Epiphytic lichen mycota of, and new records from, Şerif Yüksel Research Forest, Bolu, Turkey

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Received 2 July 2008 / Accepted 4 October 2008

Abstract. 109 epiphytic lichen taxa are reported for the first time from Şerif Yüksel Research Forest in the province of Bolu in Turkey, 38 of which are new for the province and 5 are new to Turkey.

Key words: epiphytic lichens, lichen mycota, biodiversity, research forests of Turkey

Introduction

Lichens play an important role in nutrient cycling within forests, especially cyanolichens, through litterfall decay which recycles of nitrogen and other minerals into the ecosystem (Pipp *et al.* 2001; Coxson & Curteanu 2002). Lichens, as slow-growing organisms, may be used as long-term indicators of environmental conditions. Epiphytic lichens, including species that are highly sensitive to environmental changes, especially to sulphur dioxide (Saipunkaew *et al.* 2005), dust (Branquinho *et al.* 1999) and heavy metals (Garty 2001), are actively used to monitor air quality and as ecological indicators of forest health (Brodeková *et al.* 2006). Epiphytic lichens also contribute to the biological diversity of old forests, their biomass and communities being indicators of a forest's age and structure (Pipp *et al.* 2001).

The present contribution, focusing on the epiphytic lichen diversity of Şerif Yüksel Research Forest, is the first lichenological survey in this area and provides many new records for the province of Bolu and for the lichen mycota of Turkey. Studies on the Turkish lichen mycota have increased in the last decades, but there are still many insufficiently explored Turkish provinces. Lichen lists have been published for other provinces in the west Black Sea region (Öztürk & Güvenç 2002; Yıldız & John 2002; Yıldız *et al.* 2002; Güvenç *et al.* 2006), but only a few lichens have previously reported from the province of Bolu (Karamanoğlu 1971; Aydın 1990; John 1992; Zeybek *et al.* 1993). More comprehensive recent papers which include lichen records from Bolu are by Çobanoğlu & Akdemir (2004) and Halıcı & Duman-Cansaran (2007).

Study area

The study area, Bolu Şerif Yüksel Research Forest, is located between 40°35'00"–40°39'00" N and 25°33'00"– 25°38'00" E, in the province of Bolu in the western part of the Black Sea Region of Turkey (Fig. 1). Its rough terrain covers an area of 1544 ha, its highest and lowest points being 1640 m and 1330 m respectively (Tosun 2003).

The average annual mean temperature (1975–1995) was 5.7 °C and the annual precipitation is 882.6 mm according to the Şerif Yüksel Research Forest Meteorological Station. The number of days with snow cover is 144 and with fog is 60 (Serin 1998). The major rock being Andesite and its derivatives (Irmak *et al.* 1962). Soil profile skeleton is medium and well-permeable, with pH values within the range 4.80-6.85 (Akgül & Aksoy 1976; Kantarcı 1979).

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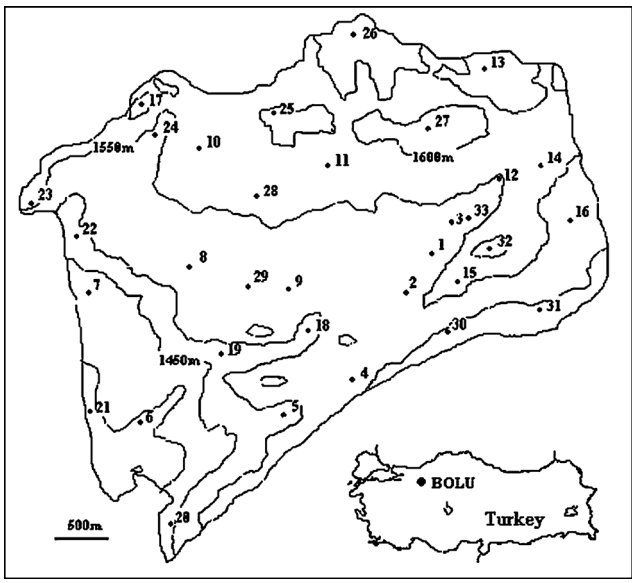

Fig. 1. Location of collecting sites within the study area

The dominant trees in the study area are Uludağ fir (*Abies bornmuelleriana* Mattf.) and Scotch pine (*Pinus sylvestris* L.) (Bozakman 1976). Trees reach 120 cm in diameter at DBH and 250 years in age. The study area also includes some distributed randomly forest gaps.

