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## LIGNICOLOUS MACROMYCETES IN THE SUBMEDITERRANEAN PART OF MACEDONIA (YUGOSLAVIA)

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During the investigation of lignicolous higher fungi in the southernmost part of Macedonia, in the vicinity of the town of Bogdanci, 63 species were established on 31 genera of autochthonous and cultivated trees and shrubs, and are presented in the table. Several interesting fungi are discussed and the localities in Yugoslavia of some rarer ones are cited. Three species were collected in this country only in this region up to now.

### Introduction

Fungi occurring in the Submediterranean and Mediterranean regions of Yugoslavia are not sufficiently known as yet. A few shorter or longer lists were published from the Adriatic coast (Bollé and Thümen 1877, Keissler 1909, Baudyš 1914, Jaap 1916, Pilát 1925, Picbauer 1928, Reid 1975, Tortić 1978, Barčić 1982), some of them concerned only with micromycetes, others mainly with macromycetes. Finds of a number of species of lignicolous *Aphylophorales* (polypores and corticia) were mentioned in several other contributions (David, Tortić and Jelić 1974, Tortić 1971, 1975, 1975a, 1980, 1983, 1983a, Tortić and Kotlaba 1976, Kuthan 1980).

In Macedonia the Submediterranean climate reaches along the valley of the river Vardar up to Skopje and Mediterranean influences are felt. It was to be expected that the mycoflora there, practically unknown, would be similar to the one along the Adriatic coast, and comparative mycological investigations of those regions would surely bring interesting results.

In the course of the investigations undertaken by us in southern Macedonia the second author collected larger lignicolous fungi in the vicinity of Bogdanci, near the Greek border, from autumn 1983 on, and the species were determined mainly by the first author.

### The Region Investigated

The small town of Bogdanci is situated in the south-eastern part of Macedonia, at about 8 km N of the Greek border. The collections were made in the area reaching from the valley of the river Vardar, at about 5 km W of Bogdanci, to the vicinity of lake Dojran, at 20 km E of the town.

The region is hilly, with altitudes between 100 and 700 m. It is under the climatic influence of the Aegean Sea, with a rather high mean yearly temperature of 14° — 14.8°C. Mean January temperature is over 3° and mean July over 25°. However, the minimum temperature in winter reaches —10°C almost every year. The yearly precipitation is about 750—760 mm. with the maximum in winter.

The forest vegetation belongs to the associations *Coccifero-Carpinetum orientalis* (Oberd.) Horv. 1959 and *Querco-Carpinetum orientalis macedonicum* Rud. ap. Horv. 1946. It is mostly developed in the form of shrubs and bushes. In the first association evergreen *Quercus coccifera*, *Phyllirea media*, *Juniperus oxycedrus*, dominate, in the second one deciduous *Carpinus orientalis*, *Fraxinus ornus*, *Quercus pubescens*, *Pistacia terebinthus* etc. *Platanus orientalis* occurs along the rivers and brooks.

### Materials and Methods

The fungi were collected on autochthonous trees and shrubs as well as on cultivated ones, such as *Ficus carica*, *Punica granatum*, *Morus* spp. etc.

Owing to the mild climate the collections were made mostly during autumn and winter months. Summer is very dry and hot and hardly, or not at all, suitable for the development of carpophores. Since the carpophores of most species found are coriaceous and hard, they were simply allowed to dry at room temperature and then packed in envelopes. The microscopical examination of the structure was done in several standard reagents (Melzer's solution, KOH, cotton blue in lactic acid, cresyl blue), and the determination made with the aid of some standard manuals, such as Eriksson and Ryvar den 1973—76, Eriksson, Hjortstam and Ryvar den 1978—1984, Jülich and Stalpers 1980 for corticia. Domański 1972, Domański et al. 1973, Ryvar den 1976, 1978 for polypores, Moser 1984 for agarics. Voucher material is preserved partly at the Department of Botany, Faculty of Science, University of Zagreb (ZA), partly at the private herbarium of the second author.

