

Aphyllorhaceous wood-inhabiting fungi on *Quercus* spp. in Italy

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Abstract—240 species representing 100 genera of aphyllorhaceous fungi growing on *Quercus* spp. in Italy are listed. Some species are considered rare or infrequent in Italy, e.g. *Bulbillomyces farinosus*, *Dendrothele dryina*, *Fomitopsis iberica*, *F. spraguei*, *Hyphoderma incrustatum*, *Inonotus andersonii*.

Key words—lignicolous fungi, diversity, oak woods

Introduction

In line with previous reports on Italian lignicolous fungi (Bernicchia 2000, Mayrhofer et al. 2001, Pérez Gorjón et al. 2006, Bernicchia et al. 2007a, b, c), a list of aphyllorhaceous fungi growing on *Quercus* spp. is announced. Oak forests are widely distributed in Europe, and 20 taxa of the genus *Quercus* L. occur in the European sector of Mediterranean region (Webb 1993). In Italy, the following species are widely distributed: *Q. cerris* L., *Q. ilex* L., *Q. pubescens* Willd., *Q. petraea* (Matt.) Liebl., *Q. robur* L. subsp. *robur* and *Q. suber* L.; these were the most common substrates from which aphyllorhaceous fungi have been collected.

In Italy, oaks are distributed from sea level to 1800 m and form parts of several vegetation types such as maquis, arid woods, evergreen woods on

siliceous rocks, woods on acid and sub acid soils, arid shrubby woodlands on limestone, heaths and olive tree farms.

Materials and methods

During the last 25 years, fungi have been collected in the most representative oak forests of Italy. 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), Ryvarden & Gilbertson (1993, 1994), Kõljalg (1995), Núñez & Ryvarden (1997) and Bernicchia (2005). All the specimens are kept in Herbarium HUBO, except the specimens PAL/Mic, deposited in the Herbarium Mediterraneum (PAL) (these last collections have provisional numbers), and a few specimens belonging to L. Ryvarden and L. Arras. The list also cites information provided by Bernicchia (1995, 2001), Larsen & Bernicchia (1990), and Onofri (2005); nomenclature follows mainly Kirk et al. (2001) and CBS (2008) with some minor exceptions in which Donk (1984), Hjortstam (1998), Hjortstam & Ryvarden (1990), Parmasto et al. (2004), Ryvarden (1991) and Ryvarden & Gilbertson (1994) are considered.

Collecting localities (see also Figure 2): The collections have been undertaken in the following sites, indicated in the map of Italy. They are numerically arranged by regions, from northern to southern and from the left to the right part of Italy: (1) Piemonte, Torino, Torre Canavese, (1a) Piemonte, Torino, Borgofranco d'Ivrea, (1b) Piemonte, Torino, Fiorano Canavese; (2) Piemonte, Torino, Piosasco (2a) Piemonte, Torino, Cumiana; (3) Lombardia, Milano, Monza Park; (4) Lombardia, Mantova, Fontana forest; (5) Veneto, Verona, "Raggio di Sole"; (6) Veneto, Verona, Tregnago, (6a) Veneto, Vicenza, Arsiero; (7) Veneto, Belluno, Castion; (8) Friuli Venezia Giulia, Pordenone, Pradisgrotte, (8a) Pordenone, Mount Jouv, (8b) Friuli Venezia Giulia, Pordenone, Pedemonte; (9) Friuli Venezia Giulia, Pordenone, Travesio, (9a) Friuli Venezia Giulia, Pordenone, Tramonti di Sopra; (10) Friuli Venezia Giulia, Udine, Latisana, (10a) Friuli Venezia Giulia, Udine, Treignano; (11) Friuli Venezia Giulia, Trieste, Conca del Percedol, (11a) Friuli Venezia Giulia, Trieste, Borgo Grotta del Gigante; (12) Friuli Venezia Giulia, Trieste, Basovizza; (13) Emilia-Romagna, Ferrara, Panfilia forest, (13a) Emilia-Romagna, Ferrara, Mesola forest; (14) Emilia-Romagna, Ravenna, St. Vitale Pinewood, (14a) Emilia-Romagna, Ravenna, Classe Pinewood; (15) Emilia-Romagna, Piacenza, Mount Taverne, (15a) Emilia-Romagna, Piacenza, Centomerli; (16) Emilia-Romagna, Parma, Tarsogno; (17) Emilia-Romagna, Parma, Carrega forest; (18) Emilia-Romagna, Reggio Emilia, Carpiteti; (19) Emilia-Romagna, Modena; (20) Emilia-Romagna, Modena, Apennines; (21) Emilia-Romagna, Bologna, St. Orsola Hospital, (21a) Emilia-Romagna, Bologna, Bologna, (21b) Emilia-Romagna, Bologna, Botanical Garden, (21c) Emilia-Romagna, Bologna, Cavaioni Park, (21d) Emilia-Romagna, Bologna, Gessi Park, (21e) Emilia-Romagna, Bologna, Talon Park, (21f) Emilia-Romagna, Bologna, Villa Ghigi Park; (22) Emilia-Romagna, Bologna, Gaggio Montano; (23) Emilia-Romagna, Bologna, La Martina Park, (23a) Emilia-Romagna, Bologna, Burzanella, (23b) Emilia-Romagna, Bologna, Castel

d'Aiano, (23c) Emilia-Romagna, Bologna, Castel dell'Alpe, (23d) Emilia-Romagna, Bologna, Loiano, (23e) Emilia-Romagna, Bologna, Corno alle Scale Park, (23f) Emilia-Romagna, Bologna, Mount Sole Park; (24) Emilia-Romagna, Bologna, Frattona forest; (25) Emilia-Romagna, Forli-Cesena, Sasso Fratino forest, (25a) Emilia-Romagna, Forli-Cesena, Badia Prataglia Riserve, (25b) Emilia-Romagna, Forli-Cesena, Campigna Reserve; (26) Toscana, Pisa, Tenuta di S. Rossore, (26a) Toscana, Pisa, Patti forest, (26b) Toscana, Pisa, Cornacchiaia Reserve; (27) Toscana, Livorno, "Il Giardino" forest; (28) Toscana, Livorno, Caselli forest; (29) Toscana, Livorno, Tombolo Pinewood, (29a) Toscana, Livorno, Castellina, (29b) Toscana, Livorno, Cecina Pinewood, 29(c) Toscana, Livorno, Colognole; (30) Toscana, Livorno, Bibbona Pinewood, (30a) Toscana, Livorno, Bibbona forest; (31) Toscana, Livorno, Rimigliano forest; (32) Toscana, Firenze, Fiesole, (32a) Toscana, Firenze, Cascine Park; (33) Toscana, Siena, St. Agnese *Cupressus* forest; (34) Toscana, Siena, Radicondoli; (35) Toscana, Siena, Il Monticello; (36) Toscana, Grosseto, La Zinghera; (37) Toscana, Grosseto, Mount Amiata, (37a) Toscana, Grosseto, Cala Martina, (37b) Toscana, Grosseto, La Collacchia; (38) Toscana, Grosseto, Poggio Carpineta; (39) Toscana, Grosseto, Burano Reserve; (40) Lazio, Roma, Villa Doria, (40a) Lazio, Roma, Castelporziano; (41) Lazio, Latina, Sughereta di Nettuno; (42) Lazio, Latina, St. Felice Circeo, (42a) Lazio, Latina, Circeo National Park; (43) Basilicata, Potenza, Monticchio; (44) Puglia, Lecce, Mount Angeli, Lapillo Tower; (45) Puglia, Lecce, Otranto forest, (45a) Puglia, Lecce, Antenna forest, (45b) Puglia, Lecce, Bitonti forest, Macchia di Ponente; (46) Puglia, Lecce, Mount Fico, (46a) Puglia, Lecce, Tiggiano forest, (46b) Puglia, Lecce, Muro Leccese, (46c) Puglia, Lecce, Pagliarone Russo, Specchia; (47) Calabria, Cosenza, Corigliano Calabro; (48) Calabria, Reggio Calabria, Calabria National Park, (48a) Calabria, Reggio Calabria, Molochio forest, (48b) Calabria, Reggio Calabria, Tripitò forest, (48c) Calabria, Reggio Calabria, Polistena, (48d) Calabria, Reggio Calabria, Sughereta, (48e) Calabria, Reggio Calabria, St. Stefano d' Aspromonte; (49) Sardegna, Sassari, Badde Longa, (49a) Sardegna, Sassari, Temple Pausania, (49b) Sardegna, Sassari, Cantoniera Catara Cetola, (49c) Sardegna, Sassari, Burgos forest, (49d) Sardegna, Sassari, Goceano forest; (50) Sardegna, Nuoro, Badde Salighes, (50a) Sardegna, Nuoro, Sta. Barbara forest, (50b) Sardegna, Nuoro, Mamoiada, (50c) Sardegna, Nuoro, Su Gologone, (50d) Sardegna, Nuoro, Supramonte di Orgosolo, (50e) Sardegna, Nuoro, Lanaittu Valley; (51) Sardegna, Nuoro, Arzana, Abe frida, (51a) Sardegna, Nuoro, Arzana, Aredili, (51b) Sardegna, Nuoro, Arzana, Gidinis, (51c) Sardegna, Nuoro, Arzana, Leone, (51d) Sardegna, Nuoro, Cala Gonne, (51e) Sardegna, Nuoro, Villanova forest; (52) Sardegna, Nuoro, Oliena, (52a) Sardegna, Nuoro, Urzulei Pinewood, (52b) Sardegna, Nuoro, Aritzo; (52c) Sardegna, Nuoro, Fonni, (52d) Sardegna, Nuoro, Montarbu forest, (52e) Sardegna, Nuoro, Baccu Nieddu, (52f) Sardegna, Nuoro, Flumendosa river; (53) Sardegna, Oristano, Is Arenas Pinewood, (53a) Sardegna, Oristano, Arborea; (53b) Sardegna, Oristano, (53c) Sardegna, Oristano, Mount Arci, (53d) Sardegna, Oristano, Sini; (54) Sardegna, Cagliari, Gentilis, (54a) Sardegna, Cagliari, Giara di Gestori, (54b) Sardegna, Cagliari, Pau, (54c) Sardegna, Cagliari, Turri, (54d) Sardegna, Cagliari, Sibiri; (55) Sardegna, Cagliari, Collinas, (55a) Sardegna, Cagliari, St. Gavino, (55b) Sardegna, Cagliari, Is Antiogus, (55c) Sardegna, Cagliari, Montevecchio, (55d) Sardegna, Cagliari, Capoterra; (56) Sicilia, Palermo, Bosco di Pomieri, (56a) Sicilia, Palermo, Madonie Park, (56b) Sicilia, Palermo, Bosco Niscemi, (56c) Sicilia, Palermo, Monte Maggiore Belsito, (56d) Sicilia, Palermo, Monte Petroso; (57) Sicilia, Palermo, Bosco Santo Canale, (57a) Sicilia, Palermo, Riserve of

