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Lichen flora of Rodnei Mountains National Park (Eastern Carpathians, Romania) including new records for the Romanian mycoflora

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Abstract: We investigated the lichen flora of the main habitats existing in Rodnei Mountains identifying 283 lichen species, and one subspecific taxon. Of these, 67 taxa are new records for the lichen flora of Romania, and 182 species are reported for the first time in Rodnei Mountains. Considering previous reports and our results, 442 lichen taxa are reported in Rodnei Mountains region in total, accounting for approx. 35% of the total lichen flora of Romania. When comparing the Red Lists of Romania and surrounding Carpathian countries, our data revealed the presence of a high number of threatened species in the region.

INTRODUCTION

During the last years, various lichenological studies reported new species for the Romanian lichen flora (Crișan, 2006; Çobanoğlu et al., 2009, 2011; Yavuz & Çobanolu, 2008; Vondrák & Šoun, 2008), but at the same time, species that had been recorded before, such as *Anzina carneonivea* (Scheidegger, 1985) and *Lepraria incana* (Bartók, 1999) are missing in the current checklist (Ciurchea, 2004).

260 lichen species from 11 locations were previously reported in Rodnei Mountains (Ciurchea, 2004), and reflected the high species richness of the national park. However, the knowledge of lichen species distribution is still scattered in Romania and some of the species records have not been rechecked since more than a century (Bartok & Crișan, personal communication).

Conserved areas are well known sanctuaries for threatened species including various groups of lichens (Goward, 1995; Zoller et al., 2000; Nascimbene et al., 2013; Ignatov et al., 2004; Lackovičová & Guttová, 2006). Furthermore, lichen habitats such as old-growth forest stands and veteran trees in extensively managed meadows with their important lichen microhabitats are often lost in managed and perturbed areas (Wolseley, 1995; Thor, 1995; Scheidegger & Werth, 2009).

The aim of this study was to assess the lichen flora of characteristic habitats of the Rodnei Mountains in a replicated design with a standardized lichen diversity assessment. This study should also reveal the importance of conserved areas for the maintenance of lichen diversity in the Rodnei Mountains and thus contribute to decisions about future conservation strategies within this biosphere reserve.

MATERIALS AND METHODS

Study area

The Rodnei Mountains are located in the northern part of the Eastern Carpathians reaching their highest elevation at Pietrosul Mare Peak (2303 m). Most of the study area is part of the Rodnei Mountains National Park, established in 1932 and declared as a UNESCO Biosphere Reserve in 1979.

Climate

Due to the position and orientation (East–West) of the mountains, the climate is characterised by the Baltic and the Oceanic influences. The mean annual temperature decreases with altitude, ranging between 6 °C at the base of the mountains and -1.5 °C at the highest altitudes. Mean annual precipitations range from 1300 to 1400 mm (Gorduza, 1983).

Sampling

The sampling method was structured according to the sampling design described by Scheidegger

et al. (2002). Four main substrates were considered in each circular plot of 1 ha: trees, dead wood, soil and rock, and for each we applied 6 relevés. If the substrate was not available or it was not colonised with lichens, it was substitued with other available substrates, thus achieving 24 relevés in each plot. All lichen species within a relevé surface of 0.2 m^2 were collected (except the crustose lichens from rocks).

The investigated habitats are well represented in the Rodnei Mountains and follow an altitudinal gradient from wooded meadows to mixed and coniferous forests, to *Pinus mugo* shrubs and alpine vegetation with bare rocks. Each of the five habitats was analysed at two levels: conserved and managed (except *Pinus mugo* shrubs and wooded meadows, for which only one type of management was found in the study area). There were seven replicated circular plots of 1 ha for each habitat with its corresponding levels of conservation (i.e., 56 plots in total). The minimum distance between the plots was 100 m. The selection of the 9 sampling localities (Fig. 1) aimed at covering the types of habitat and stand characteristics (Table 1) of the investigated area.

The lichen specimens were identified based on morphological and chemical characteristics using mostly the keys of Smith et al. (2009), Wirth (1995) and Tønsberg (1992).

For the crustose sterile species and the specimens that needed chemical analyses for identification, thin layer chromatography (TLC) was used according to the methods described in White & James (1985) with solvents A, B and C.

The specimens are stored in the Herbaria of "Alexandru Borza" Botanical Garden, Babeș-Bolyai University, Cluj-Napoca, Romania.

Data assessment

The importance of lichen flora in our results was determined by the total number of species, the number of new species for the region, and the new species for Romanian lichen flora. We also took into account the number of species in the Red List of macrolichens from Romania (Bartok & Crișan, personal communication)

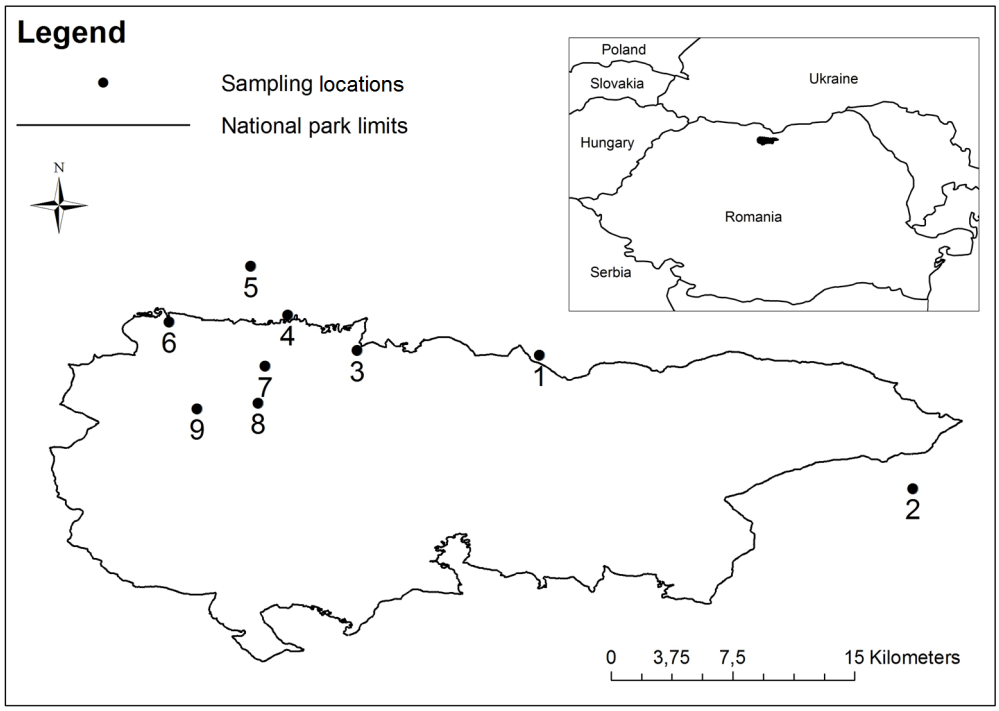

Fig. 1. Location of the Rodnei Mts National Park in Romania, and study area with sampling localities. 1 – Cascada Cailor, 2 – Rotunda Pass, 3 – Repedea Valley, 4 – Borșa 1, 5 – Borșa 2, 6 – Izvorul Dragoș Valley, 7 – Pietrosul Mare, 8 – Gropile, 9 – Bătrâna.