The results of the investigations are presented in Table 1, where fungal species are arranged according to their hosts. As most of the collecting was made during autumn and winter months, deciduous *Quercus* spp. (*Q. frainetto*, *Q. petraea* and *Q. pubescens*) as well as *Morus* spp. (*M. alba* and *M. nigra*) could not be distinguished in the leafless state.

Since the investigations have only just started, there is not a great number of data available as yet even for the most frequent species. To give an approximate picture of their distribution in this region, we have expressed the frequency by: +++ = very common (found during every or almost every collecting excursion), ++ = common (found rather frequently), + = rare (found once or only few times). It will be possible to give a more exact estimate only after several years of investigations.

### Discussion and Conclusion

To date, in the area investigated, 63 species of lignicolous macro-mycetes have been determined, growing on 31 genera of woody plants. Table 1 shows that the richest in species were the trees most frequent in this region: *Quercus* spp. (in all 31 species, 15 of those on evergreen *Q. coccifera*, 23 on deciduous oaks mentioned) and *Carpinus orientalis* (18 species). On *Pyrus amygdaliformis* and *Robinia pseudacacia* 10 fungi were noted each, on *Salix alba* 9, *Morus* spp. and *Platanus orientalis* 8 each, *Paliurus spina-christi* 7, *Ulmus minor* and *Fraxinus ornus* 5 each, *Punica granatum* 4. Three fungal species each were collected on: *Ficus carica*, *Gleditsia triacanthos*, *Pinus halepensis*, *Populus alba*, two each on *Acer campestre*, *Ailanthus altissima*, *Alnus glutinosa*, *Cornus* spp. (both *C. mas* and *C. sanguinea*), *Pistacia terebinthus*, *Prunus dulcis* (= *P. amygdalus*), *Rosa* sp., *Vitis vinifera*, and one each on *Acacia* sp., *Clematis vitalba*, *Corylus avellana*, *Crataegus monogyna*, *Juniperus oxycedrus*, *Ligustrum vulgare*, *Cionura erecta* (= *Marsdenia erecta*), *Nerium oleander*, *Prunus cerasifera*.

On the other hand, some fungi grew on a considerable number of hosts, the most versatile being *Peniophora lycii*, found on 20 genera of trees and shrubs.

The main attention was paid to *Aphyllophorales* in the broad sense, polypores and corticia, and therefore most of the species noted belong to this group.

Lignicolous fungi have an important function in nature as decomposers of wood. Some of those presented here attack, as parasites, live trees, usually specimens already weakened by injury or age (e.g. *Ganoderma adspersum*, *Phellinus torulosus*, *Ph. igniarius*) or grow both on diseased or dead parts of living trees and on dead wood as *Auricularia mesenterica*, *Pleurotus ostreatus* and others, but most are saprophytes, occurring on dead wood.

The distribution in Europe of the fungi noted is varied. Some occur practically everywhere, both in warmer and colder regions, such as *Hypoderma praetermissum*, *Schizopora paradoxa*, *Stereum hirsutum*, *Trametes versicolor*, *Vuilleminia comedens* etc., but a number of taxa are distinctly thermophilous and either restricted to southern Europe or at least much more abundant there than in parts situated more to the north (central Europe, southern Scandinavia) where they are found only in the warmest habitats, e.g. *Lopharia spadicea*, *Phellinus torulosus*, *Pulcherricium caeruleum*. Even in Yugoslavia there is a difference: some species are known now only in the regions with Mediterranean or at least Submediterranean climate, i. e. Adriatic coast and southern Macedonia, and others, if found in some northern parts of our country, are much more frequent in the southern ones.

Except three species, the fungi presented were collected also in other localities in Yugoslavia — some are even common — although the distribution of most of them in our country has not been published yet. Also, several hosts have not been noted in print for Yugoslavia, e.g. *Ailanthus altissima*, *Ficus carica*, *Gleditsia triacanthos*, *Cionura* (= *Marsdenia*) *erecta*, *Quercus coccifera*, *Pyrus amygdaliformis*.

