850, 1965; (14) coll. 6898; (17) coll. 6304; (19) coll. 5482, 5851, 5930, 6794; (24) coll. 715; (26) coll. 4992, 4969, widespread and the most common species of the genus in Italy.
- Trechispora fastidiosa* (Pers.) Liberta
(20) coll. 7092, 7093, curious species due to its terrestrial ecology; in Italy it is quite a rare species.

- Trechispora hymenocystis* (Berk. & Broome) K.H. Larss.
(16) coll. 7063; (19) coll. 6596, 6820, 6827; (20) coll. 6940, widely distributed in Europe, not very common in Italy.
- Trechispora microspora* (P. Karst.) Liberta
(19) coll. 6772, widespread but not common species.
- Trechispora mollusca* (Pers.) Liberta
(9) coll. 4426; (16) coll. 6489; (19) coll. 5865, not very frequent in Italy.
- Trechispora praefocata* (Bourdot & Galzin) Liberta
(19) coll. 5935, it is a rather rare species.
- Trechispora verruculosa* (G. Cunn.) K.H. Larss.
(9) coll. 4457, rare species in Italy with only one collecting locality.
- Trichaptum abietinum* (Dicks.) Ryvarden
(3) coll. 6399; (9) coll. 4515; (14) coll. 4530; (15) coll. 2975; (16) coll. 6282; (17) coll. 6434; (19) coll. 5358, 5561; (22) coll. 5144, 6428; (25) coll. 4943, widely distributed species.
- Tubulicrinis accedens* (Bourdot & Galzin) Donk
(19) coll. 5508, uncommon species.
- Tubulicrinis hirtellus* (Bourdot & Galzin) J. Erikss.
(12) coll. 6344; (16) coll. 6483, rare species known only from few localities.
- Tubulicrinis medius* (Bourdot & Galzin) Oberw.
(9) coll. 4470; (15) coll. 2950; (19) coll. 4696, 5852.
- Tubulicrinis subulatus* (Bourdot & Galzin) Donk
(14) coll. 4529; (15) coll. 2601, 5972; (19) coll. 5856, 6374, common species on coniferous and deciduous wood.
- Tulasnella violacea* (Johan-Olsen) Juel
(14) coll. 4534.
- Tulasnella violea* (Quél.) Bourdot & Galzin
(9) coll. 4478; (22) coll. 5141; (25) coll. 4922, frequent species, collected on multiple substrata.
- Tylospora asterophora* (Bonord.) Donk
(9) coll. 4459, rare species in Italy, collected on coniferous wood.
- Tylospora fibrillosa* (Burt) Donk
(9) coll. 4404, 4433, uncommon species in Italy.
- Vesiculomyces citrinus* (Pers.) E. Hagstr.
(9) coll. 4429; (12) coll. 6320; (16) coll. 6286; (19) 5369, 6823; (22) coll. 5180; (23) coll. 7533; (25) coll. 4927; (26) coll. 4968, very common species, often collected on different coniferous substrata.
- Xenasma tulasnelloideum* (Höhn. & Litsch.) Donk
(9) coll. 4467, 4468; (12) coll. 6034, widely distributed species.
- Xenasmatella vaga* (Fr.) Stalpers
(9) coll. 4493; (5) coll. 5714; (22) coll. 6419, very common species, known from both deciduous and coniferous substrata.

Conclusions

The numbers of wood-inhabiting fungi (190) identified from *Abies alba* substrata in Italy are higher than those from other substrata researched thus far: 126 species on *Castanea sativa* (Mayrhofer et al. 2001), 105 species on *Juniperus* spp. (Bernicchia 2000) and 52 species on *Arbutus unedo* (Pérez Gorjón et al. 2006). This could be partly due to the greater abundance of Silver Fir forests compared with forests of the other species mentioned. Some areas (such as the Reserve of “Sasso Fratino”) that harbour a high number of rare fungal species are potential candidates for biodiversity conservation.

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