Monte Genuardo and Santa Maria del Bosco, (57b) Sicilia, Palermo, Monte Pellegrino, (57c) Sicilia, Palermo, R.N.O. Serre della Pizzuta, (57d) Sicilia, Palermo, Villa Malfitano; (58) Sicilia, Palermo, Monte Carcaci, (58a) Sicilia, Palermo, Bosco della Ficuzza, (58b) Sicilia, Palermo, Monte San Calogero, (58c) Sicilia, Palermo, Monte Rose; (58d) Sicilia, Palermo, Serre di Ciminna; (59) Sicilia, Palermo, Pizzo Cane, (59a) Sicilia, Palermo, Valle di Rebottone, (59b) Sicilia, Palermo, R. N. O. of Palazzo Adriano, (59c) Sicilia, Palermo, Portella Rena; (60) Sicilia, Agrigento, Monte Cammarata, (60a) Sicilia, Agrigento, Serra Quisquina, (60b) Sicilia, Agrigento, Eremo della Quisquina; (61) Sicilia, Trapani, Bosco Inici; (62) Sicilia, Messina, Mugolino, (62a) Sicilia, Messina, St. Domenica Vittoria, (62b) Sicilia, Messina, Furiano, (62c) Sicilia, Messina, Parco dei Nebrodi; (63) Sicilia, Siracusa, Bosco Bauli; (64) Sicilia, Catania, Parco dell'Etna.



Figure 1. Map of approximate distribution of *Quercus* in Europe (AFE 2007)

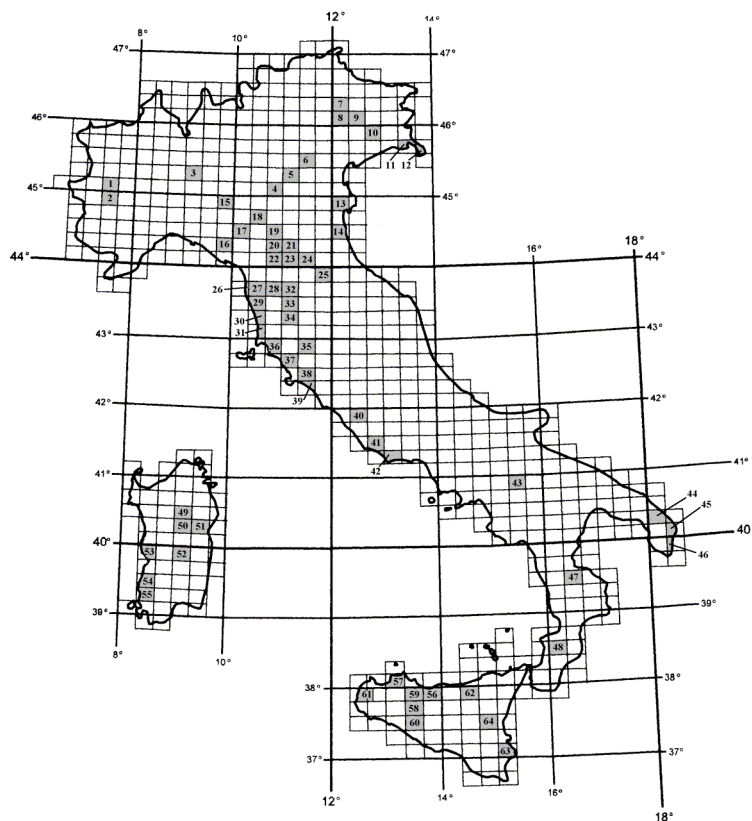


Figure 2. Map of Italy with the collecting sites. Scale 1:50000.

Results

In this survey 965 specimens belonging to 240 species, of aphyllophoraceous wood-inhabiting fungi collected on different species of *Quercus* are reported. The species are listed in alphabetic order; substrata precede the number of the locality given in brackets, notes and the herbaria number. Additional comments on distribution or frequency are given for most of the species.

Rare or infrequent species include *Bulbillomyces farinosus* (Bres.) Jülich, *Dendrothele dryina* (Pers.) P.A. Lemke, *Fomitopsis iberica* Melo & Ryvardeen, *F. spraguei* (Berk. & M.A. Curtis) Gilb. & Ryvardeen, *Hyphoderma incrustatum* K.H. Larss., *Inonotus andersonii* (Ellis & Everh.) Černý, *Lindtneria hydnoidea* Bernicchia & Ryvardeen, *L. leucobryophila* (Henn.) Jülich, *L. panphylensis* Bernicchia & M.J. Larsen, *L. trachyspora* (Bourdot & Galzin) Pilát, *Mycocacia nothofagi* (G. Cunn.) Ryvardeen, *Oligoporus simani* (Pilát) Bernicchia, *Peniophora pseudoversicolor* Boidin, *Phlebia georgica* Parmasto, *Punctularia strigosozonata* (Schwein.) P.H.B. Talbot, *Scytinostromella heterogenea*,

(Bourdot & Galzin) Parmasto, *Sistotrema subtrigonospermum* D.P. Rogers, *Trechispora clancularis* (Park.-Rhodes) K.H. Larss., *T. silvaeryae* (J. Erikss. & Ryvardeen) K.H. Larss., *Vuilleminia coryli*, Boidin, Lanq. & Gilles and *V. pseudocystidiata* Boidin, Lanq. & Gilles.

Some species have a primarily Mediterranean distribution, such as *Hexagonia nitida* Durieu & Mont., *Hyphoderma transiens* (Bres.) Parmasto, *Peniophora meridionalis* Boidin, *P. pseudoversicolor* Boidin, *P. versicolor* (Bres.) Sacc. & P. Syd., *Perenniporia meridionalis* Decock & Stalpers, *P. ochroleuca* (Berk.) Ryvardeen, *Phanerochaete martelliana* (Bres.) J. Erikss. & Ryvardeen, *Phellinus erectus* A. David, Dequatre & Fiasson, *Phellinus rosmarini* Bernicchia, *Scytinostroma aluta* Lanq., *Skeletocutis percardida* (Malençon & Bertault) Jean Keller, *Stereum reflexulum* D.A. Reid, *Trametes ljubarskii* Pilát and *Vuilleminia megalospora* Bres.

Some species more common on coniferous substrata than on hardwoods are *Antrodia serialis* (Fr.) Donk, *Hyphodontia hastata* (Litsch.) J. Erikss., *Hypochnicium molle* (Fr.) Hjortstam, *Phlebiopsis gigantea* (Fr.) Jülich and *Tubulicrinis medius* (Bourdot & Galzin) Oberw.

Checklist of collected Aphyllophorales

Abortiporus biennis (Bull.) Singer

Q. ilex: (13a) coll. 214, (53c) at the base of trunk, coll. 7003; (57d) PAL/Mic coll. 403; Widespread species in Europe, and common on deciduous wood.

Aleurodiscus aurantius (Pers.) J. Schröt.

on branch of *Q. ilex*: (49d) coll. 5238. Rare species, recorded throughout Europe usually on *Rosaceae*, but also known from other substrata.

Aleurodiscus disciformis (DC.) Pat.

Q. ilex: (42a) coll. LR 22591, (50d) coll. 4771, 5788, 7039, (51b) coll. 5806, (56a) PAL/Mic coll. 369; *Q. robur*: (42a) coll. 3103. Temperate species, widely distributed on the bark of old *Quercus* trees; especially common in Mediterranean areas.

Amaurodon viridis (Alb. & Schwein.) J. Schröt.

Q. cerris: (42a) coll. LR 22425; log of *Q. ilex*: (52d) coll. 7462. Rare species in Italy, known also from *Rosmarinus*, *Ficus* and *Arbutus*.

Antrodia albida (Fr.) Donk

log of *Q. ilex*: (50d) coll. 7044. Sporadically distributed species, growing on many deciduous wood.

Antrodia serialis (Fr.) Donk

Q. ilex: (50d) coll. 7487. Common species in European conifer forests, more rare on hardwoods.

Antrodiella leucoxantha (Bresadola) Miettinen & Niemelä

on branch of *Q. cerris*: (15a) coll. 7159, (34) coll. 6590; on log of *Q. ilex*: (13a) coll. 631, coll. 6113, (52f) coll. 7465; *Q. pubescens*: (23) coll. 6047; *Q. robur*: (14) coll. 7818, (21d) coll. 6586, 6879.

Uncommon species, recorded from some European countries.

Antrodiella onychoides (Egeland) Niemelä

log of *Q. ilex*: (13a) coll. 6310. Rare species, but locally common in some Central European countries.