Table 1. 56 investigated plots (within the 9 sampling localities, see Fig. 1). Abbreviations: AC – conserved alpine vegetation with bare rocks, AM – managed alpine vegetation with bare rocks, PM – *Pinus mugo* shrubs, CC – conserved coniferous forest, CM – managed coniferous forest, MC – conserved mixed forest, MM – managed mixed forest, WM – wooded meadows, C – conserved, M – managed.

Plot code	Location name	Coordinates x	Coordinates y	Altitude (m)	Exposition	Slope [°]	Conservation status	Habitat type
AC1	Pietrosul Mare	47,5941	24,6365	2143	W	33	C	alpine vegetation
AC2	Pietrosul Mare	47,5915	24,6379	2125	E	10	C	alpine vegetation
AC3	Pietrosul Mare	47,5955	24,6505	2136	E	5	C	alpine vegetation
AC4	Pietrosul Mare	47,5935	24,6407	2171	S	39	C	alpine vegetation
AC5	Pietrosul Mare	47,6004	24,6231	1916	W	39	C	alpine vegetation
AC6	Pietrosul Mare	47,5994	24,6304	2193	S	12	C	alpine vegetation
AC7	Pietrosul Mare	47,5996	24,6279	2173	S	43	C	alpine vegetation
AM1	Gropile	47,579	24,6325	2085	E	7	M	alpine vegetation
AM2	Gropile	47,5703	24,6468	2020	S	24	M	alpine vegetation
AM3	Gropile	47,5715	24,6396	2004	S	5	M	alpine vegetation
AM4	Gropile	47,5739	24,6344	1085	S	29	M	alpine vegetation
AM5	Bătrâna	47,5699	24,6124	1915	S	24	M	alpine vegetation
AM6	Bătrâna	47,568	24,6116	1816	S	26	M	alpine vegetation
AM7	Bătrâna	47,5782	24,6032	1719	W	24	M	alpine vegetation
PC1	Pietrosul Mare	47,6018	24,6479	1785	E	14	C	*Pinus mugo* shrubs
PC2	Pietrosul Mare	47,5886	24,6472	1882	S	36	C	*Pinus mugo* shrubs
PC3	Pietrosul Mare	47,6019	24,6506	1788	N	28	C	*Pinus mugo* shrubs
PC4	Pietrosul Mare	47,5913	24,6437	2040	S	32	C	*Pinus mugo* shrubs
PC5	Pietrosul Mare	47,6014	24,6229	2019	W	33	C	*Pinus mugo* shrubs
PC6	Pietrosul Mare	47,6071	24,6113	1821	W	26	C	*Pinus mugo* shrubs
PC7	Bătrâna	47,5692	24,596	1781	S	30	C	*Pinus mugo* shrubs
CC1	Repedea Valley	47,5964	24,6918	1164	E	26	C	spruce forest
CC2	Repedea Valley	47,5952	24,679	1326	S	38	C	spruce forest
CC3	Pietrosul Mare	47,6059	24,6067	1596	S	32	C	spruce forest
CC4	Pietrosul Mare	47,6028	24,6054	1477	S	33	C	spruce forest
CC5	Pietrosul Mare	47,6053	24,6026	1470	S	37	C	spruce forest
CC6	Pietrosul Mare	47,6036	24,6002	1353	W	25	C	spruce forest
CC7	Pietrosul Mare	47,6014	24,6013	1316	S	37	C	spruce forest
CM1	Borşa1	47,62	24,6589	1148	N	27	M	spruce forest
CM2	Repedea Valley	47,5938	24,7012	1151	N	31	M	spruce forest
CM3	Repedea Valley	47,5982	24,7051	1375	W	36	M	spruce forest
CM4	Repedea Valley	47,6018	24,7087	1357	N	25	M	spruce forest
CM5	Cascada Cailor	47,6062	24,795	1275	W	14	M	spruce forest
CM6	Izvorul Dragoş Valley	47,5982	24,6022	1081	E	35	M	spruce forest
CM7	Izvorul Dragoş Valley	47,5989	24,6016	932	N	19	M	spruce forest
MC1	Repedea Valley	47,5972	24,6907	966	N	40	C	mixed forest
MC2	Cascada Cailor	47,5951	24,797	1207	N	35	C	mixed forest
MC3	Rotunda Pass	47,5244	24,9998	1044	W	21	C	mixed forest
MC4	Rotunda Pass	47,5284	25,0041	1089	W	14	C	mixed forest
MC5	Izvorul Dragoş Valley	47,6083	24,5874	863	E	35	C	mixed forest
MC6	Repedea Valley	47,5943	24,6815	1180	E	44	C	mixed forest
MC7	Izvorul Dragoş Valley	47,6016	24,5935	1019	N	15	C	mixed forest
MM1	Repedea Valley	47,5899	24,7002	1196	W	42	M	mixed forest
MM2	Repedea Valley	47,6149	24,6977	866	W	14	M	mixed forest

Table 1 (continued)

Plot code	Location name	Coordinates x	Coordinates y	Altitude (m)	Exposition	Slope [°]	Conservation status	Habitat type
MM3	Repedea Valley	47,6128	24,6871	1257	E	35	M	mixed forest
MM4	Repedea Valley	47,6146	24,6922	1058	E	33	M	mixed forest
MM5	Izvorul Dragoş Valley	47,6227	24,5758	903	N	32	M	mixed forest
MM6	Izvorul Dragoş Valley	47,6228	24,5858	930	N	41	M	mixed forest
MM7	Izvorul Dragoş Valley	47,6242	24,5957	915	S	5	M	mixed forest
WM1	Borşa1	47,6216	24,6494	1095	N	18	M	wooded meadows
WM2	Borşa1	47,6224	24,6396	1048	N	13	M	wooded meadows
WM3	Borşa1	47,6228	24,6325	1048	N	6	M	wooded meadows
WM4	Borşa1	47,6287	24,6635	1988	N	16	M	wooded meadows
WM5	Borşa2	47,6504	24,6356	783	N	10	M	wooded meadows
WM6	Izvorul Dragoş Valley	47,6209	24,6176	1036	N	23	M	wooded meadows
WM7	Izvorul Dragoş Valley	47,6211	24,6125	957	N	33	M	wooded meadows

and the Red Lists of the surrounding countries which harbour the Carpathian mountain ridge: Hungary (Lőkös & Tóth, 1996), Ukraine (Didukh, 2009), Slovakia (Pisút et al., 2001), and Poland (Cieslinski et al., 2003), with detailed information in Table 2.

