

Lichenized and lichenicolous fungi from mylonitized areas of the subnival belt in the Tatra Mountains (Western Carpathians)

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The lichen biota of the mylonitized areas of the subnival belt in the Tatra Mts. (Western Carpathians) was examined. A list of 325 species, including 317 lichenized fungi, seven lichenicolous fungi and one not-lichenized saprophytic fungus (*Melaspilea gibberulosa*), is given based on literature records and the author's original observations. As many as 105 species are recorded from the subnival belt of the Carpathians for the first time. *Rhizocarpon glaucescens* is reported as new to central Europe from its the southernmost locality. Other new records for several regions are added, e.g. *Aspicilia polychroma* var. *rubrireagens*, *Lecanora bicinctoidea*, *L. cavicola*, *Porpidia speirea* var. *prochsthallina*, and *Thelocarpon sphaerosporum* for the Carpathians; *Arthonia muscigena* and *Lecanora stenotropa* for the Western Carpathians, and *Arthonia lapidicola*, *Cecidonia umbonella* and *Rhizocarpon grande* for the entire range of the Tatra Mts. Thirteen species of lichenized Ascomycota (*Aspicilia polychroma*, *Bellemeria diamarta*, *B. subsorediza*, *Dermatocarpon rivulorum*, *Gyalidea subscutellaris*, *Lecanora bicinctoidea*, *L. cavicola*, *L. stenotropa*, *Leptogium imbricatum*, *Rhizocarpon glaucescens*, *Thelidium olivaceum*, *Thelocarpon sphaerosporum*, and *Toninia coelestina*), and one lichenicolous fungus (*Cecidonia umbonella*) are reported from Poland for the first time. The ecology and distribution of some interesting species and the conservation status of the lichen biota in the study region are discussed. The study clearly shows the importance of the mylonitized areas of the subnival belt for the biodiversity in the Carpathians.

Key words: biodiversity, flora, lichenicolous fungi, lichens, mylonitized granite, subnival belt

Introduction

The subnival belt — developed only in the granite part of the Tatra Mts. (Fig. 1) — is the highest climatic vegetation belt in the Carpathians.

Its distinctive features include the lichen biota, domination of the landscape, and *Oreochloetum distichae subnivale*, an endemic plant community (Pawłowski 1977b). The subnival belt extends from about 2100 m a.s.l. on the northern slopes



Fig. 1. Mt. Wolowy Grzbiet — a part of the main area of the subnival belt by Morskie Oko cirque in the Polish Tatra Mts.

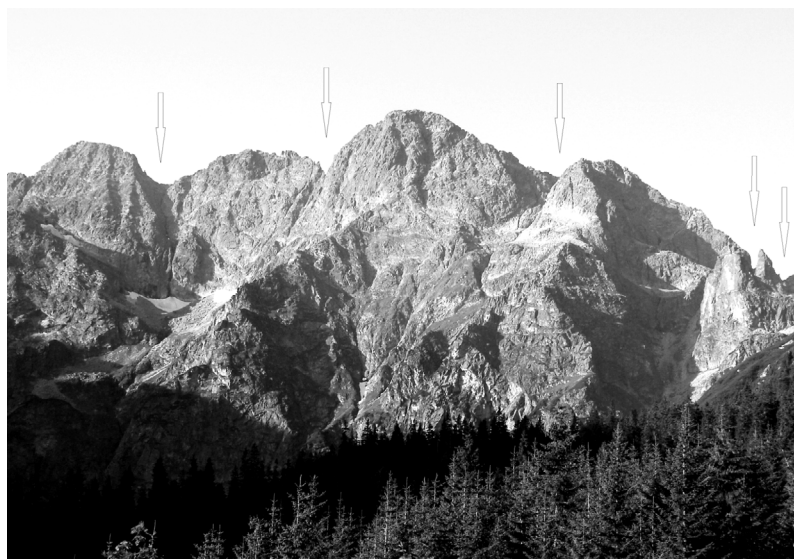
of the Tatra Mts. and about 2300 m a.s.l. on the southern slopes up to the highest peaks (Gerlachovský štít ca. 2654 m a.s.l.) (see Pawłowski 1977a, Piękoś-Mirkowa & Mirek 1996). It more or less corresponds to the cold climatic belt with a mean annual air temperature varying between -4 and -2 °C (Hess 1996). Despite its relatively small area (Balon 2000), the subnival belt of the Tatra Mts. is a major natural peculiarity in the Carpathians; its lichens, however, remained underexplored for a long time.

