

Dimitar Stoykov

Lichen-forming fungi from Rilomanastirska Gora Reserve, Rila Mts (Bulgaria)

Authors' addresses:

Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 2 Gagarin Str., 1113, Sofia, Bulgaria.

Correspondence:

Dimitar Stoykov

Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 2 Gagarin Str., 1113, Sofia, Bulgaria.

Tel.: +359 29793715

e-mail: stoykovdimitar@abv.bg

Article info:

Received: 7 June 2020

Accepted: 23 June 2020

ABSTRACT

Forty nine species are added to enrich the known lichen diversity within the Rilomanastirska Gora Reserve as a result of field and laboratory studies. Among them, *Pertusaria amara* and *Opegrapha rufescens* are new records for Rila Mts. Two species (*Sticta sylvatica* and *Lobaria pulmonaria*) are of conservation value. Data on some rarely recorded species in Bulgaria are briefly discussed.

Key words: Bulgaria, lichen mycota, protected area, Rilomanastirska Gora

Introduction

The Rilomanastirska Gora Reserve is a part of Rila National Park. It was declared in 1986 with a total area of 3676.5 ha, designated to protect the native forest ecosystems of coniferous and mixed fir and beech forests. This reserve includes the alpine zone and forest formations on both sides of the Rilska River, between Malyovitsa peak, Orlovets peak, Suhoto Lake, Dzhendemski Dol stream and Brichebor peak. There are typical to the reserve area the mixed broadleaf-coniferous forests, with the presence of *Abies alba* Mill. and *Fagus sylvatica* L. Rila oak (*Quercus protoroburoides*) forests are unique in the country, known from three localities in the valley of Rilska River, with one of them situated on slopes above the Ilijna River (Roussakova 2015). *Pinus mugo* Turra communities dominated in the subalpine belt.

This work reports data on the species diversity of lichen-forming fungi on the territory of Rilomanastirska Gora Reserve (Rila Mts). First contributions about the lichen-forming fungi from the reserve area are considered the works of Kazandzhiev (1900) and Suza (1929) recorded about 26 species, mostly from the vicinities of the Rilski monastery. Subsequently, Zhelezova (1956, 1960, 1963; Motyka & Zhelezova 1962) made consecutive contributions on the species diversity of the lichen mycota in Bulgaria and established 26 species from the reserve. Data on the lichen records from the region of the Rilski monastery could be obtained also in Popnikolov & Zhelezova (1964). Single collections from the reserve area were examined more recently by Pišút (1995, 2001). Seven new species to the

Rilomanastirska Gora Reserve from *Physciaceae* family were discovered by Atanassova & Mayrhofer (2012). Summarized information about the ecology and the known distribution of *Lobaria pulmonaria* (L.) Hoffm. in Bulgaria and within the reserve area, based on additional data from specialized collections was published in Stoykov (2015). Prior to the present studies, 56 species (including 1 subspecies, 3 varieties, and 2 forms), belonging to 33 genera from the reserve area, were known (Table 1).

Materials and Methods

The following work aimed to contribute to the lichenized fungi, collected on the territory of the reserve in different broadleaf, coniferous and mixed forest habitats. Method of linear transects for collecting of lichen-forming specimens was used, and some specimens housed at the Mycological Collection of the Institute of Biodiversity and Ecosystem Research (SOMF) were examined. Field trips were carried out in 2015. The study areas included: tourist trail from Rilski monastery in directions from Kalugerski Dol river towards Ivan Vazov chalet; region above Ilijna river with mixed broadleaf Rila oak and beech forests; forest trail to Bricheborski Dol river and Vtoroto Pochivalo below Brichebor peak; Kirilova Polyana locality, on the trail to Suhoto Ezero lake, and in the old beech forest mixed with single fir trees, below Kirilova Polyana, above the road to Rilski monastery) vicinity of St. Luka chapel. The determination of the examined materials was made generally after Dobson (2000, 2011, 2013), Nimis et al. (2009) and Atanassova & Mayrhofer (2012), using standard