RESULTS AND DISCUSSIONS

We found 283 lichens species and one subspecific taxon for the Rodnei Mountains in 56 plots (Table 3). We confirmed 102 species that were reported previously, plus 182 taxa that were new records for the region, of which 67 species have never been reported in Romania. Poorly developed specimens that could not be unambiguously assigned to listed species are not reported as new. Considering previous reports and our results, 442 lichen taxa are reported in Rodnei Mountains region, accounting for approx. 35% of the total lichen flora of Romania. Out of 284 taxa, 13 are listed in the Red List of macrolichens of Romania (Bartok & Crişan, personal communication), 8 species in the Red List of Ukraine (Didukh, 2009), 65 in the Red List of Hungary (Lőkös & Tóth, 1996), 96 in the Red List of Slovakia (Pisút et al., 2001), and 125 in the Red List of Poland (Cieslinski et al., 2003).

The most species-rich genus is *Cladonia,* of which we found 43 species in our study area. Even though most species are common, this genus contributed substantially to the lichen species richness of Rodnei Mountains.

Table 2. Red Lists (RL) including the number of lichen species according to IUCN categories: RE – Regionally extinct, CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NT – Near Threatened, LC – Least Concern, DD – Data Deficient, additional category in RL of Hungary: R – rare (problematic species including literature data without voucher specimens and new findings with no further information on the distribution), and in RL of Ukraine: R – rare (species known from few locations, with relatively stable populations but low rates), and Total no of sp. – total number of species in the Red List.

RL	IUCN Categories							R	Total no of sp.
	RE	CR	EN	VU	NT	LC	DD		
Romania		20	27	26					73
Hungary	30	24	44	45				260	403
Ukraine			5	26				21	52
Slovakia	88	140	48	169	114		14		573
Poland	141	179	201	165	68	22	110		886

Table 3. Lichen species recorded in the study area. Abbreviations: New R Mts – new records for the Rodnei Mountains, New RO – new records for Romania; RL RO – Red List of Macrolichens from Romania (Bartok & Crișan, personal communication), RL UK – Red List of lichens from Ukraine (Didukh, 2009), RL HU – Red List of lichens from Hungary (Lőkös & Tóth, 1996), RL PL – Red List of lichens from Poland (Cieslinski et al., 2003), RL SL – Red List of lichens from Slovakia (Pisút et al., 2001); Obs – number of plots where the species was observed; categories of red lists: RE – Regionally extinct, CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NT – Near Threatened, LC – Least Concern, DD – Data Deficient, R – rare; poorly developed specimens are marked with *

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
Absconditella lignicola Vězda & Pišút	1	1				VU		3	CC1,3,4
Acrocordia gemmata (Ach.) A. Massal.								1	MC3
Alectoria ochroleuca (Hoffm.) A. Massal.						LC		7	AC1, 3, 4, 5, 6 AM2, 4
Amandinea punctata (Hoffm.) Coppins & Scheid.								4	WM2, 3, 4, 5
Anisomeridium biforme (Borrer) R.C. Harris	1					VU	RE	1	MC5
Anzina carneonivea (Anzi) Scheid.	1					EN	VU	1	PM7
Arthonia caesia (Flot.) Körb.	1	1						1	MC3
Arthonia didyma Körb.	1				R	EN	CR	2	MC6, MM7
Arthonia elegans (Ach.) Almq.	1					RE		1	MC5
Arthonia lapidicola (Taylor) Branth & Rostr.					R	NT		2	MC1, MC6,
Arthonia punctiformis Ach.	1				R	EN	CR	1	CM3
Arthonia radiata (Pers.) Ach.							CR	6	MC5, MC6, MC7, MM4, MM6, MM7
Arthonia vinosa Leight.						NT	CR	1	MC6
Arthrorhaphis citrinella (Ach.) Poelt	1				VU	VU		6	AC1, AC3, AC5, AC6, AC7, PM5
Bacidia delicata (Larbal. ex Leight.) Coppins	1	1						1	MM3
Bacidia rubella (Hoffm.) A. Massal.	1					VU	VU	2	MC3, MM1
Baeomyces placophyllus Ach.	1					CR		4	PM3, AC6, AM2, CC2
Baeomyces rufus (Huds.) Rebent.								27	MC1, 2, MC2, MM5, PM3, 7, WM1, 4, 5, AC1, 2, 3, 4, 6, CC1, 2, 3, 4, 5, 6, 7, CM2, 3, 4, 5, AM1, 2, 7
Bellemerea cinereorufescens (Ach.) Clauzade & Cl. Roux	1					CR		1	MC3
Biatora betulicola Kullh.	1	1						3	PM5, AC2, AC3
Biatora chrysantha (Zahlbr.) Printzen	1	1						2	PM1, CM6
Biatora efflorescens (Hedl.) Räsänen	1	1				VU	VU	1	CC6
Biatora globulosa (Flörke) Fr.					R			2	MC3, MC4
Brodoa intestiniformis (Vill.) Goward	1					VU	NT	6	AC1, 2, 4, AM1, 2, 6
Bryoria capillaris (Ach.) Brodo & D. Hawksw.	1					CR	CR	2	CC1,4
Bryoria chalybeiformis (L.) Brodo & D. Hawksw.					VU	CR		1	AC3
Bryoria implexa (Hoffm.) Brodo & D. Hawksw.					VU	CR	CR	5	AC3, WM3, CC1, 4, 5
Bryoria lanestris (Ach.) Brodo & D. Hawksw.	1		VU			RE	CR	1	CC3
Buellia disciformis (Fr.) Mudd	1					VU		3	MC3, MM3, 5
Buellia erubescens Arnold						CR		5	MC2, 3, 4, 7, MM7
Buellia griseovirens (Turner & Borrer ex Sm.) Almb.	1	1						3	WM5, 7, CM5,
Buellia cf. hyperbolica Bagl.								1	PM1

Table 3 (continued)