Antrodiella pallescens (Pilát) Niemelä & Miettinen

fallen branch of *Q. cerris*: (15a) coll. 7160, (23) coll. 1872; *Q. ilex*: (13a) coll. 6862, (48c) coll. 5049, (49c) coll. 4110, (49d) coll. 5215; *Q. robur*: (13) coll. 4800, (23) coll. 84; *Q. suber*: (48c) coll. 5055.

Rather common species in Europe.

Antrodiella romellii (Donk) Niemelä

fallen branch of *Q. coccifera*: (46) coll. 6249; *Q. ilex*: (49c) coll. 1936, (50d) coll. 7459, (52b) coll. 7923, (53c) coll. 2070, 7081.

Widely distributed species growing on dead hardwoods.

Athelia arachnoidea (Berk.) Jülich

Q. ilex: (50d) coll. 3811; *Q. pubescens*: (50) coll. 1938, coll. 1950.

Quite a common species, both on coniferous and deciduous substrata.

Athelia epiphylla Pers.

Q. ilex: (50d) log, coll. 7457, (52d) coll. 7502. Widespread species, recorded on several substrata.

Athelopsis glaucina (Bourdot & Galzin) Oberw. ex Parmasto

On fallen branch of *Q. ilex*: (49c) coll. 2317. With a scattered distribution in Italy, growing both on coniferous and deciduous wood.

Basidioradulum radula (Fr.) Nobles

Q. ilex: (50d) coll. 4775. Widely distributed species, common on several deciduous woods.

Bjerkandera adusta (Willd.) P. Karst.

Q. ilex: (61) PAL/Mic coll. 401; *Q. gussonei*: (58a) PAL/Mic coll. 413; *Q. leptobalanos*: (58a) PAL/Mic coll. 414; branch of *Q. pubescens*: (50) coll. 5217; *Q. robur*: (26) coll. 1600; *Q. suber*: (56a) PAL/Mic coll. 410; Very common on hardwoods.

Botryobasidium danicum J. Erikss. & Hjortstam

branch of *Q. ilex*: (29c) coll. 7641. Quite a common species in North Europe, but rare in Italy.

Botryobasidium laeve (J. Erikss.) Parmasto

Q. cerris: (23c) coll. 2574. Uncommon species.

Botryobasidium subcoronatum (Höhn. & Litsch.) Donk

Q. cerris: (42a) coll. 3016. Widespread and common on all types of substrata.

Botryobasidium vagum (Berk. & M.A. Curtis) D.P. Rogers

Q. robur: (14) coll. 1158. Common and widely distributed species.

Brevicellicium olivascens (Bres.) K.H. Larss. & Hjortstam

Fallen branch of *Q. suber*: (48d) coll. 4988. Common species.

Bulbillomyces farinosus (Bres.) Jülich

Q. ilex: (49b) coll. 6598. This is the only known record.

Byssocorticium atrovirens (Fr.) Bondartsev & Singer ex Singer

stump of *Q. ilex*: (26a) coll. 7266; *Q. pubescens*: (37) coll. 5148; *Q. robur*: (13a) coll. LR 22130. With a scattered distribution in Italy, on

coniferous and deciduous wood.

Ceraceomyces borealis (Romell) J. Erikss. & Ryvarðen

log of *Q. ilex*: (50d) coll. 7853. Rare species in Italy, recorded on *Abies* too.

Ceriporia purpurea (Fr.) Donk

Q. cerris: (23) coll. 1861; *Q. ilex*: (13a) coll. 7851, 7834, (50d), coll. 7814, (52d) coll. 7373; *Q. pubescens*: (6a) coll. 4817, (50) coll. 1955; *Q. robur*: (13) coll. 4678, (21d) coll. 7244. Widely distributed species, frequent on very decayed logs and branches.

Ceriporia reticulata (Hoffm.) Domański

Q. ilex: (53c) coll. 4068; *Q. pubescens*: (28) coll. 4344, (50) coll. 1934. Common species in Europe, sporadically distributed in Italy, both on deciduous and coniferous wood.

Ceriporia viridans (Berk. & Broome) Donk

Q. ilex: (40) coll. 1498; *Q. pubescens*: (21f) coll. 4116. Widely distributed species, growing on numerous deciduous woods.

Ceriporiopsis gilvescens (Bres.) Domański

Q. robur: (13a) coll. 7205, (14) coll. 7414. Sporadically distributed species, but locally may be common in Italy.

Ceriporiopsis mucida (Pers.) Gilb. & Ryvarðen

Q. ilex: (58) PAL/Mic coll. 457.

Ceriporiopsis pannocincta (Romell) Gilb. & Ryvarðen

Q. ilex: (44) coll. 4180, (50d) coll. 6645, 7691, 7717. Scattered distributed species in Europe, rare in Italy, recorded also on *Fagus*.

Ceriporiopsis rivulosa (Berk. & M.A. Curtis) Gilb. & Ryvarðen

Q. ilex: (62) coll. 7281. Rare in Europe, with a prevalent Mediterranean distribution, recorded also on *Pinus*.

Cerrena unicolor (Bull.) Murrill

on standing tree of *Q. ilex*: (13a) coll. 6222, 333, (40) coll. 1500, (48d) coll. 5028, (50d) coll. 4773; *Q. pubescens*: (50) coll. 1953. Common species on deciduous wood.

Chondrostereum purpureum (Pers.) Pouzar

Q. cerris: (11a) coll. 5738; *Q. ilex*: (60a) PAL/Mic coll. 606; *Q. robur*: (19) coll. 227. Widespread and common species.

Coniophora arida (Fr.) P. Karst.

stump of *Q. ilex*: (13a) coll. 6347; *Q. robur*: (13a) coll. 2548, (14) coll. 1246. Common and widespread species.

Coniophora olivacea (Fr.) P. Karst.

Q. robur: (14) coll. 487. Frequent species.

Coniophora puteana (Schumach.) P. Karst.

fallen branch of *Q. ilex*: (60a) PAL/Mic coll. 448.

Corioloopsis gallica (Fr.) Ryvarðen

Q. cerris: (40) coll. 467; *Q. ilex*: (62c) PAL/Mic coll. 451; *Q. suber*: (52b) coll. 2714, fallen burnt branch (54a), coll. 2343; (56a) PAL/Mic coll. 411; Frequent species especially on *Populus*.

Corioloopsis trogii (Berk.) Domański

Q. ilex: (47) coll. 1493; *Q. robur*: (23f) coll. 2588; *Quercus* sp.: (1)

- coll. 683. Cosmopolitan species, common in Central and Southern Europe.
- Cristinia helvetica* (Pers.) Parmasto
Q. robur: (4) coll. 5311, (13a) coll. LR 22137. Widespread species, both on deciduous and coniferous wood.
- Daedalea quercina* (L.) Pers.
On stump of *Q. ilex*: (56a) PAL/Mic coll. 445, 601.
- Daedaleopsis confragosa* (Bolton) J. Schröt.
Q. frainetto: (40) coll. 1495. Common species on various deciduous woods.
- Datronia mollis* (Sommerf.) Donk
Q. robur: (13a) log, coll. 7698. A widely distributed species in Europe.
- Dendrothele acerina* (Pers.) P.A. Lemke
Q. robur: (42a) coll. LR 22449. A common species in Central Europe, usually on *Acer*.
- Dendrothele alliacea* (Quél.) P.A. Lemke
Q. robur: (45) log, coll. 6088. Less common than *D. acerina*.
- Dendrothele commixta* (Höhn. & Litsch.) J. Erikss. & Ryvar den
Q. cerris: (42a), coll. 3472; *Q. pubescens*: (48) coll. 4928; *Q. robur*: (21e) coll. 4908, (42a) coll. LR 22424, coll. 3160. Not very common, but easily overlooked, growing on the bark of old and living *Quercus*.
- Dendrothele dryina* (Pers.) P.A. Lemke
Q. ilex: (50d), coll. 3836; *Q. pubescens*: (48) coll. 4956. American species with few records in Italy.
- Dichomitus campestris* (Quél.) Domański & Orlicz
Q. cerris: (15), coll. 6746; *Q. ilex*: (42a) coll. 2675, 3092, (46b) coll. 4196, (46), coll. 6235, (48b) coll. 4975, (50e), coll. 7241, (53c), coll. 2137, 4081, (55), coll. 2369, 2704; (62c) PAL/Mic coll. 452; (57a) PAL/Mic coll. 366; *Q. robur*: (29), coll. 2275. Common species growing typically on branches.
- Eichleriella deglubens* (Berk. & Broome) Lloyd
Q. ilex: (57a) PAL/Mic coll. 438; on branch of *Q. pubescens* and fence: (50), coll. 5067. Rare species, recorded on *Fagus*, *Taxus*, and *Hedera*.
- Elmerina caryae* (Schwein.) D.A. Reid
log of *Q. ilex*: (13a) coll. 7840. Uncommon species, recorded from only few areas, and on *Populus* too.
- Fibricium subceraceum* (Hallenb.) Bernicchia
Q. robur: (13) coll. 860, 1892, 1897, 4715, 5729. Rare species, but locally frequent in Italy.
- Fistulina hepatica* (Schaeff.) With.
On stumps of *Q. ilex*: (56a) PAL/Mic coll. 704; *Q. petraea*: (56a) PAL/Mic coll. 354; *Q. virgiliana*: (58) PAL/Mic coll. 459. Common species on old *Quercus* and *Castanea* trees.
- Fomes fomentarius* (L.) J.J. Kickx; ;
Q. cerris: (23) coll. 79; *Quercus* sp.: (8) coll. 1724; *Q. petraea*: (56a)

