

# Wood and bark inhabiting fungi on oak in Lithuania

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Wood decaying and bark inhabiting fungi on *Quercus robur* L. were studied in Lithuania. A total of 2560 oaks, including 323 stumps, of different diameter classes, different states and from various habitats were investigated. More conspicuous species are briefly presented. The spatial distribution of 37 fungi in a living oak is schematically illustrated. Diagrams show the distribution of *Laetiporus sulphureus* (Bull.:Fr.) Murr. and *Phellinus robustus* (P. Karst.) Bourdot & Galzin in relation to different diameter classes of oaks. New sites are reported for the rare and endangered species *Grifola frondosa* (Dicks.:Fr.) S.F. Gray, *Hapalopilus croceus* (Pers.:Fr.) Bond. & Sing., *Hymenochaete subfuliginosa* (Bourdot & Galzin) Hruby, and *Piptoporus quercinus* (Schröd.) Pilát. The last two species seem to be new to Lithuania. An oak stand in the Punios Silas forest, Alytus district, is valuable from the point of view of nature conservation and is described. The endangered oak beetles *Osmoderma eremita* (Scopoli) and *Gnorimus variabilis* (L.) are reported from oak on new sites.

**Key words:** wood decaying fungi, red data species, *Quercus*.

## Introduction

The present work is a pilot investigation concerning wood decaying and bark inhabiting fungi on *Quercus* in Lithuania. It is a part of a Lithuanian-Swedish scientific collaboration, established in 1993-1994. Fungi studied in this project are mainly Aphyllophorales but some wood decaying fungi of Agaricales, Tremellales, and Ascomycetes are also included. The project deals with i.a. (1) ecology and distribution of oak fungi, (2) decay patterns, and population structures in some wood destroying fungi on oak, and (3) Lithuanian red data species of fungi on oak.

General information concerning oak fungi in Lithuania will also be included in a larger project entitled "Wood and bark inhabiting fungi on *Quercus* in Northern Europe" (Sunhede 1993). In this project more than 70.000 oaks have been investigated regarding fungi in Denmark, Estonia, Finland, Latvia, Lithuania, Norway, and Sweden. Information from this project will also be included in the Lithuanian-Swedish joint studies.

The aim of this paper is to give a brief introduction to Lithuanian oak-fungi and to present some Lithuanian red data species on oak.

## Material and methods

Wood decaying and bark inhabiting fungi on *Quercus robur* L., mainly Aphyllophorales, were investigated in Lithuania during 1993 (September, October) and 1994 (July,

August). In total, 2560 oaks, including 323 stumps, of different diameter classes and different states were studied regarding occurrence of fungi (Fig. 1 A). Most oaks grew in  $\pm$  pure stands, mixed deciduous woods (main part) and mixed coniferous-deciduous woods, but oaks in parks and in open fields were also included. The most intense investigations were carried out in the districts of Alytus, Kaunas, Panevėžys, Plungė, and Vilnius.

The nomenclature of the fungi cited follows Ryvarden and Gilbertson (1993, 1994) for polypores, mainly Jülich (1984) for other Aphyllophorales, Heterobasidiomycetes and Gasteromycetes, Mooser (1978) for agarics, and Dennis (1978) for Ascomycetes.

## Results

A big oak tree offers a rich number of niches for different species of fungi (Fig. 2: 1-7). The following examples can be given. The fungi may e.g. have their mycelia in the basal part of the stem and in thick roots, on varying levels in the trunk and in thicker branches, in medium thick to thin branches, and in twigs. Some fungi attack living trees, others are mainly found on weakened trees or on dead or partially living parts of the trees. Certain species have their mycelia in the bark, others are only or mainly found to fructify on decorticated wood. Several fungi continue to grow many years after the tree has died and fallen, or survive in remaining stumps. Many species start to grow on fallen trunks, branches, stumps, and a succession of fungi may appear