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
*Calicium cf. salicinum** Pers.					EN	VU	EN	1	MC6
Candelariella reflexa (Nyl.) Lettau	1				R			4	MC6, MM4, WM5, 7
Candelariella vitellina (Ehrh.) Müll. Arg.	1							3	MM5, WM5, 6
Catillaria nigroclavata (Nyl.) J. Steiner	1				R			1	WM7
Cetraria aculeata (Schreb.) Fr.					CR			2	AC3,5
Cetraria ericetorum Opiz						NT	VU	6	AC3,5, 6,7, AM2, 5
Cetraria islandica (L.) Ach.			VU		EN	VU	VU	24	PM1, 2, 3, 4, 5, 6, 7, PM2, 3, 4, 5, 6, 7, WM5, AC1, 2, 3, 4, 5, 6, 7, CC3, 4, AM11, 2, 3, 4, 5, 6, 7
Cetraria muricata (Ach.) Eckfeldt	1	1				NT		1	AC3
Cetraria sepincola (Ehrh.) Ach.	1		EN		R	EN	VU	1	PM7
Cetrelia olivetorum (Nyl.) W.L. Culb. & C.F. Culb.	1				VU	EN		2	MC2, 3
Chaenotheca brachypoda (Ach.) Tibell	1	1				EN	CR	1	MC1
Chaenotheca brunneola (Ach.) Müll. Arg.	1				CR	EN	CR	2	CC1, CM7
Chaenotheca chrysocephala (Ach.) Th. Fr.	1				VU		VU	5	MC1, CC1, 4, 5, 6
Chaenotheca ferruginea (Turner ex Sm.) Mig.	1				EN			1	CC4
Chaenotheca furfuracea (L.) Tibell	1				EN	NT	NT	4	MC6, MM3, 7, CC1
Chaenotheca gracilenta (Ach.) Mattsson & Middelb.	1						CR	1	MM3
Chaenotheca stemonea (Ach.) Müll. Arg.	1	1				EN	CR	1	CC6
Chaenotheca trichialis (Ach.) Hellb.	1				EN	NT	CR	3	MM4, CC1,5
Chrysothrix candelaris (L.) J.R. Laundon	1					CR		2	MC2, 3
Cladonia arbuscula (Wallr.) Flot.					VU			12	AC1, 2, 3, 4, 5, 6, 7, AM2, 3, 4, 5, 6
Cladonia bellidiflora (Ach.) Schaer.	1					EN		8	AC4, 7, AM1, 2, 3, 4, 5, 6
Cladonia caespiticia (Pers.) Flörke						EN		3	AC1, CC6, CM5
Cladonia callosa Delise ex Harm.	1	1						1	AC2
Cladonia carneola (Fr.) Fr.	1					CR	EN	5	PM6, WM5, CC2, 3, AM2
Cladonia cenotea (Ach.) Schaer.					VU			11	MC2, MM2, 3, PM1, 2, WM1, 3, 6, CC1, 2, CM5
Cladonia cervicornis (Ach.) Flot.								8	AC1, 2, 3,4, 6, 7, AM1,3
Cladonia chlorophaea (Flörke ex Sommerf.) Spreng.	1							34	MC5, 6, 7, MM2, 6, PM1, 2, 3, 4, 5, 6, 7, WM1, 3, 4, 5, 6, 7, AC1, 2, 3, 4, 5, 6, 7, CC2, 3, 5, 6, 7, CM5, AM1, 3, 4, 7
Cladonia coccifera (L.) Willd.					EN			16	AC1, 2, 3, 4, 5, 6, 7, CC3, AM1, 2, 3, 4, 5, 6, 7, PM7
Cladonia coniocraea (Flörke) Spreng.								28	MC1, 2, 3, 4, 5, 6, 7, MM2, 3, 4, 5, 6, 7, PM3, WM1, 3, 4, 6, 7, CC1, 3, 5, 6, 7, CM5, 6, AC5, AM3
Cladonia cornuta (L.) Hoffm.					VU		VU	13	MC2, 4, 5, 7, MM2, 5, 6, PM1, 3, WM3, CC1, CM5, AM7
Cladonia deformis (L.) Hoffm.								4	PM1, CC3, CC5, AM2
Cladonia digitata (L.) Hoffm.								41	MC1, 2, 3, 4, 5, 6, 7, MM2, 3, 4, 6, PM1, 2, 3, 4, 5, 6, WM1, 2, 3, 6, AC1, 2, 3, 4, 5, 6, CC1, 2, 3, 4, 5, 6, 7, CM1, 2, 5, AM1, 2, 3, 7
Cladonia diversa Asperges	1	1						3	AC3, AC4, AM1
Cladonia fimbriata (L.) Fr.								15	MC4, 5, 7, MM2, 5, 6, WM1, 2, 4, 5, 6, 7, CC3, 7, CM5,

Table 3 (continued)

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
Cladonia floerkeana (Fr.) Flörke					EN			13	MM2, 3, AC3, 4, 5, 6, 7, CC3, 6, AM2, 3, 4, 7
Cladonia furcata (Huds.) Schrad.								17	MC7, MM2, 5, 6, WM1, 2, 3, 5, 6, 7, CC1, 3, 4, 5, 6, CM5, AM7
Cladonia gracilis (L.) Willd.					VU			9	MC5, PM4, 5, 6, AC2, 5, CC3, 5, 6
Cladonia humilis (With.) J.R. Laundon	1	1						6	MC6, WM2, 3, 5, 7, AM6
Cladonia incrassata Flörke	1		EN			EN	RE	4	AC1, 7, CM1
Cladonia luteoalba A. Wilson & Wheldon	1	1						1	AC5
Cladonia macilenta Hoffm.								21	MC7, MM2, 3, 5, 6, PM2, 4, 6, WM1, 5, 6, 7, AC4, 6, CC2, 5, 6, AM1, 3, 5, 6
Cladonia macroceras (Delise) Ahti	1	1				VU		21	PM1, 2, 3, 4, 5, 6, 7, AC1, 2, 3, 5, 6, 7, AM1, 2, 3, 5, 6, 7
Cladonia macrophylla (Schaer.) Stenh.			VU			CR	EN	1	AC7
Cladonia magyarica Vain. ex Gyeln.	1	1					CR	1	PM4
Cladonia maxima (Asahina) Ahti	1	1						11	PM1, 2, 3, AC1, 6, 7, AM1, 2, 3, 5, 6
Cladonia metacorallifera Asahina	1	1						2	AC3, 4
Cladonia ochrochlora Flörke					R			19	MC1, 2, 4, 5, 6, 7, MM2, 3, 4, 6, PM6, WM1, 2, 3, 5, 6, 7, CC1, CM5
Cladonia parasitica (Hoffm.) Hoffm.	1					EN	NT	36	MC1, 2, 3, 5, 6, 7, MM1, 2, 3, 6, 7, PM1, 2, 3, 6, 7, WM1, 2, 3, 4, 6, 7, AC1, 4, CC1, 2, 3, 6, 7, CM1, 2, 4, 6, AM6
Cladonia phyllophora Ehrh. ex Hoffm.	1				R			6	AC1, AC2, AC3, AM1, AM4, AM6
Cladonia pleurota (Flörke) Schaer.	1				EN			10	PM1, 3, 4, AC2, 3, 4, 6, 7, PP6,7
Cladonia pocillum (Ach.) O.J. Rich.								4	AC2, AM1, 3, 5
Cladonia polydactyla (Flörke) Spreng.	1				EN			31	MC1, 2, 4, 5, MM5, 6, PM1, 2, 3, 4, 5, 6, 7, WM1, 2, 6, AC3, 4, 5, 6, 7, CC1, 3, 5, 6, CM5, AM2, 3, 4, 6, 7
Cladonia pyxidata (L.) Hoffm.								22	MC6, MM3, PM1, 2, 3, 4, 5, WM1, 6, AC1, 2, 3, 4, 5, 6, 7,CM5, AM2, 3, 4
Cladonia ramulosa (With.) J.R. Laundon	1							4	PM1, WM1, AC2, CM5,
Cladonia rangiferina (L.) Weber ex F.H. Wigg.					VU			18	PM1, 2, 4, 5, 6, AC1, 2, 3, 4, 5, 6, 7, CC3, AM1, 3, 4, 5, 6
Cladonia rangiformis Hoffm.								3	CC5, AM5, 6
Cladonia squamosa (Scop.) Hoffm.								32	MC5, MM7, PM1, 2, 3, 4, 5, 6, 7, WM1, 3, AC1, 2, 3, 4, 5, 6, 7, CC1, 2, 5, 6, AM1, 2, 3, WM1, CC3, 4, CM2, 3, AM7
Cladonia subcervicornis (Vain.) Kernst.	1	1				CR		18	MC2, 5, 6, MM2, 6, PM1, WM1, 5, AC1, 2, 4, 5, 6, 7, CC2, 4, AM3, 7
Cladonia subulata (L.) Weber ex F.H. Wigg.	1							15	MM2, 4, 6, PM1, WM1, 2, 4, 5, 6, 7, AC2, 3, 5, CC3, AM2
Cladonia sulphurina (Michx.) Fr.	1		CR			NT	EN	7	PM4, PM5, AC3, AC5, AC7, AM2, AM5
Cladonia symphycarpia (Flörke) Fr.	1							1	AM5