- PAL/Mic coll. 353. Common species.
- Fomitopsis iberica* Melo & Ryvarden
on stump of *Q. robur*: (21b) coll. 5190. Rare species with a prevalent Mediterranean distribution, recorded also on *Pinus* spp.
- Fomitopsis spraguei* (Berk. & M.A. Curtis) Gilb. & Ryvarden
on stump of *Q. suber*: (42a) coll. 3413. Very rare species, recorded on burnt *Castanea sativa* too.
- Ganoderma adpersum* (Schulzer) Donk
Q. pubescens: (61) PAL/Mic coll. 447; on living plant and stump of *Q. ilex*: (50d) coll. 3840, (50e) coll. 7240, (58) coll. 444. With a scattered distribution in Italy.
- Ganoderma applanatum* (Pers.) Pat.
on living tree of *Q. ilex*: (29) coll. 2262, (53c) coll. 1308 coll. 133; (58) PAL/Mic coll. 458, 463; at a basal trunk, *Q. suber*: (53c) coll. 7019. Widely distributed species, and common on different substrata.
- Ganoderma lucidum* (Curtis) P. Karst.
Q. ilex: (13a) coll. 820, (49c) coll. 1975, (53c) coll. 4060, (53d) coll. 1331; (56a) PAL/Mic coll. 419; (58) PAL/Mic coll. 460; *Q. robur*: (13a) coll. 366, 3519, (14) coll. 2206; (56b) PAL/Mic coll. 357. Common species.
- Ganoderma resinaceum* Boud.
Quercus sp.: (3) coll. 1829, (9) coll. 1627; *Q. pubescens*: (56a) PAL/Mic coll. 756; *Q. suber*: (42) coll. 3164. Common species in Central and Southern Europe, very often at the base of living trees in parks and gardens.
- Gloeocystidiellum lactescens* (Berk.) Boidin
Q. ilex: (40) coll. 513, (50d) coll. 3839; *Q. robur*: (13) coll. 7634, (14) coll. 1198. Common species growing on several substrata.
- Gloeocystidiellum luridum* (Bres.) Boidin
Q. ilex: (49c) coll. 1972, on fallen branches (56a) PAL/Mic coll. 705; *Q. pubescens*: (50) coll. 1932; *Q. robur*: (13a) coll. 6025; *Q. suber*: (56a) PAL/Mic coll. 378, 466; Common on deciduous substrata.
- Gloeocystidiellum porosum* (Berk. & M.A. Curtis) Donk
Q. cerris: (23) coll. 1874; *Q. ilex*: (42a) coll. 3104, (56a) PAL/Mic coll. 375, coll. 450; *Quercus* sp.: (23) coll. 149. Common species, frequent in deciduous forests. *Gloeoporus dichrous* (Fr.) Bres.
Q. cerris: (42a) coll. 3501; *Q. ilex*: (27) coll. 1251, (29a) coll. 935, (40a) coll. 4519, (40) coll. 503, (45) coll. 5438, (50d) coll. 6651, (56a) PAL/Mic coll. 760, (64) PAL/Mic coll. 449; *Q. robur*: (13a), coll. 6760; *Quercus* sp.: (43) coll. 703. Very common species on hardwoods.
- Granulobasidium vellereum* (Ellis & Cragin) Jülich
Q. robur: (14) coll. 314. Frequent species, common on *Ulmus*, but also recorded on other deciduous and coniferous substrata.
- Hapalopilus nidulans* (Fr.) P. Karst.
Q. cerris: (16) coll. 4734, (23) coll. 159, coll. 5632; *Q. ilex*: (37b) coll. 3734; (56b) PAL/Mic coll. 365; *Q. pubescens*: (23) coll. 2462;

- Q. suber*: (58a) PAL/Mic coll. 439; *Quercus* sp.: (22) coll. 5315. Common species on deciduous wood, but recorded on *Abies* too.
- Hericium coralloides* (Scop.) Pers.
Q. cerris: (31) coll. 1020; *Q. ilex*: (50d) coll. 5379, coll. 6639, (51e), coll. 7335. Frequent species in Italy, usually growing on lying logs or old branches of *Quercus*.
- Hericium erinaceus* (Bull.) Pers.
Q. ilex: (50d) coll. 4776, coll. 6657; (52c), coll. 1315; (52d), coll. 7410, (56a) PAL/Mic coll. 383; *Q. petraea*: (56a) PAL/Mic coll. 372. Uncommon species, growing on living trees and old branches.
- Hexagonia nitida* Durieu & Mont.
Q. cerris: (28) coll. 1033, 4401; *Q. ilex*: (13a) coll. 766, coll. 7538, (50d) coll. 5255, coll. 3813, coll. 7503, (53c) coll. 2335, coll. 4061, 4062, 4109, 4114, (55a) coll. 1561; (60b) PAL/Mic coll. 364, 433, (57a) PAL/Mic coll. 604. Common species, growing on old trunks, branches and snags of *Quercus* in Mediterranean areas.
- Hydnopolyporus fimbriatus* (Fr.) D.A. Reid
Q. ilex: (42a) coll. 3020. Cosmopolitan species, with a sporadic presence in Italy.
- Hymenochaete cinnamomea* (Pers.) Bres.
fallen branch of *Q. ilex*: (51c), coll. 5770. Recorded on deciduous and coniferous wood.
- Hymenochaete corrugata* (Fr.) Lév.
fallen branch of *Q. ilex*: (58c) PAL/Mic coll. 423.
- Hymenochaete fuliginosa* (Pers.) Lév.
Q. ilex: (57d) coll. 3832, (53c) coll. 2142. Uncommon species in Italy.
- Hymenochaete rubiginosa* (Dicks.) Lév.
Q. ilex: (40) coll. 1497; *Q. robur*: (21f) coll. 2733, 3624; *Q. ilex*: (56a) PAL/Mic coll. 356, 381; (58) PAL/Mic coll. 406; on stump of *Q. virgiliana*: (56c) PAL/Mic coll. 358. Common species, on several broad-leaved trees.
- Hyphoderma cremeoalbum* (Höhn. & Litsch.) Jülich
Q. cerris: (23) coll. 90; *Q. ilex*: (49a) coll. 6632. With a scattered distribution in Italy, collected also on *Abies*.
- Hyphoderma incrustatum* K.H. Larss.
on branch of *Q. ilex*: (54), coll. 2047. Very rare species, with only two recorded areas, also on *Phyllirea*.
- Hyphoderma mutatum* (Peck) Donk
Q. ilex: (13a) coll. 206; *Q. robur*: (13) coll. 1895, (14) coll. 4905. Infrequent, but locally it can be common.
- Hyphoderma praetermissum* (P. Karst.) J. Erikss. & Å. Strid
Q. cerris: (23) coll. 91, coll. 1859, coll. 1866; *Q. ilex*: (13a) coll. 226, (50) coll. 1966, (50d) coll. 5250, (53c) coll. 4049, (53d) coll. 1290, (54a) coll. 2331, (55c) coll. 2374, (56a) PAL/Mic coll. 367; *Q. robur*: (3) coll. 1880, (21c) coll. 41, 127, 595. A very common species, frequently on fallen branches.
- Hyphoderma puberum* (Fr.) Wallr.

- Q. ilex*: (42a) coll. 3110; *Q. robur*: (13) coll. 1894. A common species on decorticated deciduous wood, often on rotten logs.
- Hyphoderma roseocremeum* (Bres.) Donk
Q. ilex: (13a) coll. 207, 427, (53c) coll. 4112; *Q. pubescens*: (50) branch, coll. 1944, *Q. robur*: (13a) coll. 6327; *Quercus* (25a) coll. 6756, (37) coll. 6557. Infrequent species, also recorded on *Pinus* and *Abies*.
- Hyphoderma setigerum* (Fr.) Donk
Q. cerris: (42a) coll. 3042; *Q. ilex*: (62a) coll. 7288; *Q. pubescens*: (50) coll. 5080; *Q. robur*: (42a) coll. 3112; *Q. suber*: (54) coll. 3865, (55b) coll. 2123, (56a) PAL/Mic coll. 379. Widespread species.
- Hyphoderma sibiricum* (Parmasto) J. Erikss. & Å. Strid
Q. pubescens: (48) coll. 4947. Uncommon species, more frequently on coniferous wood.
- Hyphoderma transiens* (Bres.) Parmasto
Q. cerris: (31) coll. 1019; *Q. ilex*: (42a) coll. 3089, 3159; *Q. robur*: (42a) coll. 3022, coll. LR 22400; *Q. suber*: (42a) coll. 3001, LR 22383, log, coll. 3426. Widespread species in Mediterranean area and frequently on *Quercus*.
- Hyphodermella corrugata* (Fr.) J. Erikss. & Ryvarde
Q. ilex: (30a) coll. 1082, (53c) coll. 4055, coll. 6979; (56a) PAL/Mic coll. 409; (58) PAL/Mic coll. 420; Common species in Central and Southern Europe on several deciduous wood.
- Hyphodontia arguta* (Fr.) J. Erikss.
Q. robur: (13) coll. 7609, (14) coll. 292 coll. 7512, (21f) coll. 2731. A very common species in Italy on several different substrata.
- Hyphodontia breviseta* (P. Karst.) J. Erikss.
Q. ilex: (28) coll. 1047. Frequent species in coniferous forests, less frequently on deciduous substrata.
- Hyphodontia crustosa* (Pers.) J. Erikss.
Q. ilex: (27) coll. 991, (28) coll. 1064, (46a) coll. 6251; *Q. cerris*: (23) coll. 76, 182, 6045, (56a) PAL/Mic coll. 373. Widespread in Europe and frequent in Italy.
- Hyphodontia detritica* (Bourdot & Galzin) J. Erikss.
Q. robur: (42a) coll. 3027. Uncommon species, both on deciduous and coniferous wood.
- Hyphodontia gossypina* (Parmasto) Hjortstam
Q. robur: (13a) coll. 218, (13) coll. 7625, (14) coll. 481, 924. Common species in Central and South Europe.
- Hyphodontia hastata* (Litsch.) J. Erikss.
branch of *Q. ilex*: (50d) coll. 7247. More common on coniferous wood.
- Hyphodontia nespori* (Bres.) J. Erikss. & Hjortstam
Q. ilex: (27) coll. 957, (42a) coll. 3277; *Q. robur*: (14) coll. 1270. Quite a common species in Italy.
- Hyphodontia quercina* (Pers.) J. Erikss.
Q. ilex: (50d) coll. 3841, 4777, 7043; (53c) coll. 1297, 1317, 2311,