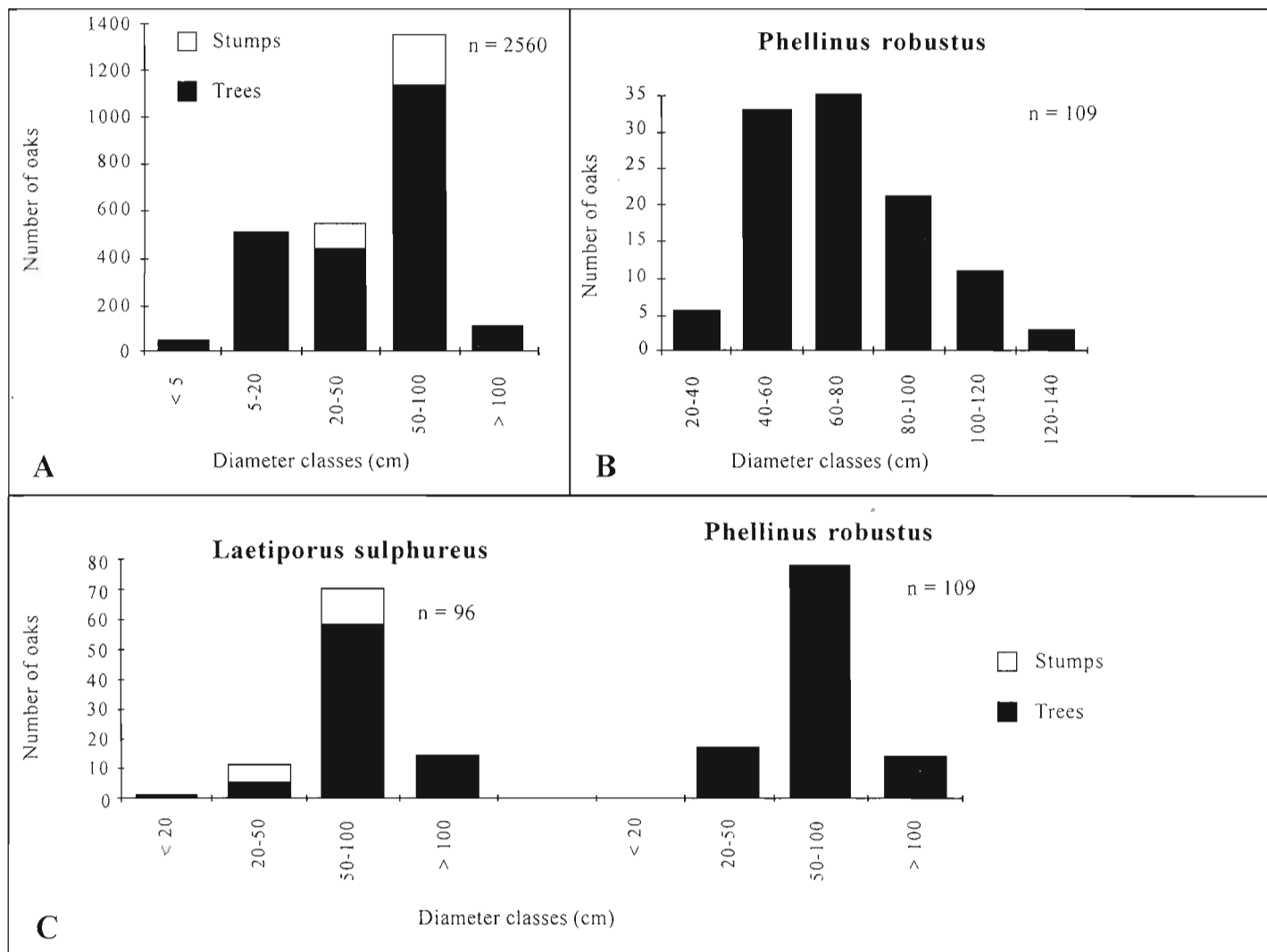


Fig. 1. Field studies on oak (*Quercus robur*) in Lithuania during 1993 and 1994. – A: Number of investigated oaks grouped in arbitrarily selected diameter classes. – B: Distribution of *Phellinus robustus* related to six arbitrarily selected diameter classes of oaks. – C: Distribution of *Laetiporus sulphureus* and *Phellinus robustus* related to arbitrarily selected diameter classes of oaks. No fruit bodies of *P. robustus* were found on low stumps.

during the continuous degradation of the wood. Different individual mycelia of a fungal species may be found in the same tree (Fig. 2: 8).