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Table 1. Lichen-forming fungi known from Rilomanastirska Gora Reserve

Taxon	Author
<i>Arthonia radiata</i>	Suza, 1929; Popnikolov & Zhelezova, 1964
<i>Alectoria sarmentosa</i>	Zhelezova 1956
<i>Anaptychia ciliaris</i>	Atanassova & Mayrhofer, 2012
<i>Bacidia rosella</i>	Popnikolov & Zhelezova, 1964
<i>Candelariella xanthostigma</i>	Zhelezova, 1963
<i>Chaenotheca chrysocephala</i>	Zhelezova, 1963
<i>Cladonia cenotea</i> , <i>C. ochrochlora</i>	Zhelezova, 1963; Popnikolov & Zhelezova, 1964
<i>Collema flaccidum</i> , <i>C. nigrescens</i> , <i>C. occultatum</i>	Suza, 1929; Zhelezova, 1963; Popnikolov & Zhelezova, 1964
<i>Dermatocarpon miniatum</i> var. <i>complicatum</i> , <i>D. miniatum</i> var. <i>miniatum</i>	Zhelezova, 1963
<i>Diploschistes muscorum</i>	Suza, 1929; Popnikolov & Zhelezova, 1964
<i>Graphis scripta</i>	Suza, 1929
<i>Lecidea lapicida</i> var. <i>lapicida</i>	Suza, 1929
<i>Lepraria membranacea</i>	Suza, 1929
<i>Leptogium lichenoides</i>	Suza, 1929
<i>Lobaria amplissima</i> , <i>L. pulmonaria</i> f. <i>papillaris</i> ; <i>L. pulmonaria</i> f. <i>pulmonaria</i> , <i>L. scrobiculata</i>	Suza, 1929; Zhelezova, 1956, 1963; Stoykov, 2015
<i>Melanelia fuliginosa</i> subsp. <i>glabrata</i> , <i>M. glabra</i>	Suza, 1929; Zhelezova & Popnikolov, 1964
<i>Nephroma parile</i> , <i>N. resupinatum</i>	Suza, 1929; Zhelezova, 1963
<i>Ochrolechia alboflavescens</i> , <i>O. pallescens</i> , <i>O. szatalaensis</i>	Zhelezova, 1963; Popnikolov & Zhelezova, 1964; Pišút, 1995
<i>Parmelina carporrhizans</i>	Zhelezova, 1956; Popnikolov & Zhelezova, 1964
<i>Pannaria conoplea</i>	Suza, 1929
<i>Peltigera didactyla</i> , <i>P. lepidophora</i> , <i>P. polydactylon</i> , <i>P. praetextata</i> , <i>P. rufescens</i> , <i>P. venosa</i>	Suza, 1929; Zhelezova 1956, 1960, 1963
<i>Pertusaria leioplaca</i>	Pišút, 2001
<i>Physcia aipolia</i> , <i>P. caesia</i> , <i>P. dubia</i> , <i>P. stellaris</i>	Atanassova & Mayrhofer, 2012
<i>Physconia distorta</i> , <i>P. grisea</i> , <i>P. perisidiosa</i>	Zhelezova, 1956; Atanassova & Mayrhofer, 2012
<i>Placidium rufescens</i> , <i>Polychidium muscicola</i>	Suza, 1929
<i>Pseudevernia furfuracea</i>	Zhelezova, 1956
<i>Pyrenula coryli</i> , <i>P. nitida</i>	Suza, 1929
<i>Rhizocarpon viridiatrum</i>	Suza, 1929; Popnikolov & Zhelezova, 1964
<i>Sticta sylvatica</i>	Suza, 1929
<i>Usnea filipendula</i> , <i>U. glabrescens</i> , <i>U. scabrata</i> , <i>U. substerilis</i> , <i>U. subfloridana</i>	Kazandzhiev, 1900, Motyka & Zhelezova, 1962
<i>Xanthoria fallax</i>	Zhelezova, 1963