- 4059, 4071 coll. 4107; (54) coll. 3872. Common and widespread species, frequently on fallen branches.
- Hyphodontia sambuci* (Pers.) J. Erikss.
Q. pubescens: (28) coll. 1061. Very common species.
- Hypochniciellum molle* (Fr.) Hjortstam
Q. ilex: (52d) coll. 7411. Sporadically distributed species in Italy, always previously collected on conifers.
- Hypochniciellum ovoideum* (Jülich) Hjortstam & Ryvarde
Q. ilex: (13a) coll. 2562; *Q. robur*: (13a) log, coll. 6026. Frequently recorded on several substrata.
- Inonotus andersonii* (Ellis & Everh.) Černý
on a living *Q. robur*: (13a), coll. 6683, developing from the outer rings of sapwood. Very rare species in Europe, only known from this locality in Italy.
- Inonotus cuticularis* (Bull.) P. Karst.
Q. ilex: (13a) coll. 7212, (21) coll. 2577, (50d) coll. 3838, (54b) coll. 3784; *Q. robur*: (13a) log, coll. 6677, 7052; *Q. suber*: (53a) coll. 3678. A widespread species, growing on branches and along the trunks.
- Inonotus dryadeus* (Pers.) Murrill
Q. cerris: (18) coll. 7740; *Q. petraea*: (6) coll. 5442; *Q. robur*: (3) coll. 1830; *Quercus* sp.: (56a) PAL/Mic coll. 605; Typically but not exclusively of *Quercus*.
- Inonotus hastifer* Pouzar
Q. robur: (13a) log, coll. 7837. Common species, especially on *Fagus*.
- Inonotus hispidus* (Bull.) P. Karst.
Q. ilex: (40) coll. 475, (53c) coll. 6982, (56a) PAL/Mic coll. 720; *Quercus* sp.: (3) coll. 1800. Frequent species, mainly on old fruits-bearing.
- Inonotus radiatus* (Sowerby) P. Karst.
Q. robur: (13a) coll. 6817, 7706; *Q. suber*: (62b) coll. 7282; *Q. virgiliana*: (58d) PAL/Mic coll. 424; Common species in Europe.
- Inonotus rheades* (Pers.) Bondartsev & Singer
Q. cerris: (42a) coll. 7910; *Q. robur*: (14) coll. 4147. Frequent species, especially on *Populus*.
- Junghuhnia nitida* (Pers.) Ryvarde
Q. coccifera: (45b) coll. 5449; *Q. ilex*: (48b) coll. 5008, (56a) PAL/Mic coll. 730; *Q. pubescens*: (42a) coll. 3127. Cosmopolitan species, widely distributed in all deciduous forests.
- Kavinia alboviridis* (Morgan) Gilb. & Budington
Q. robur: (13a) coll. 7575. Infrequent species in Italy.
- Kavinia himantia* (Schwein.) J. Erikss.
Q. ilex: (50d) log, coll. 7474; (56a) PAL/Mic coll. 436; Widely distributed species in Italy.
- Laeticorticium polygonioides* (P. Karst.) Donk
Q. ilex: (50d) coll. 7045, coll. 7391. Frequent species.

Laetiporus sulphureus (Bull.) Murrill

Q. ilex: (26), coll. 1415; *Q. pubescens*: (48) coll. 4948. Cosmopolitan species, growing at the base or along the trunk, mainly on *Quercus*, but also on old *Larix* and *Picea* in Italy.

Laxitextum bicolor (Pers.) Lentz

Q. suber: (48c) coll. 5063, (50b) coll. 4768. Widely distributed on deciduous wood, frequently recorded on *Fagus*.

Lenzites betulina (L.) Fr.

on branches of *Q. cerris* (11a) coll. 1468, 1477, 1550, 1553, 1558; (62c) PAL/Mic coll. 404 ; (50a) on stump of *Q. ilex*. Common species.

Lenzites warnieri Durieu & Mont.

Q. cerris: (20) coll. 1834; *Q. robur*: (32) coll. 7730; *Quercus* sp.: (32) coll. 7730. Rare and south-occurring species in Europe.

Lindtneria hydnoidea Bernicchia & Ryvarden

Q. robur: (14) coll. 7569. Growing on litter in coniferous forests, on *Hypnum cupressiforme* and *Hedera helix*. Known from three collecting localities in Italy, and, probably, not yet recorded in other countries of Europe.

Lindtneria leucobryophila (Henn.) Jülich

on lying log of *Q. robur*: (14) coll. 7518. Very rare species in Italy with only two collection localities (Losi 1999, Bernicchia et al. 2007c), and recorded on *Pinus* too.

Lindtneria panphyliensis Bernicchia & M.J. Larsen

Q. robur: (13) coll. 4079, 4080, 7604, 7606, 7623. Rare species, growing on *Ulmus* and *Carpinus* too. For further comments see Larsen & Bernicchia (1990).

Lindtneria trachyspora (Bourdot & Galzin) Pilát

Q. robur: (13a) coll. 7582, 7585, (14) coll. 7521. Rare species, but widely distributed in Europe.

Meripilus giganteus (Pers.) P. Karst.

At the base of trunk of *Q. ilex*: (52), coll. 5214. Common and widespread species.

Meruliopsis corium (Pers.) Ginns

Q. ilex: (13a) coll. 202, (27) coll. 980, (36) coll. 1745, (37b) coll. 3727, (48a), coll. 5021, (50e), coll. 7243, (53c), coll. 1452, (53d), coll. 1309, (54) coll. 2210, (55), coll. 2361, (55c), coll. 2378, (56d) PAL/Mic coll. 361; (56a) PAL/Mic coll. 380; *Q. pubescens*: (58a) PAL/Mic coll. 415; *Q. robur*: (23c) coll. 2575, (32a) coll. 2458. Very common species.

Meruliopsis hirtella (Burt) Jinns

Q. ilex: (13a) coll. 205, 220, 426, 836, (39) coll. 7438; *Q. robur*: (14) coll. 7527. Frequent species growing on several substrata.

Mycoacia aurea (Fr.) J. Erikss. & Ryvarden

Q. ilex: (13a) coll. 2255. Common and typical species on deciduous wood.

Mycoacia fuscoatra (Fr.) Donk

Q. cerris: (23) coll. 80; *Q. ilex*: (13a) coll. 447. Frequent species.

- Mycoacia nothofagi* (G. Cunn.) Ryvarden
Q. ilex: (50d) log, coll. 7479. Rare species.
- Mycoacia uda* (Fr.) Donk
Q. cerris: (23) coll. 1867, 1869; *Q. robur*: (14) coll. 5599, 7425.
Frequent species in humid areas.
- Mycoaciella bispora* (Stalpers) J. Erikss. & Ryvarden
Q. robur: (21f) coll. 3599. Rare species in Italy.
- Oligoporus caesius* (Schrad.) Gilb. & Ryvarden
Q. cerris: (23) coll. 92; *Q. ilex*: (39) coll. 5676, (56a) PAL/Mic coll. 700; *Q. pubescens*: (64) PAL/Mic coll. 448; (58) PAL/Mic coll. 462;
More common and widely distributed on coniferous wood.
- Oligoporus leucomallellus* (Murrill) Gilb. & Ryvarden
Q. pubescens: (21d) coll. 6368; *Q. robur*: (14) coll. 233. Frequent species in many coniferous forests, but with some records on deciduous wood.
- Oligoporus simanii* (Pilát) Bernicchia
Q. ilex: (50d) coll. 7925. Very rare species in Italy, growing both on deciduous and coniferous wood.
- Oligoporus subcaesius* (A. David) Ryvarden & Gilb.
Q. ilex: (13a) coll. 235, (54d) coll. 2385; *Q. robur*: (13a) coll. 7211, (21c) coll. 601. Common species on several deciduous woods.
- Oligoporus tephroleucus* (Fr.) Gilb. & Ryvarden
Q. cerris: (16) coll. 4742; *Q. robur*: (13a) coll. 7214, (13) coll. 7762.
Common species on several broad-leaved trees but, on *Abies* too.
- Oxyporus latemarginatus* (Durieu & Mont.) Donk
Q. ilex: (13a) coll. 198, 7096; *Q. robur*: (13) coll. 917; *Q. suber*: (59) PAL/Mic coll. 430; Common species in the Northern temperate zones.
- Oxyporus populinus* (Schumach.) Donk
Q. ilex: (13a) coll. 212. Sporadically distributed species in Italy.
- Pachykytospora tuberculosa* (Fr.) Kotl. & Pouzar
on log of *Q. ilex*: (52f), coll. 7489. Widespread species in Europe, following the *Quercus* zone, infrequent in Italy.
- Peniophora cinerea* (Pers.) Cooke
Q. ilex: (29e) coll. 996, (49c) coll. 4115. Common species on several deciduous woods.
- Peniophora incarnata* (Pers.) P. Karst.
Q. cerris: (23d) coll. 2200, (23) coll. 69; *Q. ilex*: (49c) coll. 1971, (50) coll. 1946, (60b) PAL/Mic coll. 603; *Q. petraea*: (2) coll. 3788.
Frequently recorded on deciduous substrata.
- Peniophora laeta* (Fr.) Donk
Q. cerris: (37) coll. 5136. Infrequent species in Italy.
- Peniophora lycii* (Pers.) Höhn. & Litsch.
Q. ilex: (54c) coll. 623, (54d) coll. 2384, (56a) PAL/Mic coll. 371; (59a) PAL/Mic coll. 443; *Q. pubescens*: (56a) PAL/Mic coll. 416; *Q. robur*: (14) coll. 1121. Very common species.
- Peniophora meridionalis* Boidin