The inventory work on *Quercus robur* in Lithuania has revealed many fungi. Some of the more conspicuous species found are presented below. Several of these fungi can be considered to be “true oak fungi”, at least in northern Europe. To this group belong the ascomycete *Colpoma quercinum* (Pers.) Wallroth on dead twigs, the polypores *Daedalea quercina* L.:Fr. on dead attached branches, damaged stems, fallen wood, and stumps, *Fistulina hepatica* (Schaeff.:Fr.) With. on old oaks and stumps, *Grifola frondosa* (Dicks.:Fr.) S.F. Gray at the base of old oaks, *Hapalopilus croceus* (Pers.:Fr.) Bond. & Sing. on old oaks, *Inonotus dryophilus* (Berk.) Murr. on living or newly dead trees, *Perenniporia medulla-panis* (Jacq.:Fr.) Donk on stumps, *Piptoporus quercinus* (Schrad.) Pilát on an old fallen oak,

*Phellinus robustus* (P. Karst.) Bourdot & Galzin mainly on living trees of various thickness (Figs. 1 B, C), the bark fungus *Dendrothele commixta* (Höhn. & Litsch.) J. Erikss. & Ryv. on bark of living trees, the wood fungi *Hymenochaete rubiginosa* (Dicks. ex Fr.) Lév. mainly on dead, attached or fallen, decorticated branches, and stumps, *H. subfuliginosa* (Bourdot & Galzin) Hruby on fallen decorticated branches, *Stereum gausapatum* (Fr.) Fr. on dead branches and dead parts of the stem, *Xylobolus frustulatus* (Pers. ex Fr.) Boidin on naked wood of living and dead trees, fallen wood, and on a stump, and the agaric *Mycena inclinata* (Fr.) Quéf. on stumps and dead wood.

Other fungi are characteristic of oak but also grow on one or several other substrates. Examples of species found on oak in Lithuania are: the ascomycete *Bulgaria inquinans* Fr. on rather recently dead wood with attached bark, the polypore *Laetiporus sulphureus* (Bull.:Fr.) Murr. on living trees, dead