Materials and Methods

Epiphytic lichen specimens were collected from August 2004 to July 2005 from 33 sampling sites in the study area (Fig. 1), mainly from *Abies bornmuelleriana* and *Pinus sylvestris,* and a few *Populus tremula* L. Specimens were collected from trunks and branches of 293 trees (Table 1) and determined morphologically and microscopically, supported by chemical spot tests, with the aid of floras and keys (Clauzade & Roux 1985; Purvis *et al.* 1992; Wirth 1995; Clerc 2006; Groner 2006). The nomenclature follows recent literature (e.g. Blanco *et al.* 2004). The specimens have been deposited in the herbarium of the Faculty of Science and Arts, the University of Marmara (MUFE), as collection numbers G.Ç. 1799 to 1908, and some duplicates have been retained in the herbarium of Faculty of Forestry, the University of İstanbul (ISTO).

List of taxa

Each taxon listed, with author abbreviations according to Kirk & Ansell (1992), is followed by the numbers of the sampling sites and the abbreviations of sampled tree species A = *Abies bornmuelleriana*), P = *Pinus sylvestris* and T= *Populus tremula*. An asterisk (*) indicates a new record for Turkey and a plus (+) for the province of Bolu.

Alectoria sarmentosa (Ach.) Ach. subsp. *sarmentosa* 1A, 2AP, 3A, 4P, 6AP, 7AP, 8A, 9A, 10A, 11A, 12A, 13A, 14AP, 15P, 16P, 17A, 18A, 19AP, 21P, 22A, 23A, 25A, 26A, 27A, 28A, 29A, 30P, 31P, 32A, 33A

Anaptychia ciliaris (L.) Körb. subsp. *ciliaris* 5T / 17A

Arthonia radiata (Pers.) Ach. 14A, 16A, 17A, 19A, 33A

+*Bacidia beckhausii* Körb. 33A

+*Bacidia laurocerasi* (Delise ex Duby) Zahlbr. 4AP, 17A, 33A

+*Bacidia rosella* (Pers.) De Not. 17A

+*Bacidia rubella* (Hoffm.) A. Massal. 17A, 33A

+*Bacidia subincompta* (Nyl.) Arnold 20A, 26A, 33A

+*Bryoria capillaris* (Ach.) Brodo & D. Hawksw. 1AP, 2AP, 3A, 4AP, 6P, 7AP, 8A, 9A, 10A, 11A, 12A, 13A, 14AP, 15AP, 16AP, 17A, 18A, 19P, 20A, 21AP, 22A, 23A, 25A, 27A, 28A, 29A, 30P, 31P, 32AP, 33A

Bryoria fuscescens (Gyeln.) Brodo & D. Hawksw. var. *fuscescens* 1A, 2A, 3A, 4AP, 6P, 7A, 15P, 16A, 17A, 18A, 19P, 29A, 30AP, 31P, 32AP, 33A

+*Bryoria implexa* (Hoffm.) Brodo & D. Hawksw. 17A

Buellia disciformis (Fr.) Mudd 1A, 8A, 17A, 33A

Buellia griseovirens (Turner & Borrer ex Sm.) Almb. 1A, 2A, 4AP, 6P, 7AP, 8A, 9A, 10A, 11A, 12A, 13A, 14AP, 15A, 16A, 17A, 18A, 19AP, 21A, 22A, 23A, 24A, 25A, 26A, 27A, 28A, 30P, 33A

+*Calicium adspersum* Pers. 6P

Calicium glaucellum Ach. 13A

+*Calicium salicinum* Pers. 1AP, 7A, 9A, 10A, 12A, 13A, 17A, 18A, 20A, 21A, 22A, 24A, 25A, 26A, 28A, 29A, 33A

Calicium viride Pers. 1A, 10A, 12A, 13A, 17A, 18A, 19P, 20A, 24A, 33A

Caloplaca herbidella (Hue) H. Magn. 2A, 5T, 8A, 11A, 13A, 17A, 23A, 27A, 28A, 30A