- Q. cerris*: (15a) coll. 7162; *Q. ilex*: (45b) coll. 6066, (46), coll. 6221, (49c) coll. 1973, (49c) coll. 4083, (51d) coll. 6992, (53c) coll. 2079, 6978; (58) PAL/Mic coll. 461; *Q. pubescens*: (42a) coll. 3102; (56a) PAL/Mic coll. 418; *Q. suber*: (54a) coll. 2355. Typical Mediterranean species, common and widely distributed, and sometimes on fallen burnt branches in forests crossed by fire.
- Peniophora nuda* (Fr.) Bres.
Quercus sp.: (3) coll. 1821. Very rare species,
- Peniophora pseudoversicolor* Boidin
Q. ilex: (49c) coll. 1984. Rare species, with a southern distribution, known from two collecting areas.
- Peniophora quercina* (Pers.) Cooke
Q. cerris: (62c) PAL/Mic coll. 446; *Q. ilex*: (13a) coll. 209, 6018, 7075, (30a) coll. 1071, (37b) coll. 3733, (38) coll. 3724, (42a) coll. LR 22448, (46a) coll. 6254, (49c) coll. 1979, (50) coll. 1927, 1954, 3881, (50a) coll. 7297, (52a) coll. 7378, (53c) coll. 2064, (54a) coll. 2330, 2345; (56c) PAL/Mic coll. 362, (57) PAL/Mic coll. 386; (57a) PAL/Mic coll. 387; (58) PAL/Mic coll. 405; *Q. pubescens*: (23) coll. 88, 95, 1858; *Q. robur*: (4) coll. 659; *Quercus* sp.: (3) coll. 1832. Very common and widespread species, mainly on *Quercus*.
- Peniophora rufomarginata* (Pers.) Bourdot & Galzin
Q. cerris: (42a) coll. 3494; *Q. robur*: (14) coll. 2258. Infrequent species.
- Peniophora versicolor* (Bres.) Sacc. & P. Syd.
Q. ilex: (30) coll. 1068. Common species in Mediterranean areas.
- Peniophora violaceolivida* (Sommerf.) Massee
Q. ilex: (54a) coll. 1456. Uncommon species in Italy.
- Perenniporia fraxinea* (Bull.) Ryvarden
Q. robur: (26) coll. 1613, 2280. Widespread species in Central and Southern Europe.
- Perenniporia meridionalis* Decock & Stalpers
Q. ilex: (50d) coll. 7852, on old lying trunk (52d) coll. 7374, 7375, 7376, 7377. A recent described species (Decock & Stalpers, 2006) segregates from *P. medulla-panis* (Jacq.) Donk, due to some microscopic characteristics. It seems to be a common species in warmer forests of Central and Southern Europe.
- Perenniporia ochroleuca* (Berk.) Ryvarden
Q. ilex: (13a) coll. 6682, 7108, 7864, (53c) coll. 4058, (62) coll. 7285,. With a Mediterranean distribution.
- Phanerochaete calotricha* (P. Karst.) J. Erikss. & Ryvarden
Q. robur: (13a) coll. 7550. Rare species, recorded on deciduous substrata in Italy.
- Phanerochaete martelliana* (Bres.) J. Erikss. & Ryvarden
Q. cerris: (12) coll. 5898; *Q. ilex*: (29b) coll. 1094, (54) coll. 3863; (56d) PAL/Mic coll. 435; *Q. pubescens*: (56a) PAL/Mic coll. 407. Southern species in Europe.
- Phanerochaete sanguinea* (Fr.) Pouzar

- Q. ilex*: (40) coll. 466, (45a) coll. 5451, 49 coll. 5292. Common and widely distributed species.
- Phanerochaete sordida* (P. Karst.) J. Erikss. & Ryvarde
Q. cerris: (23) coll. 1870; *Q. ilex*: (13a) coll. 125, (48b) coll. 5020; *Q. pubescens*: (21f) coll. 1749, 1761, 3543, 3545, 4117; *Q. robur*: (13) coll. 1883, (21c) coll. 132; *Q. suber*: (48d) coll. 4989, (53b) coll. 816, (54a) coll. 1448. Common species, often on burnt branches.
- Phanerochaete tuberculata* (P. Karst.) Parmasto
Q. ilex: (13a) coll. 213, (40) coll. 463, (49c) coll. 1959, (53c) coll. 1295, (54d) coll. 2386, (55a) coll. 1518, (56d) PAL/Mic coll. 432; *Q. pubescens*: (23) coll. 154, (50) coll. 1967; *Q. suber*: (53c) coll. 2321, (55) coll. 3782. Common and widely distributed species.
- Phanerochaete velutina* (DC.) Parmasto
Q. cerris: (23) coll. 68; *Q. ilex*: (13a) coll. 7185, (50e) coll. 7255, (53c) coll. 7118; (56d) PAL/Mic coll. 432; (58) PAL/Mic coll. 464; *Q. pubescens*: (23c) coll. 2576, (23f) coll. 2581, (23) coll. 152. Common species on deciduous substrata.
- Phellinus conchatus* (Pers.) Quél.
Quercus sp.: (25) coll. 893. Widespread species in Europe
- Phellinus contiguus* (Pers.) Pat.
Q. ilex: (52d) coll. 7478, 7805, (58b) PAL/Mic coll. 428; *Q. robur*: (2) coll. 2416, (3) coll. 1823, 1825; *Quercus* sp.: (21c) coll. 126. Common species.
- Phellinus erectus* A. David, Dequatre & Fiasson
Q. ilex: (50e) coll. 7461, (52) coll. 2342, (53c) coll. 1304, (56d) PAL/Mic coll. 468. Mediterranean species, growing at the base of living trees.
- Phellinus ferreus* (Pers.) Bourdot & Galzin
Q. ilex: (27) coll. 954, (50d) 5257, 5308. Cosmopolitan species, widespread in Europe.
- Phellinus ferruginosus* (Schrad.) Pat.
Q. ilex: (13a) coll. 215, 2243, 2523, (53c) coll. 6998; *Q. robur*: (4) coll. 5310, (14) coll. 6454; *Q. suber*: (53b) coll. 624. Widely distributed species.
- Phellinus igniarius* (L.) Quél.
Q. pubescens: (21e) coll. 5395. Common species.
- Phellinus punctatus* (Fr.) Pilát
Q. ilex: (13a) coll. 199, 216, 782, 784, (42a) coll. 3046, (50d) coll. 7202, (53) coll. 2035. Widespread, on several hardwoods.
- Phellinus rimosus* (Berk.) Pilát
Q. pubescens: (59) PAL/Mic coll. 427.
- Phellinus robustus* (P. Karst.) Bourdot & Galzin
Q. ilex: (53d) coll. 1328; *Q. pubescens*: (21a) coll. 668. Cosmopolitan species, on living trees, mainly on *Quercus*.
- Phellinus rosmarini* Bernicchia
at the base of the trunk of *Q. coccifera*: (45b) coll. 5456. Recorded on some dead, deciduous trees.

Phellinus torulosus (Pers.) Bourdot & Galzin

Q. ilex: (13a) coll. 789, (26) coll. 2277, (27) coll. 987, (45a) coll. 5418, (48b) coll. 5010, (52b) coll. 2696, (54) coll. 2038; (56d) PAL/Mic coll. 359; (57a) PAL/Mic coll. 390; (56b) PAL/Mic coll. 397; (60) PAL/Mic coll. 400; *Q. pubescens*: (23b) coll. 1833, 2301, (28) coll. 1053; *Q. robur*: (26) coll. 2266; *Quercus* sp.: (25b) coll. 898; Common species, commonly at the base of hardwoods.

Phlebia georgica Parmasto

Q. ilex: (49d) coll. 5222. Rare species in Italy.

Phlebia lilascens (Bourdot) J. Erikss. & Hjortstam

Q. ilex: (50d) coll. 5233; *Quercus* sp.: (8a) coll. 6446. Infrequent in Italy, while is locally frequent in some European countries.

Phlebia livida (Pers.) Bres.

Q. cerris: (28) coll. 4345; *Q. ilex*: (13a) coll. 2554; *Q. pubescens*: (23) coll. 93, 1865, (28) coll. 1041. Common and frequent species.

Phlebia radiata Fr.

Q. ilex: (49c) coll. 1976; *Q. robur*: (13) coll. 1890; *Quercus* sp.: (32a) coll. 2457. Widely distributed species and frequent on deciduous substrata.

Phlebia rufa (Pers.) M.P. Christ.

Q. cerris: (23) coll. 150, 1860; *Q. ilex*: (42a) coll. 3114, (50d) coll. 3814; (56d) PAL/Mic coll. 431; (58) PAL/Mic coll. 454; *Q. robur*: (14) coll. 190, (23) coll. 5998. Common species on deciduous substrata.