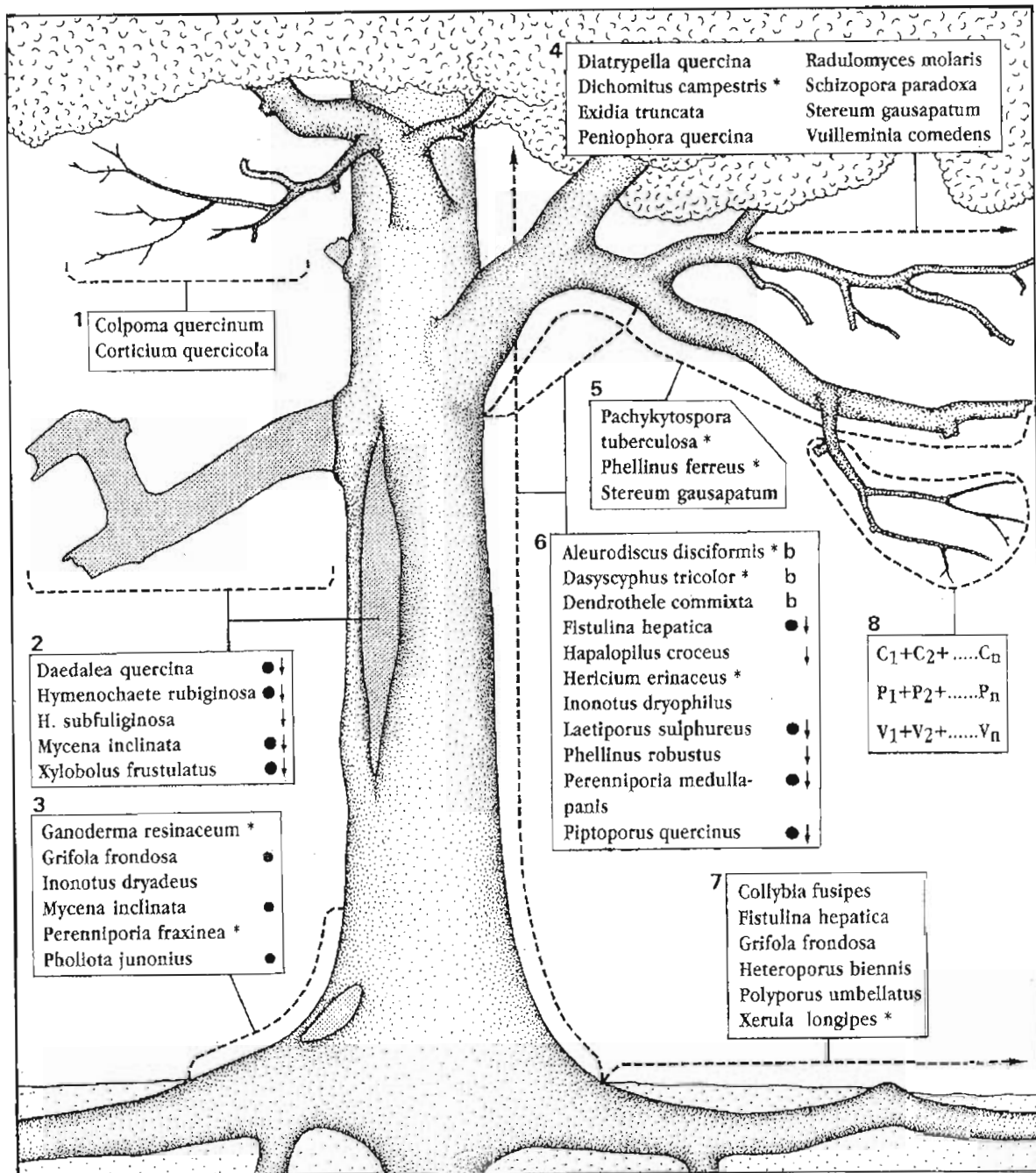


Fig. 2. Simplified, schematic drawing showing the spatial distribution of some wood and bark inhabiting fungi on *Quercus* in Northern Europe, based on occurrence of fruit bodies and identified mycelia in the wood. Species may grow: in basal part of stems and in thick roots (3, 7), on varying level in the stems and in thicker branches (2, 6), in somewhat thicker to thinner branches (4, 5), and in twigs (1). A species may occur as one or more "genets" in the wood. This is exemplified in (8). C = *Colpoma quercinum*, P = *Peniophora quercina*, V = *Vuilleminia comedens*, and 1, 2, ...n different "genets". Fruit bodies of *Polyporus umbellatus* also grow from sclerotia (a sort of nutritional tissue of fungal hyphae) immediately below the soil surface. Some species continue to live for many years in fallen wood (down-pointing arrows) or in stumps (filled circles). Bark inhabiting fungi = b. Species not recorded in Lithuania up to 1994 marked with an asterisk.

trees and stumps of various thickness (Fig. 1 C), the wood fungi *Hyphodontia quercina* (Fr.) J. Erikss., *Peniophora quercina* (Pers. ex Fr.) Cooke and *Radulomyces molaris* (Chaillat: Fr.) M. P. Christ. on dead attached branches, *Stereum hirsutum* (Wild. ex Fr.) S.F. Gray on wounded parts of stems, dead attached branches, and stumps, *Stereum rugosum* (Pers. ex Fr.) Fr. on stems (where it may cause deformation) and on attached

branches, *Vuilleminia comedens* (Nees ex Fr.) Maire on dead attached branches, the jelly fungus *Exidia truncata* Fr. on attached branches, and the agaric *Panellus stypticus* (Bull. ex Fr.) Karst. on stumps or wood.

Other wood decomposing fungi found on oak were: the polypores *Bjerkandera adusta* (Willd.:Fr.) Karst., *Fomes fomentarius* (L.:Fr.) Kickx (rather rare species on oak), *Gano-*

*derma applanatum* (Pers.) Pat., *Trametes hirsuta* (Fr.) Pilát, *Trametes versicolor* (L.:Fr.) Pilát, the wood fungi *Coniophora puteana* (Schum. ex Fr.) P. Karst. *Dentipellis fragilis* (Pers. ex Fr.) Donk, *Gloiodon strigosus* (Swartz ex Fr.) P. Karst., *Phlebia radiata* Fr., *Schizopora paradoxa* (Schröd. ex Fr.) Donk, the agarics *Armillaria mellea* s.l. (mostly observed as rhizomorphs), *Hypholoma fasciculare* (Huds. ex Fr.) Kummer, *H. sublateralitium* (Fr.) Quél., *Panellus serotinus* (Pers. ex Fr.) Kühn., *Schizophyllum commune* Fr. ex Fr., the gasteromycete *Lycoperdon pyriforme* Schaeff. ex Pers., and the pyrenomycete *Ustulina deusta* (Fr.) Petrak.