lichenological techniques. The nomenclature of the species from the reserve area follows Mayrhofer et al. (2005). The classification system of the lichen-forming fungi presented in Appendix 1. Table 2 is accepted after Lumbsch & Huhndorf (2010) and is in accordance with the changes, proposed in the latest 'Outline of Ascomycota' by Wijayawardene et al. (2018). The most recent records of *Lobaria pulmonaria* and *L. scrobiculata* (Scop.) DC in the reserve, made during the present field studies, were published in Stoykov (2018a), and some of their location points were used in Appendix 1. Table 2.

Results and Discussion

The species diversity of the lichen-forming fungi in Rilomanastirska Gora Reserve is relatively rich. The most important microhabitats for lichens are old trees (mostly beech, oak and conifers), rocks, often covered by mosses, and soil. According to the known published data and the results obtained from the examined materials (Appendix 1. Table 2), 105 species (almost 9.5 % of the known species diversity of Bulgaria), including 1 subspecies, 3 varieties, and 2 forms of the lichen-forming fungi are presented on the territory of the

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Appendix 1. Table 2. Diversity of the lichen-forming fungi of Rilomanastirska Gora Reserve. *

*The lichen taxa, studied with herbarium materials are designated in the second column with a symbol (+).

Taxon	Location	Host/Substratum
Ascomycota		
Pezizomycotina		
Arthoniomycetes		
Arthoniales		
Arthoniaceae		
<i>Arthonia radiata</i> (Pers.) Ach.	+, N42°07'53", E023°19'31"	bark of hazel and other broadleaf trees
Rocellaceae		
<i>Opegrapha rufescens</i> Pers.	+, above Bricheborski Dol river, alt. 1650 m	bark of old pine trees
Coniocybomycetes		
Coniocybales		
Coniocybaceae		
<i>Chaenotheca chrysocephala</i> (Turner ex Ach.) Th. Fr.	+	bark of conifers
Eurotiomycetes		
Chaetothyriomycetidae		
Pyrenulales		
Pyrenulaceae		
<i>Pyrenula coryli</i> A. Massal.		bark of hazel
<i>Pyrenula nitida</i> (Weigel) Ach.	+, N42°07'46", E023°19'31"	bark of beech
Verrucariales		
Verrucariaceae		
<i>Dermatocarpon miniatum</i> (L.) W. Mann var. <i>complicatum</i> (Lightf.) Th. Fr.		eruptive rocks
<i>D. miniatum</i> (L.) W. Mann var. <i>miniatum</i> <i>Placidium rufescens</i> (Ach.) A. Massal.	+, N42°07'57", E023°19'55"	siliceous and limestone rocks gneises
Lecanoromycetes		
Candelariomycetidae		
Candelariales		
Candelariaceae		
<i>Candelariella vitellina</i> (Hoffm.) Müll. Arg.	+	rock
<i>C. xanthostigma</i> (Ach.) Lettau	+	trunk of <i>Abies alba</i> , bark of old trees
Lecanoromycetidae		
Lecanorales		
Cladoniaceae		
<i>Cladonia cenotea</i> (Ach.) Schaer.	+	rotten trunks of conifers bark of trees
<i>C. coniocraea</i> (Flörke) Spreng., s.l. <i>C. ochrochlora</i> Flörke	N42°06'30", E23°20'34"; N42°07'56", E023°21'20", Stoykov 2018a	soil, among mosses mossy rocks
<i>C. pyxidata</i> (L.) Hoffm.	+, above Bricheborski Dol river, towards Vtoro Pochivalo below Brichebor peak N42°07'47", E023°19'31", Stoykov 2018a	soil, among moss
<i>C. fimbriata</i> (L.) Fr.		
Lecanoraceae		
<i>Lecanora albella</i> (Pers.) Ach.	+	bark of broadleaf tree
<i>L. carpinea</i> (L.) Vain.	+, N42°07'53", E023°19'31"	twigs of broadleaf trees
<i>L. gangaleoides</i> Nyl.		rock
<i>Lecidella elaeochroma</i> (Ach.) M. Choisy	+	bark of beech
Lecideales		
Lecideaceae		
<i>Porpidia crustulata</i> (Ach.) Hertel & Knoph, s.l.	+	siliceous rock