Among the hosts, the most interesting seems to us *Quercus coccifera*, particularly since the fungi found on it can be expected to occur on *Q. ilex*, too. One of them, *Vuileminia megalospora*, is even restricted to evergreen oaks.

Lecot (1979, 1984) has recently published two lists of hosts to *Aphylliphorales*, mostly from the Mediterranean part of France (Languedoc), but also from other localities, as well as some data from other parts of Europe. He mentions several Mediterranean trees and shrubs not occurring in the region investigated by us, and, on the other hand, does not mention some of our hosts. Therefore, already because of this fact, his list differs considerably from ours. In many cases we found the same species he did, but on different hosts, sometimes even when a host grows in both regions investigated. For instance, he has also found *Peniophora lycii* on 21 genera of trees and shrubs, including *Pyrus amygdaliformis* where we did not observe it yet; however, we collected ten species on this tree whereas he noted only two. On *Quercus coccifera* Lecot cites only three species, one of which, *Dichomitus campestris* is very common also in our localities. We have noted 14 species on this oak up to now, many of them collected by Lecot on *Q. ilex* which does not occur in our region.

It is possible to discuss here only a few of the most interesting or rare species; for some of them other localities in Yugoslavia are cited and presented on the map (Fig. 1).

*Dacryobolus sudans* was published for Yugoslavia from a few localities (Tortić 1980) but no map was given. It grows usually in mountain forests on conifers, mostly *Abies* spp; once it was found in Plitvička jezera National Park also on *Fagus sylvatica*. Hallenberg and Michelišch (1982/83) have recorded it on *Fagus sylvatica* too, in addition to *Abies alba* and *Picea abies*. The occurrence in Submediterranean region is apparently exceptional and *Pyrus amygdaliformis* probably represents a new host. Other unpublished localities are: Pelister Nat. Park, on *Abies* sp. 21.9.1983, and Trebević mountain near Sarajevo, on *Picea abies*, 19. 9. 1984. Both collected by M. and S. Tortić and the specimens are deposited at ZA. (Fig. 1 where the localities published earlier are added).

*Dichomitus campestris*. Since the publication of few then known localities in Yugoslavia by Tortić and Kotlaba (1976), several more have been established and will be published in time. In some localities the species appears to be common on particular hosts, as on *Corylus avellana* in Plitvička Jezera Nat. Park and on *Quercus coccifera* in Bogdanci.

*Hymenochaete subfuliginosa* is apparently restricted to the species of the genus *Quercus*. Curiously, it was not yet found in any other locality in Yugoslavia.

*Laeticorticium macrosporum*. A thermophilous species, cited as frequent in the south of France on many genera of trees and shrubs by Bourdot and Galzin (1928); therefore one may expect it not to be rare in the region investigated as well as on the Adriatic Coast. Howe-