Table 3 (continued)

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
Cladonia uncialis (L.) Weber exF.H. Wigg.	1				VU			7	AC3, AC4, AM1, AM2, AM4, AM5, AM6
Collema flaccidum (Ach.) Ach.						EN	EN	3	MC3, 4, 6
Cornicularia normoerica (Gunnerus) Du Rietz						VU		7	PM5, AC1, 3, 4, 5, 7, AM1
Dibaeis baeomyces (L. f.) Rambold & Hertel						NT		1	AC3
Dimerella pineti (Ach.) Vězda	1							6	MM2, 4, CC6, CM4, 6, 7
Ephebe lanata (L.) Vain.						EN		1	AC4
Evernia divaricata (L.) Ach.						CR	CR	4	MC4, MM3, 5, CC4
Evernia prunastri (L.) Ach.						NT	EN	11	MC2, 3, 4, 5, 6, 7, MM1, WM2, 3, CC1, 6
Fellhaneropsis vezdae (Coppins & P. James) Sérus. & Coppins	1	1				LC		1	MM4
Flavocetraria cucullata (Bellardi) Kärnefelt & A. Thell						VU		2	AM2, 4
Fuscidea arboricola Coppins & Tønsberg	1	1						8	MM2, 3, CC2, 5, 6, 7, CM6
Fuscidea pusilla Tønsberg	1	1						7	MC6, MM2, WM5, CC5, 7, CM3, 4
Graphis pulverulenta (Pers.) Ach.	1							5	MC1, 3, 7, MM2, 7,
Graphis scripta (L.) Ach.						NT	EN	5	MC1, 3, 4, 5,6
Heterodermia speciosa (Wulfen) Trevis.	1			R		CR	CR	1	MC5
Hypocenomyce scalaris (Ach. ex Lilj.) M. Choisy								1	WM7
Hypogymnia farinacea Zopf	1					VU	VU	4	WM3, 7, CC6, CM5,
Hypogymnia physodes (L.) Nyl.								39	MC1, 2, 3, 4, 5, 6, 7, MM1, 2, 3, 4, 5, 6, 7, PM2, 3, 4, 6, WM1, 2, 3, 4, 5, 6, 7, AC3,CC1, 2, 3, 4, 5, 6, 7, CM1, 2, 3, 4, 5, 6
Hypogymnia tubulosa (Schaer.) Hav.					VU	NT	NT	14	MC3, 5, 7, MM3, PM4, WM1, 2, 3, 4, 6, 7, CC3, 4, CM6
Hypogymnia vittata (Ach.) Parrique						CR	VU	1	AC6
Icmadophila ericetorum (L.) Zahlbr.	1					EN	CR	2	AC3, CC3
Imshaugia aleurites (Ach.) S.L.F. Mey.							VU	1	WM4
Japewia subaurifera Muhr & Tønsberg	1	1						2	MM1, CC2
Lecanactis abietina (Ehrh. ex Ach.) Körb.	1						CR	1	CC1
Lecanora albella (Pers.) Ach.						EN	CR	1	MC4
Lecanora albellula (Nyl.) Th.	1	1						2	WM2, 4
Lecanora argentata (Ach.) Malme	1							4	MC3, 4, 5, 6
Lecanora carpinea (L.) Vain.	1							8	MC2, 3, 4, 5, 6, 7, MM5, WM2
Lecanora cf. hybocarpa (Tuck.) Brodo								1	MC5
Lecanora chlarotera Nyl.	1							17	MC1, 2, 6, 7, MM2, 3, 4, 5, 6, 7, WM2, 3, 4, 5, 6, 7, CC4
Lecanora cinereofusca H. Magn.	1						CR	3	MC3, 4, 5
Lecanora circumborealis Brodo & Vitik.	1	1						4	MC6, WM3, 4, 5
Lecanora compallens Herk & Aptroot	1	1						2	AC3, 5
Lecanora conizaeoides Nyl. ex Cromb.	1							10	MM3, WM1, CC3, 4, 5, 6, CM3, 4, 5, 6
Lecanora expallens Ach.	1							4	MC1, 4, CC1, 5
Lecanora glabrata (Ach.) Malme	1							1	WM5
Lecanora intumescens (Rebent.) Rabenh.						EN	EN	6	MC1, 2, 4, 6, 7, CC2

Table 3 (continued)