+*Candelariella reflexa* (Nyl.) Lettau 17A

Candelariella xanthostigma (Pers. ex Ach.) Lettau 17A

+*Cetrelia olivetorum* (Nyl.) W.L. Culb. & C.F. Culb. 17A

+*Chaenotheca brunneola* (Ach.) Müll. Arg. 17A

Chaenotheca chrysocephala (Turner ex Ach.) Th. Fr. 6P, 9A, 10A, 12A, 13A, 14A, 17A, 18A, 21A, 24A, 25A, 26A, 28A, 33A

Chaenotheca furfuracea (L.) Tibell 17A, 33A

Chaenotheca trichialis (Ach.) Th. Fr. 12A, 17A, 22A, 33A

Table 1. Sampling sites in the study area

Site No.	GPS coordinates	Altitude (m)	Aspect	Slope (%)	Sampled Tree*
1	40º 36' 47"N, 25º 35' 54"E	1530	NE	8	A(9), P(2)
2	40º 36' 27"N, 25º 35' 48"E	1560	NW	4	A(7), P(3)
3	40º 37' 00"N, 25º 36' 06"E	1540	NE-N	6	A (10)
4	40º 35' 58"N, 25º 35' 26"E	1540	SW	6	A(3), P(7)
5	40º 35' 49"N, 25º 34' 56"E	1470	W	55	T (3)
6	40º 35' 44"N, 25º 34' 19"E	1380	-	0	A(2), P(8)
7	40º 36' 24"N, 25º 33' 57"E	1420	SE	3	A(9), P(1)
8	40º 36' 51"N, 25º 34' 35"E	1530	-	0	A(10)
9	40º 36' 42"N, 25º 35' 17"E	1540	SW	12	A(10)
10	40º 37' 24"N, 25º 35' 45"E	1570	W	2	A(10)
11	40º 37' 20"N, 25º 35' 38"E	1580	SE	6	A(10)
12	40º 37' 16"N, 25º 36' 28"E	1560	E	13	A(10)
13	40º 37' 56"N, 25º 36' 29"E	1610	NW	4	A(10)
14	40º 37' 20"N, 25º 36' 50"E	1590	-	0	A(9), P(1)
15	40º 36' 41"N, 25º 36' 17"E	1560	SE	15	A(5), P(5)
16	40º 36' 57"N, 25º 37' 01"E	1540	SE	2	A(7), P(3)
17	40º 37' 41"N, 25º 34' 23"E	1590	SE	14	A(10)
18	40º 36' 24"N, 25º 35' 16"E	1520	S	16	A(5)
19	40º 36' 14"N, 25º 34' 44"E	1480	S	18	A(5), P(5)
20	40º 35' 20"N, 25º 34' 30"E	1440	SW	24	A(5)
21	40º 35' 48"N, 25º 34' 02"E	1370	W	27	A(5), P(5)
22	40º 36' 49"N, 25º 33' 53"E	1490	S	4	A(5)
23	40º 37' 05"N, 25º 33' 34"E	1550	SE	13	A(5)
24	40º 37' 29"N, 25º 34' 28"E	1545	W	9	A(5)
25	40º 37' 38"N, 25º 35' 07"E	1600	NW	10	A(5)
26	40º 38' 05"N, 25º 35' 34"E	1620	E	15	A(5)
27	40º 37' 33"N, 25º 36' 05"E	1635	-	0	A(5)
28	40º 37' 06"N, 25º 35' 06"E	1570	S	2	A(5)
29	40º 36' 39"N, 25º 34' 57"E	1540	E	8	A(5)
30	40º 36' 19"N, 25º 36' 00"E	1495	S	14	A(5), P(6)
31	40º 36' 27"N, 25º 37' 00"E	1455	S	17	P(5)
32	40º 36' 48"N, 25º 36' 31"E	1605	S	19	A(5), P(2)
33	40º 37' 04"N, 25º 36' 08"E	1540	N	5	A(36)
TOTAL					293

*A = *Abies bornmuelleriana* Mattf. P = *Pinus sylvestris* L. T = *Populus tremula* L.