Table 1

## LIGNICOLOUS MACROMYCETES IN THE SUBMEDITERRANEAN PART OF MACEDONIA (YUGOSLAVIA)

Species	Querc.	Q. c.	Carp.	Pyr.	Rob.	Sal.	Mor.	Plat.	Pal.	Ulm.	Frax.	Pun.
<i>Hymenochaete subfuliginosa</i> Bourd. et Galz.	+											
<i>Dacrymyces stillatus</i> Nees ex Fr.	+											
<i>Trametes hirsuta</i> (Wulf. ex Fr.) Pil.	+											
<i>Lenzites betulina</i> (L. ex Fr.) Fr.	+						+					
<i>L. warnieri</i> Dur. et Mont. ap. Mont.	+					+						
<i>Auricularia mesenterica</i> (Dicks.) Fr.	+					+					++	
<i>Daedaleopsis confragosa</i> (Bolt. ex Fr.) Schroet.	+++					++						
<i>Armillariella tabescens</i> (Scop. ex Fr.) Sing.	++											
<i>Radulomyces molaris</i> (Chaill. in Fr.) M. P. Christ.	+++		+									
<i>Peniophora lycii</i> (Pers.) Höhn. et Litsch.	++		+++	+	++	+			+++	+	+	
<i>Hyphodontia crustosa</i> (Pers. ex Fr.) John Erikss.	+		+		+		+++	+				
<i>Schizopora paradoxa</i> (Schrad. ex Fr.) Donk	+		+		+	+		++				
<i>Phlebiopsis roumeguerii</i> (Bres.) Jül. et Stalpers	+++		+					+				
<i>Stereum gausapatum</i> (Fr.) Fr.	+		+								+	
<i>Lopharia spadicea</i> (Fr.) Boid.	++		++	+					+			
<i>Phellinus torulosus</i> (Pers.) Bourd. et Galz.	+		+				+++					
<i>Radulomyces confluens</i> (Fr.) M. P. Christ.	+++	+	+	+	+							++
<i>Stereum hirsutum</i> (Willd.) Pers.	++	+	+++		+			+				+
<i>Peniophora meridionalis</i> Boid.	+	++	+									+
<i>P. quercina</i> (Pers.) Cooke	+++	+++										
<i>Dichomitus campestris</i> (Quél.) Domañ. et Orlicz	++	+++										
<i>Cerrera unicolor</i> (Bull. ex Fr.) Murr.	++	+										
<i>Pulchericium caeruleum</i> (Fr.) Parm.	+++	++		+					+		+	
<i>Peniophora incarnata</i> (Pers.) Cooke		++		+		++			+			
<i>Laeticorticium polygonioides</i> (Karst.) Donk		+						+				
<i>Vuilleminia megalospora</i> Bres.		+++										
<i>Meruliopsis hirtellus</i> (Burt.) Ginns		+										
<i>Laeticorticium macrosporum</i> (Bres.) Erikss. et Ryv.		+										
<i>Polyporus anisoporus</i> Del. et Mont. ap. Mont.		+								+		
<i>Steccherinum ochraceum</i> (Pers. ex Fr.) S. F. Gray s. l.		+	+									
<i>Ganoderma lucidum</i> (Leys.) Karst.		+	+	+	+							
<i>Exidia glandulosa</i> Bull. ex Fr.			++									
<i>Vuilleminia comedens</i> (Nees ex Fr.) Maire			+++									
<i>Skeletocutis nivea</i> (Jungh.) Keller			+									
<i>Chondrostereum purpureum</i> (Pers. ex Fr.) Pouz.			+			+						
<i>Trametes versicolor</i> (L. ex Fr.) Quél.			+	+			+		+			
<i>Hyphoderma praetermissum</i> (Karst.) Erikss. et Strid				+					+			
<i>Dacryobolus sudans</i> (Fr.) Fr.				+								
<i>Phlebia rufa</i> (Pers. ex Fr.) M. P. Christ.				+								
<i>Exidiopsis calcea</i> (Pers.) Wells					+							
<i>Ganoderma resinaceum</i> (Boud.) ex Pat.					+							
<i>G. adpersum</i> (S. Schulz.) Donk					+		+					
<i>Pleurotus ostreatus</i> (Jacq. ex Fr.) Kummer s. l.					+		+					
<i>Flammulina velutipes</i> (Curt. ex Fr.) Sing.							+					
<i>Scytinostroma portentosum</i> (Berk. et Curt.) Donk							+++	+				
<i>Hyphodermella corrugata</i> (Fr.) Erikss. et Ryv.								+				
<i>Panus tigrinus</i> (Bull. ex Fr.) Sing.						+		+				
<i>Phellinus igniarius</i> (L. ex Fr.) Quél.						+						
<i>Byssomerulius corium</i> (Fr.) Parm.								+	+	+		
<i>Gloeoporus dichrous</i> (Fr.) Bres.									+			
<i>Phellinus robustus</i> (Karst.) Bourd. et Galz.											+	
<i>Ph. punctatus</i> (Fr.) Pil.												++