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Parmeliaceae

<i>Alectoria sarmentosa</i> (Ach.) Ach.		branches of <i>Abies alba</i>
<i>Bryoria capillaris</i> (Ach.) Brodo & D. Hawksw., s.l.	+ , N42°08'06", E023°21'24"	twigs of conifers
<i>B. fuscescens</i> (Gyeln.) Brodo & D. Hawksw., s. l.	+	twigs of conifers
<i>B. subcana</i> (Nyl. ex Stizenb.) Brodo & D. Hawksw., s.l.	+	twigs of conifers
<i>Cetraria islandica</i> (L.) Ach.	+	soil, among mosses
<i>Evernia divaricata</i> (L.) Ach.	+	twigs and bark
<i>E. prunastri</i> (L.) Ach.	+	twigs and bark
<i>Flavoparmelia caperata</i> (L.) Hale	+	twigs and bark
<i>Hypogymnia physodes</i> (L.) Nyl.	+ , N42°06'33", E023°20'28" N42°07'46", E023°19'31", Stoykov 2018a	twigs twigs
<i>H. tubulosa</i> (Schaer.) Hav.		
<i>Melanelia fuliginosa</i> (Fr. ex Duby) Essl. subsp. <i>glabratula</i> (Lamy ex Nyl.) Coppins	+ , N42°07'46", E023°19'31"	trunks of trees, on rocks and mosses
<i>Melanelia glabra</i> (Schaer.) Essl.		<i>Prunus cerasifera</i> Ehrh.
<i>Parmelia saxatilis</i> (L.) Ach.	+	rocks
<i>P. sulcata</i> Taylor	+ , Stoykov 2018a	twigs
<i>Parmelina carporrhizans</i> (Taylor) Poelt & Vězda	+	twigs
<i>P. quercina</i> (Willd.) Hale	+ , Stoykov 2018a	twigs
<i>Platismatia glauca</i> (L.) W.L. Culb. & C.F. Culb.	+	twigs of conifers
<i>Pseudevernia furfuracea</i> (L.) Zopf	+	twigs and bark
<i>Usnea filipendula</i> Stirt.		twigs and bark
<i>U. florida</i> (L.) F.H. Wigg. emend. Clerc, s.l.	+	twigs and bark
<i>U. glabrescens</i> (Vain.) Vain.		twigs and bark of spruce, oak
<i>U. hirta</i> (L.) Weber ex F.H. Wigg., s.l.	+ , Stoykov 2018a	twigs and bark of oak twigs and bark of oak (<i>Quercus petraea</i> (Mattuschka) Liebl.) twigs and bark of oak
<i>U. scabrata</i> Nyl.	+	<i>Abies alba</i> , <i>Betula</i> , <i>Pinus sylvestris</i>
<i>U. subfloridana</i> Stirt.		trunks and bark of conifers
<i>U. substerilis</i> Motyka		
<i>Vulpicida pinastri</i> (Scop.) J.-E. Mattsson & M.J. Lai	+	
Ramalinaceae		
<i>Bacidia rosella</i> (Pers.) De Not.		bark of broadleaf trees
<i>Ramalina calicaris</i> (L.) Fr.	+ , N42°07'52", E023°19'35" + , N42°07'52", E023°19'35", Stoykov 2018a	bark of trees bark of trees
<i>R. farinacea</i> (L.) Ach.		
<i>R. fraxinea</i> (L.) Ach.	+ , N42°07'52", E023°19'35"	bark of trees
Stereocaulaceae		
<i>Lepraria incana</i> (L.) Ach., s.l.	+ , N42°07'52", E023°19'35", Stoykov 2018a	soil among mosses, bark of trees
<i>L. membranacea</i> (Dicks.) Vain.		gneises, among mosses
Peltigerales		
Collemataceae		
<i>Collema flaccidum</i> (Ach.) Ach.	+	granite rock with mosses
<i>C. nigrescens</i> (Huds.) DC.		<i>Prunus cerasifera</i> Ehrh., beech trees
<i>C. occultatum</i> Bagl.		trees
<i>Leptogium lichenoides</i> (L.) Zahlbr.		gneises
<i>L. gelatinosum</i> (With.) J.R. Laundon	+ , Stoykov 2018a	mossy bark of old tree
Lobariaceae		
<i>Lobaria amplissima</i> (Scop.) Forssell		trunk of beech
<i>L. pulmonaria</i> (L.) Hoffm. f. <i>papillaris</i> (Delise) Hue	+ , N42°09'11", E023°24'1", Stoykov 2018a	trunks and bark of beech
<i>L. pulmonaria</i> (L.) Hoffm. f. <i>pulmonaria</i>	N42°07'53", E023°19'24", 1436 m; maple, N42°07'56", E023°19'30", 1354 m; oak, N42°06'26", E023°20'38", Stoykov 2018a	bark of oak, beech