+*Chaenothecopsis viridialba* (Kremp.) A.F.W. Schmidt 1P, 24A

Chrysothrix candelaris (L.) J.R. Laundon 7A, 9A, 10A, 12A, 13A, 17A, 18A, 20A, 21A, 22A, 23A, 24A, 25A, 26A, 28A

Cladonia coniocraea (Flörke) Spreng. 1AP, 3A, 6P, 7A, 8A, 9A, 10A, 11A, 12A, 13A, 14P, 17A, 19AP, 20A, 21AP, 22A, 23A, 24A, 25A, 26A, 27A, 29A, 30P, 31P, 32AP, 33A

Cladonia fimbriata (L.) Fr. 1A, 2A, 7A, 9A, 11A, 14A, 17A, 18A, 19P, 20A, 21P, 22A, 25A, 29A, 30P, 31P, 32A, 33A

Cladonia furcata (Huds.) Schrad. subsp. *furcata* 2A

Cladonia pyxidata (L.) Hoffm. 8A, 9A, 10A, 33A

**Cyphelium inquinans* (Sm.) Trevis 3A, 7A, 11A, 12A, 13A, 17A, 22A, 24A, 25A, 33A

Evernia divaricata (L.) Ach. 1A, 2A, 4P, 7AP, 9A, 10A, 13A, 16P, 17A, 18A, 20A, 21AP, 23A, 24A, 25A, 26A, 27A, 28A, 30AP, 32A, 33A

Evernia prunastri (L.) Ach. 2A, 5T, 6AP, 7A, 8A, 14A, 15A, 16A, 17A, 18A, 21A, 25A, 32A, 33A

**Graphina ruiziana* (Fée) Müll. Arg. 3A, 4P, 6P, 8A, 9A, 10A, 11A, 12A, 14A, 17A, 21A, 23A, 24A, 28A, 29A, 33A

Hypocenomyce scalaris (Ach. ex Lilj.) M. Choisy 4P, 6P, 15P, 19P, 21P, 30P, 31P, 33A