## SPECIES CITED IN THE TABLE ABOVE COLLECTED ON OTHER HOSTS

<i>Byssomerulius corium</i>	<i>Populus alba</i>
<i>Exidiopsis calcea</i>	<i>Ficus carica</i>
<i>Hyphodontia crustosa</i>	<i>Acacia</i> sp., <i>Pinus halepensis</i>
<i>Peniophora incarnata</i>	<i>Ailanthus altissima</i> , <i>Pistacia terebinthus</i> , <i>Prunus dulcis</i> , <i>Vitis vinifera</i>
<i>Peniophora lycii</i>	<i>Acer campestre</i> , <i>Ailanthus altissima</i> , <i>Cornus mas</i> , <i>C. sanguinea</i> , <i>Ficus carica</i> , <i>Gleditsia triacanthos</i> , <i>Juniperus oxycedrus</i> , <i>Ligustrum vulgare</i> , <i>Cionura erecta</i> , <i>Nerium oleander</i> , <i>Pistacia terebinthus</i> , <i>Prunus dulcis</i> , <i>Vitis vinifera</i>
<i>Phellinus torulosus</i>	<i>Cornus</i> sp.
<i>Radulomyces confluens</i>	<i>Clematis vitalba</i>
<i>Schizopora paradoxa</i>	<i>Corylus avellana</i> , <i>Gleditsia triacanthos</i>
<i>Stereum hirsutum</i>	<i>Rosa</i> sp., <i>Vitis vinifera</i>
<i>Trametes versicolor</i>	<i>Alnus glutinosa</i>

## SPECIES NOT INCLUDED IN THE TABLE AND THEIR HOSTS

<i>Auriculariopsis ampla</i> (Lév.) Maire	<i>Populus alba</i>
<i>Bjerkandera adusta</i> (Willd. ex Fr.) P. Karst.	<i>Alnus glutinosa</i>
<i>Hyphodontia sambuci</i> (Pers.) John Erikss.	<i>Acer campestre</i>
<i>Laetiporus sulphureus</i> (Bull. ex Fr.) Murr.	<i>Gleditsia triacanthos</i>
<i>Meruliopsis taxicola</i> (Pers.) Bond.	<i>Pinus halepensis</i>
<i>Peniophora cinerea</i> (Fr.) Cooke	<i>Populus alba</i>
<i>P. pini</i> (Schleich. ex Fr.) Quél.	<i>Pinus halepensis</i>
<i>Phellinus pomaceus</i> (Pers.) Maire	<i>Prunus cerasifera</i>
<i>Tulasnella violacea</i> (Johan-Olsen) Juel	<i>Rosa</i> sp.
<i>Vuilleminia cystidiata</i> Parm.	<i>Crataegus monogyna</i>
<i>Mycoaciella bispora</i> (Stalpers) Erikss et. Ryv.	host unknown

Querc. = *Quercus* spp. (*Q. frainetto*, *Q. petraea*, *Q. pubescens*), *Q. c.* = *Quercus coccifera*, *Carp.* = *Carpinus orientalis*, *Pyr.* = *Pyrus amygdaliformis*, *Rob.* = *Robinia pseudacacia*, *Sal.* = *Salix alba*, *Mor.* = *Morus* spp. (*M. alba*, *M. nigra*), *Plat.* = *Platanus orientalis*, *Pal.* = *Paliurus spina-christi*, *Ulm.* = *Ulmus minor*, *Frax.* = *Fraxinus ornus*, *Pun.* = *Punica granatum*

+++ = very common    ++ = common    + = rare

ver, in addition to Bogdanci it was collected only in Kalifront in the island of Rab on *Quercus ilex* (Tortić 1980). Although in both cases it grew only on evergreen oaks, other hosts will be surely established in time. (Fig. 1).