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<i>L. scrobiculata</i> (Scop.) DC.	+ , N42°06'30" , E023°20'16" , Stoykov 2018a	gneises; mossy rocks, trunk of old beech
<i>Sticta sylvatica</i> (Huds.) Ach.		mossy gneises
Massalungiaceae		
<i>Leptochidium albociliatum</i> (Desm.) M. Choisy		rocks and mosses
<i>Polychidium muscicola</i> (Sw.) Gray		mosses
Nephromataceae		
<i>Nephroma laevigatum</i> Ach.	+ , after Bricheborški Dol river, N42°07'53" , E023°21'28"	trunk of old beech
<i>N. parile</i> (Ach.) Ach.	+ , Kirilova Polyana	bark of beech
<i>N. resupinatum</i> (L.) Ach.	+ , Kirilova Polyana	bark of beech, on soil among mosses, mossy rock
Pannariaceae		
<i>Pannaria conoplea</i> (Ach.) Bory		mossy gneisses
<i>Protopannaria pezizoides</i> (Weber) P.M. Jørg. & S. Ekman	+ , along the trail to Ivan Vazoh chalet	bark of beech
Peltigeraceae		
<i>Peltigera canina</i> (L.) Willd.	+	soil, among mosses
<i>P. didactyla</i> (With.) J.R. Laundon		rocks
<i>P. lepidophora</i> (Nyl. ex Vain.) Bitter		soil
<i>P. polydactylon</i> (Neck) Hoffm.		gneises
<i>P. praetextata</i> (Flörke) Vain.		granite rock, mossy bark of beech
<i>P. rufescens</i> (Weiss) Humb.		rotten trunk
<i>P. venosa</i> (L.) Hoffm.	+ , N42°08'03" , E023°21'15"	soil, among mosses,
Rhizocarpaceae		
<i>Rhizocarpon geographicum</i> (L.) DC.	+	siliceous rocks
<i>R. viridiatrum</i> (Wulfen) Körb.		siliceous rocks
Teloschistales		
Caliciaceae		
<i>Amandinea punctata</i> (Hoffm.) Coppins & Scheid.	+ , N42°07'52" , E023°19'36"	bark of beech
<i>Calicium viride</i> Pers.	+ , Kirilova Polyana, alt. ca 1200 m.	bark of fir
Physciaceae		
<i>Anaptychia ciliaris</i> (L.) Körb.	+ , N42°07'48.5" , E023°19'50" ; oaks, N42°06'24" , E023°20'39" , N42°06'34" , E023°20'31" , Stoykov 2018a	bark of spruce and old beech trees
<i>Physcia aipolia</i> (Humb.) Fűrnr.	+ , N42°07'48.5" , E023°19'50"	bark of beech, oak
<i>P. caesia</i> (Hoffm.) Fűrnr.		siliceous rock
<i>P. dubia</i> (Hoffm.) Lettau		siliceous rock
<i>P. stellaris</i> (L.) Nyl.		bark of beech, oak
<i>Physconia distorta</i> (With.) J.R. Laundon	N42°06'24.5" , E023°20'39" , Stoykov 2018a	bark and dead branches of beech, <i>Quercus robur</i> L., oaks
<i>P. grisea</i> (Lam.) Poelt		bark of spruce
<i>P. perisidiosa</i> (Erichsen) Moberg		deciduous branches
<i>Rinodina sophodes</i> (Ach.) A. Massal.	+ , N42°07'51" , E023°19'30" ; N42°06'34" , E023°20'31"	bark and twigs of beech
Teloschistaceae		
<i>Xanthoria fallax</i> (Hepp) Arnold		bark of spruce
Ostropomycetidae		
Ostropales		
Graphidaceae		
<i>Diploschistes muscorum</i> (Scop.) R. Sant.		moss on rocks
<i>Graphis scripta</i> (L.) Ach.	N42°07'51" , E023°19'56"	bark of trees
Porinaceae		
<i>Pseudosagedia aenea</i> (Wallr.) Hafellner & Kalb.	after Kalugerski Dol river	branches of smooth-bark trees