Hypogymnia farinacea Zopf 32A

Hypogymnia physodes (L.) Nyl. 1AP, 2AP, 3A, 4AP, 6AP, 7AP, 8A, 9A, 10A, 11A, 12A, 13A, 14AP, 15AP, 16AP, 17A, 18A, 19AP, 20A, 21AP, 22A, 24A, 25A, 26A, 27A, 28A, 29A, 30AP, 31P, 32AP, 33A
Hypogymnia tubulosa (Schaer.) Hav. 1A, 4P, 6AP, 10A, 12A, 13A, 14A, 15AP, 16AP, 17A, 18A, 19A, 21AP, 22A, 23A, 24A, 25A, 26A, 27A, 28A, 29A, 31P, 32A, 33A
+*Hypogymnia vittata* (Ach.) Parrique 16A
+*Lecania cyrtella* (Ach.) Th. Fr. 5T, 6P
Lecanora albella (Pers.) Ach. 4A, 5T, 10A, 12A, 13A, 14A, 16A, 17A, 18A, 19A, 21A, 26A, 28A, 30A, 32A, 33A
Lecanora argentata (Ach.) Malme 1A, 2A, 4A, 17A, 21A, 32A, 33A
Lecanora carpinea (L.) Vain. 4A, 6P, 14A, 15A, 16A, 17A, 18A, 19A, 23A, 30A
Lecanora chlarotera Nyl. 4AP, 6P, 7P, 8A, 10A, 12A, 13A, 14A, 15A, 16A, 17A, 18A, 19AP, 21A, 23A, 27A, 28A, 30A, 31P, 32A, 33A
Lecanora dispersa (Pers.) Röhl. 26R
+*Lecanora expallens* Ach. 17A
Lecanora intumescens (Rebent.) Rabenh. 5T, 17A, 32A
Lecanora saligna (Schrad.) Zahlbr. 5T
+*Lecanora subcarpinea* Szatala 4A
+*Lecanora symmicta* (Ach.) Ach. 3A, 6P, 9A, 10A, 11A, 12A, 13A, 17A
Lecanora varia (Hoffm.) Ach. 5T, 16P, 17A
Lecidella elaeochroma (Ach.) M. Choisy f. *elaeochroma* 1A, 2A, 4A, 5T, 6AP, 7A, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15A, 16A, 17A, 18A, 19A, 20A, 21A, 22A, 23A, 25A, 27A, 28A, 29A, 30A, 32A, 33A
Lecidella elaeochroma f. *soralifera* (Erichsen) D. Hawksw. 5T
Letharia vulpina (L.) Hue 19P, 30P, 31P
Lobaria pulmonaria (L.) Hoffm. 7A, 8A, 9A, 11A, 14A, 17A, 18A, 22A, 23A, 25A, 27A, 29A, 33A
Melanelixia fuliginosa (Duby) O. Blanco *et al.* subsp. *glabratula* (Lamy) J.R. Laundon 2A, 3A, 4A, 5T, 6P, 7A, 8A, 9A, 13A, 17A, 20A, 21A, 22A, 23A
Melanohalea exasperatula (Nyl.) O. Blanco *et al.* 17A
Nephroma laevigatum Ach. 25A
+*Nephroma parile* (Ach.) Ach. 21A, 33A
+*Ochrolechia androgyna* (Hoffm.) Arnold 12A, 13A, 14A, 15A, 16A, 17A
Ochrolechia parella (L.) A. Massal. 12A, 20A, 21A, 33A
+*Ochrolechia tartarea* (L.) A. Massal. 17A
Ochrolechia turneri (Sm.) Hasselrot 1A, 2AP, 3A, 4P, 6P, 7AP, 8A, 10A, 13A, 14AP, 16AP, 17A, 18A, 19P, 21AP, 23A, 25A, 26A, 29A, 30AP, 31P, 33A
+*Opegrapha atra* Pers. 2A, 3A, 8A, 9A, 10A, 11A, 12A, 13A, 17A, 18A, 20A, 22A, 23A, 24A, 25A, 26A, 27A, 28A, 29A, 33A
Opegrapha vulgata (Ach.) Ach. 10A
Parmelia saxatilis (L.) Ach. 7A, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15A, 16A, 17A, 19P, 21A, 22A, 23A, 24A, 25A, 26A, 27A, 28A, 29A, 32A, 33A
+*Parmelia submontana* Nadv. ex Hale 1A, 3A, 4A, 7A, 16A, 17A, 18A, 20A, 23A, 33A
Parmelia sulcata Taylor 1A, 2A, 6AP, 7A, 15A, 17A, 18A, 21A, 32A, 33A
Parmeliopsis ambigua (Wulfen) Nyl. 1AP, 2AP, 3A, 4P, 6P, 7AP, 8A, 9A, 10A, 11A, 12A, 13A, 14AP, 15AP, 16AP, 17A, 18A, 19P, 20A, 21AP, 22A, 23A, 24A, 25A, 26A, 27A, 28A, 29A, 30AP, 31P, 32AP, 33A
+*Parmeliopsis hyperopta* (Ach.) Arnold 11A, 12A, 13A, 25A, 33A
Peltigera collina (Ach.) Röhl. 22A
+*Peltigera degenii* Gyeln. 8A
Pertusaria albescens (Huds.) M. Choisy & Werner var. *albescens* 7A, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15A, 17A, 18A, 19A, 20A, 23A, 24A, 25A, 26A, 27A, 28A, 29A, 30A, 32A, 33A
Pertusaria amara (Ach.) Nyl. 2A, 3A, 7A, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15P, 16A, 17A, 18A, 21A, 25A, 26A, 30A
+*Pertusaria coccodes* (Ach.) Nyl. 10A, 17A, 26A, 33A
+*Pertusaria coronata* (Ach.) Th. Fr. 17A, 26A, 32A, 33A
Pertusaria hemisphaerica (Flörke) Erichsen 2A, 3A, 7A, 8A, 9A, 10A, 11A, 13A, 17A, 18A, 21A, 22A, 23A, 26A, 27A, 29A, 30P, 33A
+*Pertusaria hymenea* (Ach.) Schaer. 8A
Pertusaria pertusa (Weigel) Tuck. 33A
**Pertusaria pupillaris* (Nyl.) Th. Fr. 13A
Phylctis argena (Spreng.) Flot. 1A, 14A, 17A, 27A, 28A, 33A
Physcia adscendens (Th. Fr.) H. Olivier 17A
Physcia leptalea (Ach.) DC. 17A
Physcia stellaris (L.) Nyl. 5T
Physcia tenella (Scop.) DC. 5T, 17A
Physconia distorta (With.) J.R. Laundon 5T, 11A, 14A, 17A, 20A, 29A
Platismatia glauca (L.) W.L. Culb. & C.F. Culb. 1AP, 2AP, 3A, 4P, 6P, 7AP, 8A, 9A, 10A, 11A, 12A, 13A, 14P, 15AP, 16AP, 17A, 18A, 19P, 21AP, 22A, 24A, 25A, 26A, 27A, 28A, 29A, 30P, 31P, 32AP, 33A
Pleurosticta acetabulum (Neck.) Elix & Lumbsch 17A
Pseudevernia furfuracea (L.) Zopf var. *furfuracea* 1AP, 2AP, 3A, 4AP, 6P, 14AP, 15AP, 16AP, 17A, 18A, 19P, 20A, 21AP, 23A, 25A, 30AP, 31P, 32AP, 33A
Ramalina calicaris (L.) Fr. 1A, 8A, 17A, 20A, 33A
+*Ramalina canariensis* J. Steiner 1A
Ramalina farinacea (L.) Ach. 1AP, 2A, 3A, 4A, 5T, 6A, 7A, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15A, 16A, 17A, 18A, 19A, 20A, 21A, 22A, 23A, 24A, 25A, 26A, 27A, 28A, 29A, 30A, 32A, 33A
Ramalina fastigiata (Pers.) Ach. 2A, 3A, 7A, 11A, 12A, 13A, 14A, 15A, 16A, 17A, 20A, 22A, 23A, 27A, 28A, 29A, 30A, 32A
Ramalina fraxinea (L.) Ach. 1A, 7A, 8A, 12A, 19A, 20A, 21A, 27A, 29A, 30A, 32A
+*Ramalina thrausta* (Ach.) Nyl. 1A, 2A, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 16A, 17A, 18A, 20A, 21A, 22A, 23A, 24A, 26A, 33A
Rinodina exigua (Ach.) Gray 4A, 16A, 17A, 30A, 33A