Phlebiopsis gigantea (Fr.) Jülich

Q. ilex: (53c) coll. 7119. Common species on coniferous substrata.

Phlebiopsis roumeguerii (Bres.) Jülich & Stalpers

Q. cerris: (23e) coll. 850; *Q. ilex*: (23) coll. 5634, (29c) coll. 7638, (42a) coll. 2998, (48a) coll. 5009, 5037, (50d) coll. 3829, 3833, 5245, 7484, (52d) coll. 7409, (53c) coll. 1312, 2060, 2062, 6606, (54) coll. 3862, 3867; (60b) PAL/Mic coll. 363; (63) PAL/Mic coll. 425; (58c) PAL/Mic coll. 426; (58) PAL/Mic coll. 454, 465; *Q. pubescens*: (23) coll. 5634, (28) coll. 1037, (50) coll. 1960; *Q. suber*: (56a) PAL/Mic coll. 377; Common Mediterranean species.

Phylloporia ribis (Schumach.) Ryvar den

Q. ilex: (30a) coll. 1093; (57c) PAL/Mic coll. 440; *Q. pubescens* s. l.: (57a) PAL/Mic coll. 399. Widespread species, on several substrata.

Podoscypha multizonata (Berk. & Broome) Pat.

Q. ilex: (53c) coll. 5294. A rare species in Italy, growing close or at the base of living trees.

Polyporus arcularius (Batsch) Fr.

Q. cerris: (23) coll. 2461; *Q. ilex*: (50c) coll. 5220, (56a) PAL/Mic coll. 725; *Q. suber*: (52b) coll. 2703; *Quercus* sp.: (62c) PAL/Mic coll. 456; Widely distributed species in Europe but not very frequent in Italy.

Polyporus brumalis (Pers.) Fr.

Q. suber: (57a) PAL/Mic coll. 453.

- Polyporus meridionalis* (A. David) H. Jahn.
On stump of *Q. ilex*: (59c) PAL/Mic coll. 551.
- Polyporus squamosus* (Huds.) Fr.
On stump of *Q. petraea*: (56a) PAL/Mic coll. 602.
- Polyporus tuberaster* (Jacq.) Fr.
Q. ilex: (26) coll. 3583, (50d) coll. 5231, (53c) coll. 4082, 4056, (54) coll. 2390; *Q. suber*: (53c) coll. 2133. Frequent in the Mediterranean area, on fallen branches and stumps.
- Porostereum spadiceum* (Pers.) Hjortstam & Ryvar den
Q. ilex: (13a) coll. 5421, (49c) coll. 1982, (52a) coll. 7294; (59) PAL/Mic coll. 471; *Q. robur*: (13) coll. 4719, (14) coll. 1242, 2250; *Q. pubescens*: (21f) coll. 945; *Quercus* sp.: (17) coll. 1654, (43) coll. 728; (59a) PAL/Mic coll. 470; Common species on deciduous wood.
- Punctularia strigosozonata* (Schwein.) P.H.B. Talbot
Q. ilex: (55) coll. 2256; *Q. robur*: (13a) 7207, 7511. Rare species.
- Radulomyces confluens* (Fr.) M.P. Christ.
Q. ilex: (5) coll. 1516, (13a) coll. 2522; *Q. robur*: (14) coll. 1283, (23) coll. 1851; *Q. suber*: (54a) coll. 1298. Common species on both coniferous and deciduous substrata.
- Radulomyces molaris* (Chaillet ex Fr.) M.P. Christ.
Q. cerris: (12) coll. 5912, (40a) coll. 4517; *Q. ilex*: (39) coll. 7434, (40) coll. 474, (53c) 1316, 1521, (54) 2054; *Q. pubescens*: (23) coll. 1877; (56a) PAL/Mic coll. 417; *Q. robur*: (13) coll. 411, (14) coll. 1196, (21c) coll. 600, (23) coll. 70; *Quercus* sp.: (43) coll. 713; *Q. suber*: (54a) coll. 2353, (55b) coll. 2127; (56a) PAL/Mic coll. 409; *Q. petraea*: (56) PAL/Mic coll. 355. Common species.
- Resupinatus poriaeformis* (Pers.) Thorn, Moncalvo & Redhead
Q. ilex: (50d) coll. 3826. Uncommon species.
- Rigidoporus ulmarius* (Sowerby) Imazeki
Q. pubescens: (26) coll. 1542. Uncommon species in Italy, with a Central and Southern distribution in Europe.
- Sarcodontia crocea* (Schwein.) Kotl.
On stump of *Q. ilex*: (56a) PAL/Mic coll. 398.
- Schizopora flavipora* (Berk. & M.A. Curtis ex Cooke) Ryvar den
On lying log of *Q. ilex*: (13a) coll. 7584; *Q. robur*: (4) coll. 5309, 7666; *Quercus* sp.: (17) coll. 1642. Widely distributed species.
- Schizopora paradoxa* (Schrad.) Donk
Q. cerris: (62c) PAL/Mic coll. 402; *Q. ilex*: (13a) coll. 221, 223, 356, 822, (35) coll. 1741, (37b) coll. 3728, (40) coll. 472, (53c) coll. 1319, 2072, (55) coll. 478; (57c) PAL/Mic coll. 395; *Q. robur*: (13a) coll. 217, (14) coll. 809, (21c) coll. 37; *Q. suber*: (42a) coll. 3406; *Quercus* sp.: (1) coll. 31, (32a) coll. 2460. Very common species.
- Schizopora radula* (Pers.) Hallenb.
Q. ilex: (53c) coll. 4054. Frequent species in Europe.
- Scopuloides rimosa* (Cooke) Jülich
Q. ilex: (29c) coll. 7668; *Q. pubescens*: (23) coll. 181. Frequent species on deciduous wood.

Scytinostroma aluta Lanq.

Q. ilex: (46) coll. 6252; *Q. pubescens*: (24) coll. 7106. Recorded on *Rosmarinus* and *Quercus*.

Scytinostroma ochroleucum (Bres. & Torrend) Donk

Q. ilex: (42a) coll. 3039, LR 22354. Very rare species.

Scytinostromella heterogenea (Bourdot & Galzin) Parmasto

Q. ilex: (52d) coll. 7796. Rare species.

Sistotrema brinkmannii (Bres.) J. Erikss.

Q. ilex: (49a) coll. 6635, (49c) coll. 1985, (50) coll. 1924.

Sistotrema coroniferum (Höhn. & Litsch.) Donk

Q. ilex: (49c) coll. 1981. Uncommon species.

Sistotrema diademiferum (Bourdot & Galzin) Donk

Q. coccifera: (46) coll. 6239; *Q. ilex*: (50d) coll. 3816, (51a) coll. 5787. Frequent species in Italy.

Sistotrema muscicola (Pers.) S. Lundell

Q. ilex: (52d) coll. 7790. Rare species in Europe, sporadically distributed in Italy.

Sistotrema subtrigonospermum D.P. Rogers

Q. cerris: (42a) coll. 3002. This is the only record in Italy.

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

Q. pubescens: (23) coll. 1849. Infrequent species.

Skeletocutis lenis (P. Karst.) Niemelä

Q. robur: (13) coll. 7670. Common and widely distributed species, on very rotten wood.

Skeletocutis nivea (Jungh.) Jean Keller

Q. cerris: (15a) coll. 7155, (23) coll. 5992; *Q. ilex*: (13a) log, coll. 204, 778, 7709, (26) coll. 3591, (29c) coll. 1607, (29c) coll. 7622, (35) coll. 1747, (42a) coll. 3017, (48b) coll. 5007, (50) coll. 5071, (53c) coll. 1322, 2309, 1294, (54) coll. 2047, (54b) coll. 3785, (55) coll. 2364; *Q. pubescens*: (56a) PAL/Mic coll. 415; (57a) PAL/Mic coll. 437, 441; *Q. robur*: (13) coll. 5728, 7622, (14) coll. 34, 555, 7718; *Quercus* sp.: (17) coll. 1643, 1650. Frequent species.

Skeletocutis percandida (Malençon & Bertault) Jean Keller

Q. ilex: (55d) coll. 2326. Common Mediterranean species.

Skeletocutis subincarnata (Peck) Jean Keller

Q. ilex: (52d) coll. 7458. Recorded on *Pinus* too.

Skeletocutis vulgaris (Fr.) Niemela & Y.C. Dai

Q. robur: (13) log, coll. 7572. Its distribution is not completely clear, due to the confusion with *Skeletocutis lenis* (P. Karst.) Niemelä, but it seems to be a more southern species.

Spongipellis delectans (Peck) Murrill

Inside a log cavity of living *Q. ilex*: (50d), coll. 5249, 6910; *Q. suber*: (41) coll. 7915. Rare but widely distributed species.

Spongipellis pachyodon (Pers.) Kotl. & Pouzar

Q. ilex: (13a) coll. 6394, (29) coll. 1533; *Q. pubescens*: (23a) coll. 6439; *Q. suber*: (31) coll. 1024; *Quercus* sp.: (1b) coll. 30. Uncommon species in Italy even if, locally, it can be frequent.

Steccherinum bourdotii Saliba & A. David

Q. ilex: (13a) coll. 6314; *Q. robur*: (13) coll. 7617.

Steccherinum fimbriatum (Pers.) J. Erikss.

Q. ilex: (35) coll. 3722; *Q. pubescens*: (50) coll. 1930; *Q. robur*: (42a) coll. 3106; *Quercus* sp.: (43) coll. 722. Common species.