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Pertusariales**Megasporaceae**

Aspicilia cinerea (L.) Körb., s.l. +, after Kalugerski Dol river rock

Ochrolechiaceae

Ochrolechia alboflavescens (Wulfen) Zahlbr. bark of *Abies alba*
O. pallescens (L.) A. Massal. +, N42°06'34", E023°20'31" bark of beech, *Sorbus* sp.
O. szatalaensis Verseggy bark of beech

Pertusariaceae

Pertusaria albescens (Huds.) M. Choisy & Werner +, N42°06'33", E023°20'28", bark of oak trees
 [= *Lepra albescens* (Huds.) Hafellner] Stoykov 2018a
P. amara (Ach.) Nyl. [= *Lepra amara* (Ach.) Hafellner] bark of beech trees
 +, N42°06'33", E023°20'28"
 +, near the trail from Kalugerski bark of old beech tree
 Dol river to Ivan Vazov hut
P. hemisphaerica (Flörke) Erichsen +, N42°07'51", E023°19'56", bark of beech
 N42°07'49", E023°19'49"
P. flavida (DC.) J.R. Laundon +, N42°06'33", E023°20'28" rock
P. lactea (L.) Arnold +, N42°07'52", E023°21'37"; bark of beech
 N42°09'29", E023°23'48"
P. leioplaca DC. +, N42°06'28", E023°20'20", bark of beech
 N42°08'06", E023°21'17"
P. pertusa (Weigel) Tuck.

Trapeliales**Trapeliaceae**

Xylographa parallela (Ach. : Fr.) Fr. +, N42°07'47", E023°21'35" decorticated dead conifer tree