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
Lecanora pulicaris (Pers.) Ach.	1							23	MC1, 2, 5, MC6, 7, PM5, 6, 7, WM1, 2, 3, 4, 5, 6, 7, CC2, 3, 6, 7, CM3, 4, 5, 6
Lecanora saligna (Schrad.) Zahlbr.	1							1	WM3
Lecanora strobilina (Spreng.) Kieff.	1	1						7	MC6, MM2, 4, 5, PM5, WM2, 7
Lecanora subintricata (Nyl.) Th. Fr.	1							4	PM6, WM2, 4, 7
Lecanora subrugosa Nyl.	1					LC		1	MM4
Lecanora symmicta (Ach.) Ach.	1							5	PM2, 5, 6, WM2, 4
Lecanora umbrina (Ehrh.) Röhl	1								WM7
Lecanora varia (Hoffm.) Ach.	1				R		VU	4	WM2, 3, 4, 5
Lecidea berengeriana (A. Massal.) Nyl.	1							1	AC5
Lecidea leprarioides Tønsberg	1	1						1	CC1
Lecidea nylanderi (Anzi) Th. Fr.	1	1						24	MC1, 2, 3, 4, 5, 7, MM1, 2, 4, 5, 7, PM1, WM5, CC1, 2, 3, 4, 5, 6, 7, CM1, 2, 3, 4
Lecidella cf. albida Hafellner								1	MC3
Lecidella elaeochroma (Ach.) M. Choisy								9	MC1, 2, 3, 4, 5, 6, 7, MM1, 4
Lecidella elaeochroma f. soralifera (Erichsen) D. Hawksw.	1	1						1	CC2
Lecidella subviridis Tønsberg	1	1						10	MC5, 6, 7, MM1, 2, 7, CC2, 3, 6, 7
Lecidoma demissum (Rutstr.) Gotth. Schneid. & Hertel						EN		5	AC2, 4, 7, AM1, 3
Lepraria eburnea J.R. Laundon	1	1						11	MC1, 6, 7, MM1, 2, 4, 5, 7, CM1, 4, 7
Lepraria ecorticata (J.R. Laundon) Kukwa	1	1						2	PM4, CC1
Lepraria elobata Tønsberg	1	1						24	MC2, 3, 4, 5, 6, MM6, 7, PM1, 2, 3, WM6, AC2, 4, CC2, 3, 4, 5, 6, 7, CM2, 3, 4, 5, 6
Lepraria incana (L.) Ach.	1							1	MC3
Lepraria jackii Tønsberg	1	1						17	MC1, 2, MM1, 3, 7, PM5, WM5, AC5, CC2, 3, 4, 5, 6, CM1, 3, 4, 7
Lepraria lobificans Nyl.	1				R			32	MC1, 2, 3, 4, 5, 6, 7, MM1, 2, 3, 4, 5, 6, 7, PM2, 3, 7, WM1, 4, AC2, CC1, 2, 3, 4, 5, 6, 7, CM2, 3, 4, 6, 7
Lepraria membranacea (Dicks.) Vain.	1							2	MM2, CC1
Lepraria neglecta Vain.	1	1						1	AC4
Lepraria nivalis J.R. Laundon	1	1						11	PM2, 5, WM2, AC2, 3, 4, 5, 6, 7, CC2, AM7
Lepraria rigidula (B. de Lesd.) Diederich	1	1						7	MC2, 6, MM1, WM2, CC1, 5, CM3
Lepraria toensbergiana Slav.–Bay. & Kukwa	1	1						8	MC7, MM3, PM3, CC1, 3, 7, CM3, 4,
Lepraria umbricola Tønsberg	1	1						3	MM1, CM2, 7
Lepraria vouauxii (Hue) RC. Harris	1	1			R			3	MM2, CM1, 7
Leprocaulon microscopicum (Vill.) Gams	1							2	MC5, CC4
Leptogium lichenoides (L.) Zahlbr.						LC		5	MC3, 6, MM5, 6, 7
Lichenomphalia hudsoniana (H.S. Jenn.) Redhead et al.	1			R		NT	VU	5	PM5, AC3, CC6, CM6, AM2
Lichenomphalia umbellifera (L.) Redhead et al.	1	1				NT		3	CM3, 6

Table 3 (continued)

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
Lichenomphalia velutina (Quél.) Redhead et al.	1	1						1	MC1
Lobaria pulmonaria (L.) Hoffm.			VU	VU	RE	EN	CR	2	MC3, MM1
Loxospora cismonica (Beltr.) Hafellner	1					CR	RE	2	MC1, 5,
Loxospora elatina (Ach.) A. Massal.	1					EN	NT	16	MC1, 2, 3, 4, 5, 6, 7, MM1, 2, CC1, 4, 5, 6, CM2, 4, 5
Megalospora tuberculosa (Fée) Sipman	1	1						1	MC7
Melanelia hepatizon (Ach.) A. Thell							NT	4	PM6, AC4, 6, AM5
Melanelia stygia (L.) Essl.	1						NT	3	PM2, AC3, 5
Melanelixia fuliginosa subsp. glabratula (Lamy) J.R. Laundon								23	MC1, 2, 3, 4, 5, 7, MM1, 2, 3, 4, 5, 7, WM1,2, 4, 5, 6, 7, CC4, 7, CM6, 7
Melanelixia subargentifera (Nyl.) O. Blanco et al.	1					VU	VU	2	WM2, 3
Melanelixia subaurifera (Nyl.) O. Blanco et al.	1		VU				NT	11	MC2, 3, 4, 5, MM2, 5, WM2, 3, 5, 6, 7,
Melanohalea elegantula (Zahlbr.) O. Blanco et al.	1	1		R		VU		2	MC6, MM1
Melanohalea exasperatula (Nyl.) O. Blanco et al.	1							6	MC6, WM2, 3, 4, 5, 7
Melaspilea ochrothalamia Nyl.	1	1						2	PM1, PM5
Melaspilea proximella (Nyl.) Nyl.	1							1	PM4
Menegazzia terebrata (Hoffm.) A. Massal.	1				CR	CR	CR	1	MC4
Micarea elachista (Körb.) Coppins & R. Sant.	1	1				EN		2	WM3
Micarea farinosa Coppins & Aptroot	1	1						1	CM2
Micarea lignaria (Ach.) Hedl.					RE			5	PM2, AC3, 5, 6, AM1
Micarea melaena (Nyl.) Hedl.	1				R	NT		1	CM4
Micarea micrococca (Körb.) Gams	1	1						1	MM4,
Micarea misella (Nyl.) Hedl.	1				R			2	MC2, MM5
Micarea prasina Fr.	1							23	MC1, 4, 5, 7, MM1, 3, 4, 5, 6, 7, PM7, CC1, 2, 3, 4, 6, 7, CM2, 3, 4, 5, 6, 7
Micarea turfosa (A. Massal.) Du Rietz	1	1				DD		1	AC2
Micarea viridileprosa Coppins & Van den Boom	1	1						1	MC1
Micarea xanthonica Coppins & Tønsberg	1	1						1	MM5
Mycobilimbia epixanthoides (Stirt.) Zahlbr.	1	1						10	MC5, 7, MM4, 5, 6, 7, AC2, CC6, 7, CM7
Mycoblastus fucatus (Stirt.) Zahlbr.	1	1						6	MC2, 4, 5, 7, MM3, CC5,
Mycoblastus sanguinarius (L.) Norman	1					VU	CR	1	MC2
Nephroma parile (Ach.) Ach.	1			VU	CR	CR	CR	1	CC2
Ochrolechia androgyna (Hoffm.) Arnold	1					VU		3	MC6, CC2,AM4
Opegrapha niveoatra (Borrer) J.R. Laundon	1							1	MM2
Opegrapha varia Pers.						NT	VU	4	MC1, 3, 5, 6
Opegrapha viridis Pers.					R	VU	VU	3	MC1, 3, 4,
Opegrapha vulgata (Ach.) Ach.						VU	VU	2	MC1, 5,
Parmelia omphalodes (L.) Ach.	1					EN	NT	4	PM2, AC3, CC2, AM1,
Parmelia saxatilis (L.) Ach.							NT	12	PM6, WM2, 4, AC3, 4, 5, CC2, 4, AM2, 4, 5, 6
Parmelia submontana Nádv.	1					VU	CR	6	MC2, 3, 6, WM4, 5, 7,