*Meruliopsis hirtellus* was first published for Europe by Pilát and Lindtner (1938) from Katlanovska Banja on *Buxus*, as a new species, *Merulius macedonicus*. Later it was established that *M. macedonicus*, as well as *Byssomerulius armeniacus* described by Parmasto, were identical with *M. hirtellus*, spread in North America. Recently it was

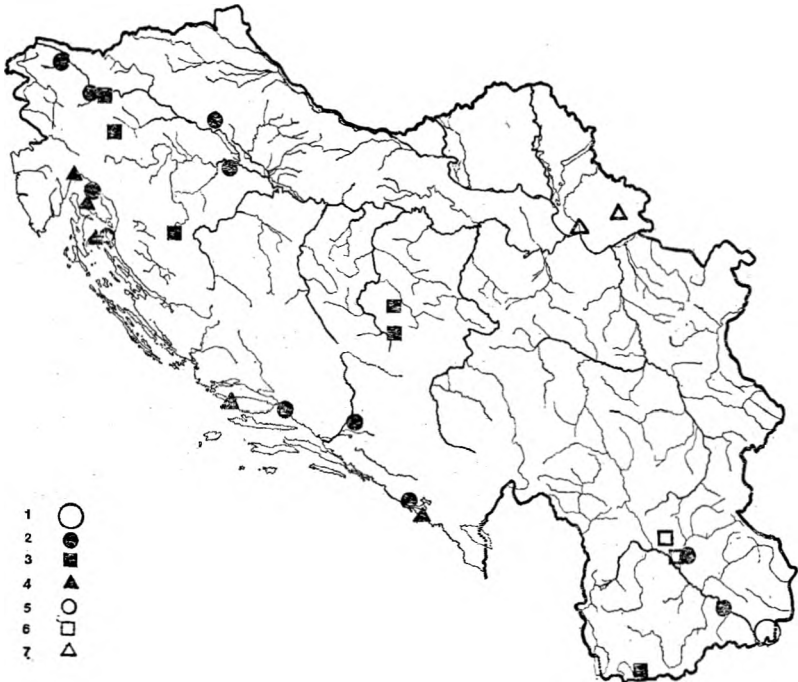


Fig. 1. 1 The territory investigated, 2 *Pulchericium caeruleum*, 3 *Dacryobolus sudans*, 4 *Peniophora meridionalis*, 5 *Laeticorticium macrosporum*, 6 *Meruliopsis hirtellus*, 7 *Mycoaciella bispora*

published by Bernicchia (1983) from Italy, where, according to her personal communication, she found the same species subsequently in two more localities, and by Pou and Telleria (1985) from Spain. In addition to the collection at Bogdanci, another was made in Macedonia 25.9.1983 in Skopska Crna Gora Mt. near Skopje, on *Quercus petraea*. Therefore this species, considered as extremely rare in Europe, may turn out not to be very rare, at least in Southern Europe. Macroscopically it could be confused with resupinate forms of the frequent *Byssomerulius corium*. (Fig. 1).

*Mycoaciella bispora*, considered as a rare species because known from only few localities in Europe, was collected in Yugoslavia already by V. Lindtner in two localities: near Pančevo on (probably) *Salix* sp.

1.12.1935 and on *Populus* sp. 28.9.1952 — both det. K. Hjortstam, Göteborg — and near Banatski Karlovac, on *Populus alba*, 10.9.1937, det. M. Tortić. The specimens are preserved at BEO. Unfortunately, the host of the find at Bogdanci could not be identified. (Fig. 1).

*Penophora lycii* is apparently the most frequent lignicolous species in the region investigated, collected on 20 genera of trees and shrubs. In Yugoslavia about 15 localities are known now, only a few of them published (Jaap 1916, Pilát 1925, Picbauer 1928); the species grew on a number of hosts, many of them not mentioned here. The localities are situated mostly at the sea-coast and the species seems to be rather thermophilous, although occurring in suitable habitats even in Scandinavia.