Umbilicariomycetidae**Umbilicariales****Umbilicariaceae**

Lasallia pustulata (L.) Mérat +, N42°06'33", E023°20'30" rock

Rilomanastirska Gora Reserve. They belong to 53 genera, 29 families, 13 orders, 5 subclasses (*Chaetothyriomycetidae*, *Candelariomycetidae*, *Lecanoromycetidae*, *Ostropomycetidae*, and *Umbilicariomycetidae*), and 4 classes (Arthoniomycetes, Coniocybomycetes, Eurotiomycetes, and Lecanoromycetes), subdivision Pezizomycotina, division Ascomycota. The species richness is found to be the highest in the class Lecanoromycetes (97 species); among the subclasses in Lecanoromycetidae (79 species), and Ostropomycetidae (15); among the orders in Lecideales (34 species), and Peltigerales (23); among the families in Parmeliaceae (26 species), Physciaceae (9), Peltigeraceae (7), and Pertusariaceae (7). The richest genera were *Usnea* (7 species), *Peltigera* (7), and *Pertusaria*, including *Lepra* (7); *Cladonia* (5), *Physcia* (4), *Bryoria*, *Collema*, *Lecanora*, *Lobaria*, *Nephroma*, *Ochrolechia*, *Physconia*, and *Ramalina* (3). Most probably the diversity of the lichen-forming fungi in that part of the Rila mountain is a result of its known complex habitat and microhabitat diversity, ecology, geographic location, unique surroundings, the presence of preserved old-growth forest communities, composed of coniferous and broadleaf (predominantly beech, Rila oak) trees, the peculiar geology of the reserve, and its specific environmental conditions (air humidity and atmospheric purity, mountain rivers and streams, unique temperature amplitudes, type of soils, rocks), etc.

During this study, we have observed the following species: *Alectoria sarmentosa*, *Calicium viride*, *B. fuscescens*, *B. subcana* s.l., *Chaenotheca chrysocephala*, *Cladonia cenotea*, *C. coniocraea*, *C. fimbriata*, *Evernia divaricata*, *Hypogymnia physodes*, *H. tubulosa*, *Opegrapha rufescens*, *Platismatia glauca*, *Pseudevernia furfuracea*, *Vulpicida pinastri*, *Xylographa parallela*, along with most of the species of genus *Usnea* Dill. ex Adans. with pendulous thalli, have ecological preferences to old-growth coniferous forests. Another group of species (*Arthonia radiata*, *Evernia prunastri*, *Melanelia fuliginosa* subsp. *glabratula*, *Lecanora albella*, *L. caprinea*, *Ochrolechia pallescens*, *Parmelia sulcata*, *Pertusaria amara* (= *Lepra amara* (Ach.) Hafellner), *P. albescens* (= *Lepra albescens* (Huds.) Hafellner), *P. hemisphaerica*, *P. flavida*, *P. pertusa*, *P. leioplaca*, *Pyrenula nitida*, *Pseudosagedia aenea*, *Ramalina fraxinea*, *R. calicaris*, *Usnea scabrata* and *U. subfloridana*) has preferences to broadleaf trees.

Arthonia radiata was reported in the region of Rilomanastirska Gora Reserve on the bark of hazel (Suza, 1929). It has been confirmed during this study on *Corylus avellana* L. along the trail from Kalugerski Dol river, in direction to Ivan Vazov chalet, and near St. Luka chapel, on bark of old deciduous trees. Recently this species has been recorded on bark of hazel and smooth-bark shrubs in Ibur

Reserve, Rila National Park (Gyosheva & Stoykov, 2019). It was reported from Vitosha, Rila and Rhodopi Mts (Mayrhofer et al., 2005). *Arthonia radiata*, along with *A. cinnabarina* (DC.) Wallr., is known to be common on young smooth-bark trunks in Great Britain (Rose, 1993).

Mention deserves the presence of thalli of *Calicium viride* studied with a single collection from the reserve area, based on a specimen collected from Kirilova Polyana locality on the bark of fir. In Bulgaria, it is known from the limited number of localities on the bark of old-aged coniferous trees (spruce, fir). The species was reported by Zhelezova (1956) along the road to Ribnite Ezera lakes on the bark of *Abies alba*. So far *C. viride* is known in the Pirin, the Rila and the Rhodopi Mts (Mayrhofer et al., 2005; Ivanov 2010). It has been recorded on old-aged spruce trees in the Central Rilski Reserve (Stoykov, 2018b).