The following finds of some rare and endangered species should be specified. *Grifola frondosa*: Vilnius district, Dūkšto Ažuolynas forest, at the base of a rather thick oak, 29.9.1993. – Kaunas, Kauno Ažuolynas park, near the base of a rather thick oak. *Hapalopilus croceus*: Alytus district, Punios Šilas forest, on three, 1.1-1.3 m thick oaks, 26-27.9.1994. – Panevėžys district, Sujetai forest, on 1.9 m thick oak 2.8.1994. *Hymenochaete subfuliginosa*: Kėdainiai district, Šėta forest, 2-3 km E of Sangailai, on fallen oak wood, 1.10.1993. – Vilnius, Verkiai park, on fallen wood of oak, 8.10.1993. *Inonotus dryophilus*: Alytus district, Punios Šilas forest, on three living oaks 26.7, 27.7. and 28.7.1994. – Panevėžys district, Gustonys forest, on wind-broken oak, 6.8.1994. – Perekšliai forest, 9.8.1994, on dead standing oak. – Trakai district, Varnikiai forest, on living oak, 11.10.1993; – Vilnius, Verkiai park, on living oak 12.10.1993. *Piptoporus quercinus*: Alytus district, Punios, Punios Šilas forest, on fallen oak, 27.7.1994.

## Discussion and conclusions

The four polypores *Daedalea quercina*, *Fistulina hepatica*, *Laetiporus sulphureus*, and *Piptoporus quercinus* all cause brown rot in oak. Of these, *F. hepatica* is rather rare and *P. quercinus* very rare in Lithuania (see below) and are of little importance from the forester's point of view. *Daedalea quercina* is rather common on old stumps but is also rather often found on living trees, on dead thick often de-corticated branches or wounds after removed branches. Jahn (1979) and Rypáček (1966) consider the species to be saprotrophic and parasitic only on damaged trees. *Laetiporus sulphureus* is rather commonly found on trunks or thicker branches of living oaks in Northern Europe. The species causes an intensive brown rot in the heartwood which finally shrinks and bursts into more or less cubical pieces, easily powdered in the dry state. The oak stems may in time become quite hollow, but the oak may still live for many years as the fungus does not attack the sapwood and the bark. However, strong winds may break stems and thick branches with a well developed rot long before the tree has become hollow. In the present investigation fruitbodies were observed on 96 oaks

and stumps (Fig. 1 C). However, many oaks were found with brown rot of the "Laetiporus-type" but with no fruit bodies, indicating a commoner presence of the fungus. Besides, many healthy looking trees without fruit bodies (which are annual and do not appear every year) but decayed by the fungus most probably have been overlooked.

Most wood decaying fungi on oaks cause white rot of different kinds. Among the polypores, *Phellinus robustus* seems to be the most serious one from the forester's point of view. This fungus was found in most oak-stands investigated, on living trunks with a diameter varying from 29 to 130 cm (cf. Figs. 1 B, C). The perennial fruit bodies were mostly found above 2 m to very high up on the stems but also on the branches. Fruit bodies may continue to grow for some time on timber of wind-felled trunks and fallen branches. In contrast to *L. sulphureus*, *P. robustus* has not been found to fructify on low stumps after felled trees (Fig. 1 C). According to Davidson et al. (1942), Gilbertson & Ryvarden (1987), Larsen & Cobb-Poulsen (1990), and Ryvarden & Gilbertson (1994), *P. robustus* causes white rot in the heartwood. However, a study of decay pattern and population structures of *P. robustus* (Sunhede and Vasiliauskas, in manuscript) clearly shows that the species is no heart rotter. Several oaks broken by the wind at higher level were observed to be attacked by this fungus.

From the point of view of nature protection some oak stands showed very high qualities. One of these valuable sites, situated in Punios Šilas forest, in the Alytus district, was visited in the end of August 1994. It consists of a strip of forest (mainly in the forest areas 32 and 38) at the river Nemunas. Here a great number of oaks of different ages grow together with i.a. *Acer*, *Alnus*, *Betula*, *Carpinus*, *Corylus*, *Picea*, *Pinus*, and *Tilia*. The diameter of the oaks varies from less than 20 cm to more than 150 cm. There is a mixture of various oak substrates as living, partially living, standing dead, or fallen trees, fallen thick branches, and stumps. The growth places vary from wet to dry ground and from shaded to sunexposed sites. This forest area is an excellent habitat for many oak fungi, including such species as *Fistulina hepatica*, *Hapalopilus croceus*, *Inonotus dryophilus*, *Piptoporus quercinus* and *Xylobolus frustulatus*. In addition, the rare oak beetle *Osmoderma eremita* (Scopoli) was found on one of the old oaks. The beetle is listed as vulnerable in the Lithuanian red data book and earlier not known from this site according to Balevičius et al (1992). This rather small but very valuable locality in the Punios Šilas forest highly deserves protection. Further studies of the fungus flora and insect fauna would be very rewarding.