Table 3 (continued)

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
Parmelia sulcata Taylor								10	MC2, 4, 6, PM6, WM2, 3, 4, 6, 7, CC5
Parmelina quercina (Willd.) Hale	1					CR	CR	2	WM2, 3
Parmeliopsis ambigua (Wulfen) Nyl.								18	MC2, PM1, 2, 3, 4, 6, 7, WM1, 3, 4, 6, 7, CC1, 2, 3, 6, 7, CM5
Parmeliopsis hyperopta (Ach.) Vain.						VU	VU	6	MC4, PM1, 4, 6, 7, CC4
Peltigera canina (L.) Willd.						VU		3	WM3, 5, 6
Peltigera degenii Gyeln.	1				EN	VU	VU	3	MC3, 5, MM5
Peltigera horizontalis (Huds.) Baumg.						EN		6	MC2, 3, 5, MM5, WM3, 4,
Peltigera hymenina (Ach.) Delise	1	1			EN	DD		10	MC4, 5, 6, MM1, 3, 4, WM2, 3, CC6, CM2
Peltigera lepidophora (Nyl.) Bitter	1		CR			EN	CR	1	MM2
Peltigera membranacea (Ach.) Nyl.	1					DD		1	WM5
Peltigera polydactylon (Neck.) Hoffm.	1				EN	DD		4	MC1, MM2, 4, WM5,
Peltigera praetextata (Flörke ex Sommerf.) Zopf	1					VU		8	MC1, 2, 3, 4, MM4, 5, 6, 7,
Peltigera rufescens (Weiss) Humb.	1							3	WM3, 5, 7
Pertusaria amara (Ach.) Nyl.							NT	2	MC2, 5
Pertusaria coccodes (Ach.) Nyl.	1	1			R	NT	VU	1	MM4
Pertusaria leioplaca DC.					R	NT	CR	4	MC1, 2, 5, 6,
Pertusaria oculata (Dicks.) Th. Fr.	1							1	AC5
Pertusaria pertusa (L.) Tuck.						VU	NT	1	MC3
Pertusaria pupillaris (Nyl.) Th. Fr.	1	1				NT		1	MC6
Phaeophyscia endophoenicea (Harm.) Moberg	1	1			R	EN	CR	1	MC6
Phaeophyscia orbicularis (Neck.) Moberg	1							3	MM4, WM3, 4
Phlyctis argena (Ach.) Flot.	1							6	MC2, 3, 4, 6, MM1, 6,
Physcia adscendens (Fr.) H. Olivier	1							6	MM4, WM2, 3, 4, 6, 7,
Physcia aipolia (Ehrh. ex Humb.) Fürnr.	1					NT		3	WM2, 5, 7
Physcia dubia (Hoffm.) Lettau	1				R			1	WM2
Physcia leptalea (Ach.) DC.	1	1						1	MM5
Physcia stellaris (L.) Nyl.								5	MC7, WM2, 3, 4, 6
Physcia tenella (Scop.) DC.	1							4	WM2, 3, 4, 6,
Placynthiella dasaea (Stirt.) Tønsberg	1	1			R			12	MC1, 2, 7, MM2, 3, 4, 7, WM7, CC2, 4, CM5, AM5
Placynthiella icmalea (Ach.) Coppins & P. James	1	1			R			16	MC2, 5, 7, MM3, 5, 6, 7, PM4, 5, WM1, 3, CM5, 6, AM5, 6, 7
Placynthiella uliginosa (Schrad.) Coppins & P. James	1				R			3	PM3, WM6, AM7
Platismatia glauca (L.) W.L. Culb. & C.F. Culb.					R		NT	15	MC2, 3, 4, MM1, 3, WM2, 6, AC3, CC1, 4, 5, 6, CM2, 5, 6
Porina aenea (Wallr.) Zahlbr.	1				R			4	MC1, MM1, 6, 7
Porina lectissima (Fr.) Zahlbr.	1							1	MM1
Pseudephebe pubescens (L.) M. Choisy						EN		11	PM2, 6, AC1, 3, 4, 5, 6, 7, AM1, 2, 3
Pseudevernia furfuracea (L.) Zopf							NT	37	MC2, 3, 4, 5, 6, 7, MM1, 2, 3, 5, 6, 7, PM1, 2, 3, 4, 5, 6, WM1, 2, 3, 4, 5, 6, 7, AC3, CC1, 2, 3, 4, 6, 7, CM1, 2, 4, 5, AM1
Pycnothelia papillaria (Ehrh.) L.M. Dufour					EN	EN	VU	1	AC4
Pyrenula nitida (Weigel) Ach.						VU	EN	5	MC1, 2, 3, 4, MM2

Table 3 (continued)