Ochrolechia pallescens was reported from the following floristic regions: Stara Planina, Belasitsa, Pirin, Rila and Rhodopi Mts (Mayrhofer et al., 2005). It has been confirmed with herbarium material in SOMF on large branches of *Sorbus* sp. above the Ilijna River.

Opergrapha rufescens has been recorded in the Rilomanastirska Gora Reserve, above Brichebor peak, on the bark of very old pine trees at altitude 1650 m. It was known so far only from Central Balkan National Park and Strandzha Nature Park on the bark of oaks (Spier et al., 2008). Recently, it has been collected in the Balgarka Nature Park, Todorchetata village, on the bark of young walnut trees (Stoykov, unpubl.).

Pertusaria amara has been recorded on the bark of old beech trees from Kirilova Polyana locality and after Kalugerski Dol river in direction to Ivan Vazov chalet (Appendix 1. Table 2). The species was known so far in the Black Sea coast region, Stara Planina, Belasitsa and Strandzha Mts (Mayrhofer et al., 2005; Spier et al., 2008).

Pertusaria hemisphaerica has been found on the bark of old beech tree along the trail from the Kalugerski Dol river in direction to Ivan Vazov chalet. It was reported only from the following floristic regions: Black Sea coast, Belasitsa, Pirin and Rila Mts (Mayrhofer et al., 2005).

Pertusaria leioplaca was known on the slopes above Rilski monastery on *Fagus sylvatica* at 1200 m alt. (Pišút, 2001). The species has been recorded during this study on beech in the vicinities of Brichebor peak and Kalugerski Dol rivers and above Rilski monastery – St. Luka chapel locality, and near Kirilova Polyana locality. During 2014 it was collected on the bark of old beech trees in Rhodopi Mts – Mantaritsa Reserve, Pashino Burdo locality and in Strandzha Mts – Nature Park Strandzha, near Kondolovo village (Stoykov, unpubl.). It has been reported in Rila Mts from Ibur Reserve, along with *Pertusaria lactea* (L.) Arnold (Gyosheva & Stoykov, 2019).

Pseudosagedia aenea was known so far from the Black Sea region, Stara Planina (Boatin Reserve), Rila – Ibur Reserve and Strandzha mountains – Silkosiya Reserve (Popnikolov & Zhelezova, 1964; Spier et al., 2008; Gyosheva & Stoykov, 2019).

Xylographa parallela has been recorded on the decorticated bark of dead decorticated coniferous tree above Kirilova Polyana. It was known from the Stara Planina, Pirin, Rila and Rhodopi Mts (Mayrhofer et al., 2005).

Two lichens of conservation concern in Bulgaria were known from Rilomanastirska Gora Reserve, according to the data accepted in the National Strategy for protection of the biological diversity (Vodenicharov et al., 1993): *Sticta sylvatica* (Suza 1929), and following the criteria of the IUCN, *Lobaria pulmonaria* (Stoykov 2015, 2018a). Both species exist in single localities and are with restricted regional distribution throughout the country, furthermore the populations of the lung lichen decline in many European countries.

Polychidium muscicola could be considered as one of the rarely recorded species among the lichen-forming fungi of Bulgaria, because it is known so far only with single localities in the Rila Mts: Rilomanastirska Gora Reserve, above the Rilski monastery, at 1200 m alt. (Suza, 1929), Central Rilski Reserve, above Sarugyol hut, at 1990 m alt. (Stoykov, 2018b), and in the Rhodopi Mts: Smolyan and Chepelare (Szatala, 1930; Popnikolov & Zhelezova, 1964).

Acknowledgement

This study was conducted within the framework of ‘Phylogeny, distribution and sustainable use of fungi’ project. Mrs. Siyka Nikolova (Sofia, Bulgaria) is acknowledged for the determination of *Rinodina sophodes* collections. The author is grateful to the anonymous reviewers for their useful remarks.

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