Of the rare and endangered species found and reported under "results" (above) *Hapalopilus croceus* (as *Aurantiporus*), *Grifola frondosa*, and *Inonotus dryophilus* are treated in the red data book of Lithuania (Balevičius et al. 1992).

According to the maps in Balevičius et al. (1992) there is no recent location of *H. croceus* in Lithuania but two old sites are known from the Kėdainiai district, Sviliai forest 1966 and the Alytus district, Punios Šilas forest 1962, respectively. Our finds of *H. croceus* in Punios Šilas forest show that the species is still present there after more than 30 years. The finding of *H. croceus* on an old oak in the Panevėžys district in 1994 represents a new locality. At the base of this oak was found also the rare beetle *Gnorimus variabilis* (L.) listed as vulnerable by Balevičius et al (1992). *Hapalopilus croceus* is considered to be one of the ten most endangered fungi in Europe and has been suggested for the Bern convention. *Piptoporus quercinus* seems to have been found for the first time in Lithuania (see above). This rare and endangered species which inhabits old, thick, dead or living oaks is recommended to be included in the Lithuanian red data list.

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### References

- Balevičius K., Lapelė M. & Paltanavičius S.** (Editors) 1992. Red data book of Lithuania. – Environmental Protection Department of the Republic of Lithuania. Vilnius 364 pp. (in Lithuanian).
- Davidson R. W., Campbell W. A. & Vaughn D. B.** 1942. Fungi causing decay of living oaks in the Eastern United States and their cultural identification. U. S. Dept. Agr. Tech. Bull. 785: 1-65, illus.
- Dennis R. W. G.** 1978. British Ascomycetes. Cramer: Stuttgart.
- Gilbertson R. L. & Ryvarden L.** 1987. North American Polypores 2. Megasporoporia - Wrightoporia. Fungiflora. Oslo.
- Jahn H.** 1979. Pilze die an Holz wachsen. Herford.
- Jülich W.** 1984. Kleine Kryptogamenflora IIb/1. Die Nichtblätterpilze, Gallertpilze und Bauchpilze. Stuttgart – New York.
- Larsen M. J. & Cobb-Pouille L. A.** 1990: Phellinus (Hymenochaetaceae). A survey of the world taxa. Synopsis Fungorum 3: 1-206.
- Moser M.** 1978. Kleine Kryptogamenflora IIb/2. Die Röhrlinge und Blätterpilze. Stuttgart - New York.
- Rypáček V.** 1966. Biologie holzzerstörender Pilze. Jena.
- Ryvarden L. & Gilbertson R. L.** 1993. European Polypores 1. Abortiporus-Lindtneria. Oslo.
- Ryvarden L. & Gilbertson R. L.** 1994. European Polypores 2. Meripilus-Tyromyces. Oslo.
- Sunhede S.** 1993. Wood and bark inhabiting fungi on Quercus in Northern Europe. In Fungi and Lichens in the Baltic Region. 12th international conference abstracts p. 128. Vilnius.

## ГРИБЫ, РАСТУЩИЕ НА ДРЕВЕСИНЕ И КОРЕ ДУБА В ЛИТВЕ

С. Сунгедэ, Р. Василяускас

### Резюме

В условиях Литвы проводились исследования грибов, поражающих древесину и кору дуба обыкновенного (*Quercus robur* L.). Всего было исследовано 2560 деревьев (включая 323 пня) различного диаметра (рис. 1А), находящихся в различных условиях произрастания. Коротко представлены наиболее характерные виды. Схематически иллюстрировано распространение 37 видов грибов на живых деревьях дуба (рис. 2). В диаграммах показано распределение *Laetiporus sulphureus* (Bull.:Fr) Murr. и *Phellinus robustus* (P. Karst.) Bourd & Galz.) (рис. 1В,С) по ступеням толщины деревьев дуба. Обнаружены новые местонахождения исчезающих видов *Grifola frondosa* (Dicks.: Fr.) S.F.Gray, *Hapalopilus croceus* (Pers.:Fr.) Bond & Sing., *Hymenochaete subfuliginosa* (Bourd. & Galz.) Hruby и *Piptoporus quercinus* (Schrad.) Pilat. Два последних вида в Литве найдены впервые. Описан ценный с точки зрения охраны природы древостой дуба в Пунайском массиве Алитусского района. Представлены новые места обитания редких насекомых *Osmoderma eremita* (Scopoli) и *Gnorimus variabilis* (L.), обитающих на деревьях дуба.

**Ключевые слова:** дереворазрушающие грибы, исчезающие виды, дуб обыкновенный.