Steccherinum ochraceum (Pers.) Gray

Q. ilex: (13a) coll. 203, (35) coll. 1742, 1744, (35) coll. 3731, (37b) coll. 3726, 3735, (40a) coll. 4518, (40) coll. 476, 1491, (46) coll. 6232, 48e coll. 4951, (49c) coll. 1970, 4108, (51a) coll. 5822, (53c) coll. 1303; (56c) PAL/Mic coll. 360; (57a) PAL/Mic coll. 389; (57c) PAL/Mic coll. 396; (58b) PAL/Mic coll. 412; *Q. pubescens*: (50) coll. 6840; *Q. robur*: (1a) coll. 1338, (21c) coll. 134, 594; *Q. suber*: (48d) coll. 4987, (56a) PAL/Mic coll. 374, 376; *Quercus* sp.: (2a) coll. 2289. Common species.

Stereum gausapatum (Fr.) Fr.

Q. cerris: (15a) coll. 7154; *Q. ilex*: (13a) coll. 219, 420, 776, 790, (27) coll. 970, 1095, (51) coll. 5791; (58) PAL/Mic coll. 467; *Q. pubescens*: (23) coll. 5659; *Q. robur*: (21c) coll. 131; *Q. suber*: (48d) coll. 4995, (53c) coll. 1310, 7017. Frequent species.

Stereum hirsutum (Willd.) Pers.

Q. cerris: (8b) coll. 1710; *Q. ilex*: (48d) 4996, (50) coll. 5239, (53c) coll. 1293, 1302, 1320, 1325, (54a) coll. 1287, 1288, (55) coll. 465, 2368, 2692, (55a) coll. 1519, (56d) PAL/Mic coll. 384; (57a) PAL/Mic coll. 388; (57b) PAL/Mic coll. 391; (57c) PAL/Mic coll. 394; *Q. robur*: (21c) coll. 140; *Q. suber*: (53b) coll. 625. Very common species.

Stereum ochraceoflavum (Schwein.) Fr.

Q. cerris: (15a) coll. 7161. Uncommon species in Italy.

Stereum reflexulum D.A. Reid

Q. ilex: (35) coll. 2201. Mediterranean species, on shrubs and hardwoods of macchia.

Stereum rugosum Pers.

Q. ilex: (35) coll. 1743, 1748, (37a) coll. 3732, (53c) coll. 4064, (56a) PAL/Mic coll. 743; *Q. robur*: (2b) coll. 2407. Common species.

Stereum subtomentosum Pouzar

Q. cerris: (4) coll. 2194; *Q. petraea*: (4) coll. 7944; *Q. robur*: (13) 5726, (14) coll. 616, 1387, (26) coll. 1603; *Quercus* sp.: (10) coll. 5470. Rather frequent species on lying logs of *Fagus* and *Alnus* too.

Subulicystidium longisporum (Pat.) Parmasto

Q. ilex: (42a) coll. LR 22443, (50d) coll. 3837; (57c) PAL/Mic coll. 421; *Q. robur*: (13) coll. 7417, (13) coll. 7616, (14) coll. 1249. Common species.

Terana caerulea (Lam.) Kuntze

Q. cerris: (23d) coll. 2303, 2306, (31) coll. 1027; *Q. ilex*: (26b) coll. 6262, (53c) coll. 1525, (55) coll. 2360, (56d) PAL/Mic coll. 385; (63) PAL/Mic coll. 429; *Q. pubescens*: (28) coll. 1042; (56a) PAL/Mic coll. 408; *Quercus* sp.: (43) coll. 725. Common and widespread

species.

Thelephora terrestris Ehrh.

Q. ilex: (46c) coll. 6231. Common species.

Trametes hirsuta (Wulfen) Pilát

Q. ilex: (13a) coll. 7254; (64) PAL/Mic coll. 442; *Quercus* sp.: (9a) coll. 2830. Cosmopolitan and widely distributed.

Trametes ljubarskii Pilát

Q. robur: (21f) coll. 1760, 1762. With a southern distribution in Europe.

Trametes ochracea (Pers.) Gilb. & Ryvarden

Q. ilex: (48b) coll. 4991; *Q. robur*: (13) coll. 7602, (23f) coll. 3660, (26) coll. 1606; *Quercus* sp.: (3) coll. 1824. Common species.

Trametes pubescens (Schumach.) Pilát

Quercus sp.: (40) coll. 1494. Rather common species.

Trametes versicolor (L.) Lloyd

Q. cerris: (12) coll. 5899, (23) coll. 63; *Q. ilex*: (53c) coll. 1300; (57b) PAL/Mic coll. 392; *Q. suber*: (54a) coll. 1453. Very common species.

Trechispora alnicola (Bourdot & Galzin) Liberta

Q. ilex: (42a) coll. LR 22349. Rare species in Italy.

Trechispora clancularis (Park.-Rhodes) K.H. Larss.

Q. robur: (14) log, coll. 7555, 7577, 7583. Very rare species, with only two collection areas in Italy.

Trechispora cohaerens (Schwein.) Jülich & Stalpers

Q. cerris: (23) coll. 6006; *Q. robur*: (14) coll. 7416. Common species.

Trechispora farinacea (Pers.) Liberta

Q. ilex: (55c) coll. 2372; *Q. robur*: (13) coll. 4708, (14) coll. 490. The most common species of the genus in Italy.

Trechispora fastidiosa (Pers.) Liberta

Q. suber: (56a) PAL/Mic coll. 422.

Trechispora microspora (P. Karst.) Liberta

Q. ilex: (13a) coll. 6334; *Q. robur*: (13a) coll. 2537, 2557. Widespread but not very common.

Trechispora mollusca (Pers.) Liberta

Q. ilex: (29c) coll. 7679; *Q. robur*: (14) coll. 7576. Infrequent species in Italy.

Trechispora praefocata (Bourdot & Galzin) Liberta

Q. ilex: (13a) coll. 6117, 6120. Rather rare species.

Trechispora silvae-ryae (J. Erikss. & Ryvarden) K.H. Larss.

Q. ilex: (52e) coll. Arras 110, 116, 670.

Trichaptum bifforme (Fr.) Ryvarden

Q. cerris: (42a) coll. 3037; *Q. suber*: (53b) coll. 627, (54a) coll. 1455, 1457, 2347; *Q. robur*: (26) coll. 1611. Common species on deciduous wood.

Tubulicium vermiferum (Bourdot) Oberw. ex Jülich

Q. ilex: (48b) coll. 4985. Infrequent species.

- Tubulicrinis medius* (Bourdot & Galzin) Oberw.
Q. ilex: (53c) coll. 2056. Rather common species, typically growing on conifers.
- Tulasnella violacea* (Johan-Olsen) Juel
Q. ilex: (48b) coll. 5012.
- Tulasnella violea* (Quél.) Bourdot & Galzin
Q. ilex: (50d) coll. 3828, 5246. Common species.
- Tyromyces fissilis* (Berk. & M.A. Curtis) Donk
Q. robur: (14a) coll. 6580. Uncommon species, sporadically recorded in Italy.
- Vararia ochroleuca* (Bourdot & Galzin) Donk
Q. robur: (13a) coll. 1673. Widely distributed, and locally frequently.
- Vuilleminia comedens* (Nees.) Maire
Q. cerris: (23) coll. 1873; *Q. ilex*: (30a) coll. 1078, (50) coll. 1943, (55) coll. 2371, (56a) PAL/Mic coll. 368; 382; *Q. pubescens*: (21f) coll. 3625, (48) coll. 4935; *Q. robur*: (4) coll. 2196, (13a) coll. 210, (21c) coll. 38, (24) coll. 7083; *Q. suber*: (56a) PAL/Mic coll. 455; *Quercus* sp.: (23) coll. 87; (57c) PAL/Mic coll. 393; Common species.
- Vuilleminia coryli* Boidin, Lanq. & Gilles
Q. cerris: (42a) coll. 3503. Rare species, recorded on different deciduous substrata.
- Vuilleminia megalospora* Bres.
Q. ilex: (33) coll. 7454, (50e) coll. 6833, 6836, 6848, (53c) coll. 2057, 6832, 6849. Uncommon species.
- Vuilleminia pseudocystidiata* Boidin, Lanq. & Gilles
Q. pubescens: (50) coll. 7115. Very rare species.
- Xenasma pruinosum* (Pat.) Donk
Q. robur: (42a) coll. 3018. Uncommon species.
- Xenasmatella vaga* (Fr.) Stalpers
Q. ilex: (56a) PAL/Mic coll. 370.
- Xylobolus frustulatus* (Pers.) Boidin
Q. ilex: (53c) coll. 6981. Rare species in Italy, recorded from only two areas.
- Xylobolus subpileatus* (Berk. & M.A. Curtis) Boidin
Q. cerris: (11) coll. 4142, (40a) coll. 4516; *Q. ilex*: (50d) coll. 3827; *Q. robur*: (14) coll. 1258, (42a) coll. 3095; *Quercus* sp.: (7) coll. 7525. Frequently recorded on deciduous substrata.

Conclusions

The aphyllophoraceous wood-inhabiting macrofungi growing on *Quercus* spp. show a very high diversity in Italy compared to other investigated substrata; 203 species on *Pinus* spp. (Bernicchia et al. 2007b), 190 on *Abies alba* (Bernicchia et al. 2007a), 166 on *Fagus sylvatica* (Bernicchia et al. 2007c), 126 on *Castanea sativa* (Mayrhofer et al. 2001), 105 on *Juniperus* spp. (Bernicchia 2000) and 52 on *Arbutus*

unedo (Pérez Gorjón et al. 2006). This higher diversity level may be due partly to the abundant amount of woody debris of *Quercus* fallen on the ground. Besides silvicultural management of the Italian Forestry Administration is to be considered as an important factor of appearance of wood decomposing fungi in forest ecosystems; in fact the action of cutting and the accumulation of logs and branches in the ground cover stimulate pathogens and wood-inhabiting fungi to colonize such type of substrata. Several species are widely distributed, while the presence of some rare taxa could provide very interesting data that might help delimit special conservation areas and be useful for compiling red lists of endangered species.

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