+*Schismatomma graphidioides* (Leight.) Zahlbr. 9A, 10A, 12A, 13A, 14A, 17A, 18A, 20A, 21A, 24A, 26A, 28A, 29A, 30A, 33A
Tuckermanopsis chlorophylla (Wild.) Hale 1AP, 2AP, 3A, 4P 6, 7AP, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15AP, 16AP, 17A, 18A, 19AP, 20A, 21AP, 22A, 23A, 24A, 25A, 26A, 27A, 28A, 29A, 30AP, 32AP, 33A
+*Usnea cavernosa* Tuck. 11A, 17A, 30A, 33A
Usnea filipendula Stirt. 2A, 4A, 6AP, 7A, 9A, 10A, 12A, 17A, 18A, 19AP, 21A, 22A, 24A, 25A, 26A, 27A, 28A, 29A, 30A, 32A, 33A
**Usnea flammea* Stirt. 6P
Usnea florida (L.) Weber ex F.H. Wigg. 1AP, 2A, 3A, 6AP, 7AP, 8A, 9A, 10A, 11A, 12A, 14A, 15A, 16A, 17A, 18A, 19AP, 20A, 21A, 23A, 24A, 25A, 26A, 27A, 29A, 30AP, 31P, 32AP, 33A
Usnea fulvoreagens (Räsänen) Räsänen 1A, 4A, 6P, 7A, 16A, 17A, 18A, 19P, 30A, 32A, 33A
Usnea hirta (L.) Weber ex F.H. Wigg. 4AP, 15A, 17A, 29A, 32A, 33A
**Usnea subscabrosa* Nyl. ex Motyka 6P, 18A, 19AP, 24A, 25A, 26A, 30P, 31P
Usnea subfloridana Stirt. 1AP, 2AP, 4AP, 6AP, 7AP, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15AP, 16AP, 17A, 18A, 19AP, 21AP, 22A, 23A, 24A, 25A, 26A, 27A, 28A, 29A, 30AP, 32AP, 33A
Usnea substerilis Motyka 1A, 2, 6P, 7A, 14A, 15A, 16A, 33A
+*Vulpicida pinastri* (Scop.) J.-E. Mattsson 1A, 26A
Xanthoria parietina (L.) Th. Fr. 5T

Results and Discussion

The list contains 109 epiphytic taxa (including 4 subspecies, 3 varieties and 2 forms) belonging to 46 genera, morphologically classified as 48.6 % crustose, 27.5 % fructicose, 22.1 % foliose and 1.8 % squamulose. Of these, 38 taxa are reported for the first time from Bolu province and 5 (*Cyphelium inquinans, Graphina ruiziana, Pertusaria pupillaris, Usnea flammea* and *Usnea subscabrosa*) are new to Turkey.