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
Pyrenula nitidella (Flörke ex Schaer.) Müll. Arg.	1				R	EN	CR	1	MC3
Ramalina canariensis J. Steiner	1			R				3	MC2, 3, 6
Ramalina farinacea (L.) Ach.						VU	EN	3	MC2, 4, 5
Ramalina fastigiata (Pers.) Ach.						EN	EN	1	MC2
Ramalina pollinaria (Westr.) Ach.						VU	VU	1	MC3
Rinodina sophodes (Ach.) A. Massal.						EN	VU	3	WM2, 3, 5
Ropalospora viridis (Tønsberg) Tønsberg								2	MC2, 5
Scoliciosporum chlorococcum (Graewe ex Stenh.) Vězda	1							12	MC7, MM2, 4, 5, 7, WM3, 5, 6, 7, CC7, CM3, 5
Scoliciosporum sarothamni (Vain.) Vězda	1	1						7	MC6, MM3, 5, 7, WM5, 6, 7
Scoliciosporum umbrinum (Ach.) Arnold								4	MM2, 4, 5, WM5,
Sphaerophorus fragilis (L.) Pers.						EN	VU	4	PM2, AC3, 4, 6
Stereocaulon alpinum Laurer			VU			EN	VU	1	AC3
Strigula jamesii (Swinscow) R.C. Harris	1	1						1	MC5
Thamnolia vermicularis (Sw.) Schaer.				VU		LC		14	PM5, 7, AC1, 2, 3, 4, AC5, 6, 7, AM1, 2, 3, 4, 5
Thelotrema lepadinum (Ach.) Ach.	1					EN	CR	2	MC3, 4
Trapelia corticola Coppins & P. James	1	1						1	PM1
Trapeliopsis flexuosa (Fr.) Coppins & P. James								13	MM2, 3, 6, WM5, 6, AC5, 7, CC3, 4, 5, 7, CM6, 7
Trapeliopsis gelatinosa (Flörke) Coppins & P. James	1					NT		3	MC1, CC2, AM5
Trapeliopsis granulosa (Hoffm.) Lumbsch	1							22	MC7, PM1, 3, 4, 5, 6, AC1, 2, 3, 4, 5, 6, 7, CC3, CM2, AM1, 2, 3, 4, 5, 6, 7
Trapeliopsis pseudogranulosa Coppins & P. James	1	1						2	PM5, CC1
Trapeliopsis viridescens (Schrad.) Coppins & P. James	1					NT		4	MC1, 7, AC7, CC6
Tuckermannopsis chlorophylla (Willd.) Hale			VU		EN	VU	NT	2	MC2, WM1
Umbilicaria crustulosa (Ach.) Lamy	1					EN	NT	2	AC7, CC4
Umbilicaria cylindrica (L.) Delise					RE			28	PM1, 2, 3, 4, 5, 6, 7, WM1, 4, 6, AC1, 2, 3, 4, 5, 6, 7, CC2, 3, 4, 5, AM1, 2, 3, 4, 5, 6, 7
Umbilicaria deusta (L.) Baumg.					CR	LC		11	AC1, 2, 4, 6, CC4, AM1, 2, 4, 5, 6, 7
Umbilicaria polyphylla (L.) Baumg.					CR	LC		6	PM6, WM1, AC6, AM1, 3, 6
Umbilicaria vellea (L.) Ach.						EN	VU	1	CC4
Usnea chaetophora Stirt.	1	1						2	MC2, CC4
Usnea diplotypus Vain.	1	1			CR	RE		2	CC4, 5
Usnea filipendula Stirt.					CR	VU	CR	5	MC4, CC1, 3, 4, 5, CM2,
Usnea florida (L.) Weber ex F.H. Wigg.				VU	CR	CR	CR	1	MC3
Usnea fulvoreagens (Räsänen) Räsänen	1		EN		CR	CR	RE	1	MC4
Usnea glabrescens (Nyl. ex Vain.) Vain.	1							1	CC4
Usnea hirta (L.) Weber exF.H. Wigg.						VU	VU	5	WM2, 3, 4, 5, CC6
Usnea lapponica Vain.	1							1	MC4
Usnea scabrata Nyl.	1							1	MM1
Usnea subfloridana Stirt.					CR	EN	CR	4	MC2, 4, 6, WM5
Vulpicida pinastri (Scop.) J.–E. Mattsson	1					NT	NT	11	PM4, 6, 7, WM2, 4, 6, 7, CC4, 5, 6, 7

Table 3 (continued)

Lichen taxa	New R Mts	New RO	RL RO	RL UK	RL HU	RL PL	RL SL	Obs	Plot codes
Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale								1	WM4
Xanthoparmelia somloensis (Gyeln.) Hale	1							1	WM2
Xanthoria candelaria (L.) Th. Fr.	1							2	WM4, 7
*Xanthoria cf. ulophyllodes** Räsänen						VU	VU	1	WM2
Xanthoria parietina (L.) Beltr.							NT	5	WM2, 3, 4, 5, 6
Xanthoria polycarpa (Hoffm.) Rieber	1						NT	1	WM5, 7
Xylographa parallela (Ach.) Fr.						EN		3	MC2, WM4, CC1
Xylographa vitiligo (Ach.) J.R. Laundon	1					DD	EN	2	MM3, PM7
Totals	182	67	12	8	65	125	96		

Several inconspicuous taxa (*Micarea* sp., *Placynthiella* sp., *Scoliciosporum* sp., *Lichenomphalia umbelifera*, *Lichenomphalia velutina*) possibly overlooked in previous surveys, were found mainly because of the systematic sampling protocol used here, which forced us to consider all lichens present in small sampling plots.

Another group of neglected species in Romania includes taxa that only recently have received a thorough taxonomic treatment that makes identification possible in routine lichen diversity assessments. Among these is the genera *Lepraria* for which we found 13 species, all new for the Rodnei Mountains, and 10 species new for the country.

The numerous new species for the region is mainly due to the fact that the previous studies focused on rocks, whereas substrates such as trees, soil, and wood, were poorly investigated. For example, there are only 49 previously reported species on soil substrate versus the 108 taxa that we report here. We only confirm 158 out of the 260 species present in the previous checklist, which was represented mainly by saxicolous lichens (ca 57 % of total) (APNMR, 2013), including crustose, foliose and fruticose species, whereas in our survey the crustose saxicolous lichens were not sampled.

We found a relatively high number of species that are restricted to conserved habitats in Rodnei Mountains and which are known as indicators of ancient woodland and ecological continuity in forest landscapes (Rose, 1976; Goward, 1995; Wolseley, 1995; Thor, 1995; Gauslaa & Solhaug, 1996): A*rthonia caesia*, *Bryoria lanestris, Cetrelia olivetorum*, *Chaenotheca brachypoda*, *Ch. brunneola, Heterodermia speciosa, Lecanora cinereofusca, Lobaria pulmonaria, Loxospora cismonica, Megalospora tuberculosa, Menegazzia terebrata, Pertusaria coccodes, Thelotrema lepadinum, Usnea florida* and *U. subfloridana*.

Also species from Red Lists, which depend on rare and often threatened habitats (Thor, 1995), such as *Anisomeridium biforme* and *Usnea fulvoreagens*, are extinct in some regions of the Carpathians (Pisút et al., 2001) but were recorded (once each) in conserved mixed forests in the present study of the Rodnei Mountains. Other examples of species limited to conserved areas, having Critically Endangered status in the Red Lists and being recorded once or twice in our study include: *Arthonia vinosa, Bellemerea cinereorufescens, Bryoria capillaris, B. chalibeiformis, Cetraria aculeata, Cladonia magyarica, Hypogymnia vittata, Icmadophila ericetorum, Lecanactis abietina, Lecanora albella, Mycoblastus sanguinarius, Nephroma parile, Phaeophyscia endophoenicea* and *Pyrenula nitidella* (Table 3). All these species stress the importance of maintaining their suitable habitats, which are currently restricted to protected areas.

The present study, with its large number of new species for Romanian lichen flora and for the Rodnei Mountains region, suggests the need of more detailed inventories. To this day, there is no official Red List of lichens for Romania, except a manuscript dealing with macrolichens only (Bartok & Crișan, personal communication). In this context lichen diversity and richness inventories are important for better estimating the degree of threat for each species. This will enable the compilation of a comprehensive Red List of Lichens from Romania that will be an invalu-

able tool for promoting lichen conservation in the country (Thor, 1995; Dietrich & Scheidegger, 1997; Scheidegger et al., 2000).

The high total number of lichen species, the large number of species that appear in Red Lists, together with the indicator species for ancient woodlands and ecological continuity of forest landscapes, underline the high value of conserved habitats in the Rodnei Mountains. The existing National Park here has the potential of conserving a considerable part of the lichen diversity and the lichen's characteristic habitats. Their presence is also important for other groups of organisms, which depend on lichens or their habitats, thus emphasizing the biocomplexity of microbial and invertebrate communities. It is important that at least these „islands" such as Rodnei Mountains to be conserved if otherwise natural resources are still exploited in a non–sustainable manner that is leading to a substantial loss of biodiversity.

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