*P. meridionalis* in microscopically somewhat similar to the precedent, since both have dendrohyphidia and the incrustated cystidia are in both not acute but rounded at the tip. In *P. lycii* they are, however, more or less globose, whilst in *P. meridionalis* they are cylindric. Sometimes both species are found on the same branch but can be distinguished even macroscopically by their colour: bluish-grey in *P. lycii* and ochre-brown in *P. meridionalis*. *P. meridionalis*, characteristic of Submediterranean and Mediterranean regions, was not yet published for Yugoslavia, but several localities, all on the sea-coast, are now known in addition to the one at Bogdanci: Opatija, on *Carpinus orientalis*, 15.2. 1983; Malinska (island of Krk) or *Acer* sp. 20. 5. 1978, leg. M. Horvat; Kalifront (island of Rab) on *Quercus ilex* 14.5.1977; Milna (island of Brač) on *Pistacia terebinthus* 14.8.1984; Pržno near Tivat in Boka Kotorska on *Pistacia lentiscus* 25.5. 1976, leg. F. Kotlaba. Except where the collector is indicated the specimens were collected by M. and S. Tortić and all are preserved in ZA. The species is in Bogdanci rather frequent and is surely spread and frequent also at the Adriatic coast. It is possible that some specimens published earlier as *P. lycii* were in fact *P. meridionalis*, which was described only later. (Fig. 1)

*Pulchericium caeruleum* is easily noticed owing to its striking deep blue colour; it was published for our country by some authors cited below. In the vicinity of Bogdanci it is abundant on all species of oaks and was noted also on some other hosts (Table 1). Other known localities are: Ljubljana, on *Carpinus betulus*, and Lesce, on *Quercus* sp. (both Voss 1889—92); Medvednica Mt. near Zagreb, on *Quercus* sp. and *Cornus* sp., 29.9. and 2.10.1966, 1. et d. M. Tortić and M. Svrček, ZA; vicinity of Petrinja, *Cornus* sp., 12. 9. 1976 1. et d. M. and S. Tortić, ZA; Njivice (island of Krk) on *Quercus* sp. and *Carpinus* sp. January 1978 and 1983, 1. et d. D. Vrščaj, ZA; Makarska, unidentified dead branch. leg. L. Göttl 2.11.1979, ZA; »Bregava ad Klepci Hercegovinae« on dead wood (Picbauer 1930); Hercegnovi, on *Rubus* sp. (Jaap 1916); Demir Kapija, on deciduous wood PRM, BEO (Pilát 1937); Katlanovska Banja, on deciduous wood, PRM, BEO (Pilát and Lindtner 1938). (Fig. 1).

Most localities lie at the sea-coast and in warmer parts of Macedonia; elsewhere the species is rather rare.

*Vuilleminia comedens* is a common and wide spread species, occurring on various broad-leaved shrubs and trees on dead branches attached to the living plant and it seems to be frequent also in Yugoslavia particularly on *Corylus avellana* and *Quercus* spp. There exist, however, two other species, cleared up only recently: *V. cystidiata* and *V. megalospora*, macroscopically very similar (there may be a slight difference in co-

lour), with a similar mode of living, and differing mainly in the shape and size of the spores. In *V. cystidiata* the spores are sausage-shaped as are those in *V. comedens*, but smaller, about  $13.5-17 \times 3.5-5 \mu\text{m}$  (in *V. comedens* they are  $17-23 \times 5-7 \mu\text{m}$ ), and in *V. megalospora* they are ellipsoid,  $20-28 \times 10-13 \mu\text{m}$ . Both *V. comedens* and *V. megalospora* lack cystidia, which are developed in *V. cystidiata*, but difficult to find if the fruitbody is not in the best condition. *V. megalospora* grows, as far as known, only on evergreen oaks (as *Quercus coccifera*, *Q. ilex*), whilst *V. cystidiata* apparently prefers *Crataegus* spp.; it was, however, collected also on some other genera of shrubs and trees such as *Acer*, *Carpinus*, *Cornus* (information by F. Kotlaba, Prague).

In the vicinity of Bogdanci fertile material of all three species was collected. A few cystidia were observed in our specimen of *V. cystidiata*, and the size and shape of the spores agreed very well with those in the material collected by the first author in Austria at the same time and place as the one discussed by Boidin and Lanquetin (1983).