Epiphytic lichen species show different sensitivities to the degrees of air pollution (Purvis *et al.* 1992; Wirth 1995). Their total diversity and richness in sensitive species, e.g. *Anaptychia ciliaris, Bryoria fuscescens, Lobaria pulmonaria,* and many species of *Ramalina* and *Usnea*, in the study area are indicative of very low levels of atmospheric pollution despite the poor diversity of tree species.

The most frequent species in the forest (encountered in at least 15 sites) are the macrolichens *Alectoria sarmentosa, Bryoria capillaris, Cladonia coniocraea, Parmelia saxatilis, Parmeliopsis ambigua, Ramalina farinacea, Tuckermanopsis chlorophylla, Usnea florida, U. subfloridana,* and the less conspicuous microlichens *Buellia griseovirens, Calicium salicinum, Chaenotheca chrysocephala, Lecidella elaeochroma, Pertusaria albescens. Usnea subfloridana* is the most dominant *Usnea* species in the study area.

The most obvious fructicose and foliose lichen assemblages on fir and pine trees are composed of *Usnea* spp. and those predominating species *Alectoria sarmentosa* and *Bryoria* spp. *Ramalina* spp., *Hypogymnia physodes, H. tubulosa* and *Parmelia saxatilis* especially on their bases. *Evernia divaricata, Parmelia saxatilis, Platismatia glauca, Ramalina farinacea* and *Tuckermanopsis chlorophylla* are often present with *Pseudevernia furfuracea.* The crustose associations on trunks are observed between *Calicium* spp. with *Schismatomma graphidioides, Chaenotheca* spp. and *Chrysothrix candelaris*. *Parmeliopsis ambigua* with small thalli is associated with *Opegrapha atra. Cladonia* spp. and *Peltigera* spp. occur with mosses on bases of trees and stumps. These associations mainly correspond with those described by Coppins & Coppins (2006).

The dominant species on the branches and twigs of fir are *Lecanora albella, Melanelixia fuliginosa* subsp. *glabratula, Melanohalea exasperatula* and *Rinodina exigua. M. exasperatula* and *Hypogymnia physodes* are concentrated at the bottom of leaves of fir. The pines, with a very acidic bark (Wirth 1995), have a relatively low number of species compared with the fir. *Chrysothrix candelaris* and *Cyphelium inquinans* show optimal growth on particularly dry and rough bark of mature fir (on the lower trunk), while *Hypocenomyce scalaris* on scales of pine bark, and *Hypogymnia physodes, H. tubulosa, Pseudevernia furfuracea* and *Platismatia glauca* are common for both trees. About 11 % of the total number of species was detected only on higher trunks and branches of felled fir trees at sampling site no.17; these would no doubt have remained undetected by a standard sampling procedure. The results of species distribution on felled fir trees presented in our other survey in the same forest (Çobanoglu *et al.* in prep) shows that an inventory of lichen taxa of a forest may be incomplete due to some species only occurring on unreachable parts of trees.

A few interesting lichenicolous species were also observed: *Parmelia saxatilis* on the thallus lobes of *Lobaria pulmonaria* and *Graphina ruiziana* on *Pertusaria* spp. Most species of *Bacidia* and *Chaenotheca* have been detected on rotting bark and dead wood. Some species that are good indicators of old forest trees, such as *Chaenotheca* spp. and *Lecanora varia* (Coppins & Coppins 2006), are distributed widely in the study area.

Cyanolichens are represented by *Lobaria pulmonaria,* species of *Nephroma* and *Peltigera.* Representative indicator species with an oceanic distribution are *Buellia disciformis, Chrysothrix candelaris, Nephroma laevigatum* and *Peltigera collina.*

The presented data on epiphytic lichen species composition on *Abies* and *Pinus* are similar to those of recent forest studies around this region (Çobanoğlu & Akdemir 2004; Halıcı & Duman-Cansaran 2007). The epiphytic species mostly coincide with those recorded from Abant (Çobanoğlu & Akdemir 2004). In addition, especially crustose species of the genera *Bacidia, Calicium, Chaenotheca, Pertusaria* and the new records *Graphina ruiziana* and *Cyphelium inquinans* attract further attention in this study.

Acknowledgements. We are grateful to Suat Tosun, Zehra Özpay, Mehmet Tokcan, Seyfettin Kiniş, Abdurrahim Aydın, and the personnel of the Ministry of Environment and Forestry and the Management of Forestry Research.

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