In BEO there is a collection by V. Lindtner from Hudova at Vardar, on *Quercus coccifera*, 19.3. 1939, determined by Pilát as *V. comedens*, which is very probably *V. megalospora*; it is unfortunately sterile and cannot be taken into account.

For the moment, Bogdanci is the only known locality in Yugoslavia of *V. cystidiata* and *V. megalospora*. However, both species certainly occur also elsewhere in our country and may have been even collected in sterile state and therefore could not be identified. *V. cystidiata* will probably be found in various regions, mainly on *Crataegus* spp., and *V. megalospora* is probably spread not only in other localities in Macedonia on *Q. coccifera*, but also along the Adriatic coast on *Q. ilex*.

Since our investigations in southern Macedonia have only started, many additional finds of fungi as well as hosts not mentioned here are to be expected.

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## SAŽETAK

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LIGNIKOLNI MAKROMICETI U SUBMEDITERANSKOM PODRUČJU MAKEDONIJE

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Istraživane su lignikolne više gljive na autohtonom i sađenom drveću i grmlju u okolici Bogdanaca, u najjužnijem dijelu Makedonije. U tom submediteranskom području, gdje se osećaju i utjecaji mediterana, raste izvjestan broj drvenastih vrsta koje su raširene i na jadranskoj obali.

Dosad je ustanovljeno 63 vrsta gljiva na 31 rodu drveća i grmlja (Tab 1). Najviše ih je nađeno na *Quercus* spp., ukupno 31, od toga na listopadnim *Q. petraea*, *Q. frainetto* i *Q. pubescens* 23, a na zimzelenom *Q. coccifera* 15, te na *Carpinus orientalis* 18 vrsta. Ovo je drveće u istraživanom kraju i najmnogobrojnije. Brojčani podaci o gljivama na ostalim domaćinima navedeni su u engleskom tekstu.

Kako je vidljivo iz tablice, manji broj gljiva nađen je na samo po jednom domaćinu, većina ih je rasla na 2 i više. Najčešća i najmanje izbirljiva je *Penophora lycii*, utvrđena dosad tamo na 20 rodova.

Među determiniranim vrstama prisutno je nekoliko parazita, koji napadaju živo iako uglavnom oslabielo drveće, a često mogu nastaviti razvitak i na uginulom, no većina su saprofiti na mrtvom drvetu, kadgod na mrtvim dijelovima živih stabala.

Pojedine vrste dolaze manje više svugdje, u hladnijim i toplijim područjima, ali dio ostalih je izrazito termofilan pa su u Evropi ili ograničene samo na južnije dijelove, ili se u srednjoj Evropi (poneke i u južnoj Skandinaviji) nalaze samo na najtoplijim staništima. To se opaža i unutar Jugoslavije jer su neke gljive nađene zasad jedino u submediteranskim i mediteranskim krajevima, dakle osim u istraživanom području također i u jadranskom primorju.

Ovdje navedene gljive (izuzevši tri vrste) sabrane su u nas i na drugim lokalitetima, no rasprostranjenost većine njih u Jugoslaviji još nije bila objavljena. Također nisu bili zabilježeni za našu zemlju i neki domaćini kao *Ailanthus altissima*, *Ficus carica*, *Gleditsia triacanthos*, *Cionura erecta*, *Pyrus amygdaliformis*, *Quercus cocifera*. On tih nam se čini naročito interesantnim *Q. coccifera*, pogotovu što se može pretpostaviti da vrste ustanovljene na njemu rastu i na *Q. ilex*, rasprostranjenom duž jadranskog primorja.

U engleskom tekstu raspravlja se поближе o manjem broju zanimljivijih vrsta a za neke rjeđe navedeni su i ostali poznati lokaliteti u Jugoslaviji i označeni na karti (sl. 1).

Istraživanja su u ovom kraju tek započela i bude li moguće da se nastave, nema sumnje da će se s vremenom pronaći još dosta vrsta a i ustanoviti i drugi domaćini.

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