The biodiversity of small intrusions of mylonitized granite rock occurring in the tectonic zones of the crystalline part of the subnival belt (Fig. 2) is especially interesting. During the process of chemical weathering, mylonite (originated from granite as a result of contact metamorphism) enriches the habitat with biogenes taken

up by lichens. Supplied calcium is an important substance that allows rare calciphilous species to occur in the area dominated by siliceous rocks. Very small mylonitized areas are characterised by a great habitat heterogeneity, which, together with specific microclimatic conditions of the subnival belt, results in a high species richness (see Šmarda 1960, Vězda 1960, Ochyra 1996, Pačlová & Lisická 1998). The importance of habitat type for biodiversity is emphasized by the occurrence of a specific plant association, *Festuco versicoloris-Agrostietum alpinae*, the richest in species in the Tatra Mts. (Piękoś-Mirkowa & Mirek 1996).

First lichenological studies in the mylonitized area of the Polish Tatra Mts. were conducted by Tobolewski (1957, 1959, 1969) and Nowak (1974). Findings have also been reported

Fig. 2. Location of intrusions of mylonitized granite in the tectonic zones of the crystalline massif of Mięguszwieckie Szczyty. From the left: Mięguszwiecka Przełęcz pod Chłopkiem pass (2307 m a.s.l.), Wyżnia Mięguszwiecka Przełęcz pass (2330 m a.s.l.), Hińczowa Przełęcz pass (2323 m a.s.l.), Przełęczka pod Zadnim Mnichem pass (2135 m a.s.l.) and Ciemnosmreczyńska Przełęczka pass (2115 m a.s.l.).



in recent years (Bielczyk 2004, Czarnota 2004, Flakus 2004a, 2004b, 2005, 2006, Krzewicka 2004a, 2004b, Flakus & Bielczyk 2006, Osyczka 2006, Wilk & Flakus 2006). The first data on lichens growing in mylonitized areas in the Slovak part of the Tatra Mts. were published by Krajina (1933) in a paper on *Pulsatilla vernalis*. Later on, studies by Vězda (1960, 1961, 1962) and Pačlová and Lisická (1998) contributed much to the knowledge of lichens in mylonitized areas. Some species representing these habitats have also been given in other publications (Pišút 1961, 1962, 1968a, 1968b, Kyselová 1995, Aptroot *et al.* 2003, Lisická & Türk 2004, Lisická 2005). Altogether a total of 169 species and infraspecific taxa of lichens have been reported from mylonitized areas of the highest vegetation belt in the Carpathians.

The aim of this study is to update the current knowledge of lichenized and lichenicolous fungi of mylonitized areas in the subnival belt in the Tatra Mts., one of the most species-rich habitats in the Carpathians. Both the present author's observations and literature records were used in the analysis.

Material and methods

The data are based on literature records and study of original specimens collected by the

author in the field from 14 localities during 2003 to 2005. As a model area for more detailed research, the mylonite areas of the subnival belt near Morskie Oko cirque and Zawrat pass in the Polish High Tatra Mts. were chosen (Fig. 3). The localities of each species are indicated by numbers corresponding with the list above, followed by the relevant collection number in brackets. Unless otherwise stated, the author collected the specimens.

LOCALITIES: Poland, Western Carpathians, High Tatra Mts., subnival belt, mylonitized area: 1. Szpiglasowa Przełęcz pass, alt. 2110 m, 49°11'53"N, 20°02'34"E, 17 July 2003; 2. Mięguszwiecka Przełęcz pod Chłopkiem pass, alt. 2307 m, 49°11'09"N, 20°03'55"E, 18 July 2003; 3. Mięguszwiecka Przełęcz pod Chłopkiem pass, alt. 2307 m, 49°11'01"N, 20°03'56"E, 21 July 2003; 4. Szpiglasowa Przełęcz pass, alt. 2107–2110 m, 49°11'53"N, 20°02'34"E, 27 July 2003; 5. Hińczowa Przełęcz pass, alt. 2323 m, 49°11'16"N, 20°03'19"E, 1 August 2003; 6. below Mięguszwiecka Przełęcz pod Chłopkiem pass, alt. 2300 m, 49°11'02"N, 20°03'55"E, 3 August 2003; 7. on the trail to Mięguszwiecka Przełęcz pod Chłopkiem pass, below Mt. Kazalnica Mięguszwiecka, alt. 2100 m, 49°11'08"N, 20°04'08"E, 12 August 2003; 8. Ciemnosmreczyńska Przełęczka pass, alt. 2110–2115 m, 49°11'21"N, 20°02'59"E, 16 August 2003; 9. Przełęczka pod Zadnim Mnichem pass, alt. 2135 m, 49°11'19"N, 20°03'06"E, 16 August 2003; 10. Hińczowy Żleb gully, alt. 2250 m, 49°11'10"N, 20°03'21"E, 17 August 2003; 11. Szpiglasowa Przełęcz pass, alt. 2107 m, 49°11'53"N, 20°02'34"E, 15 July 2004; 12. Mięguszwiecka Przełęcz pod Chłopkiem pass, alt. 2307 m, 49°11'09"N, 20°03'55"E, 16 July 2004; 13. Mięguszwiecka Przełęcz pod Chłopkiem

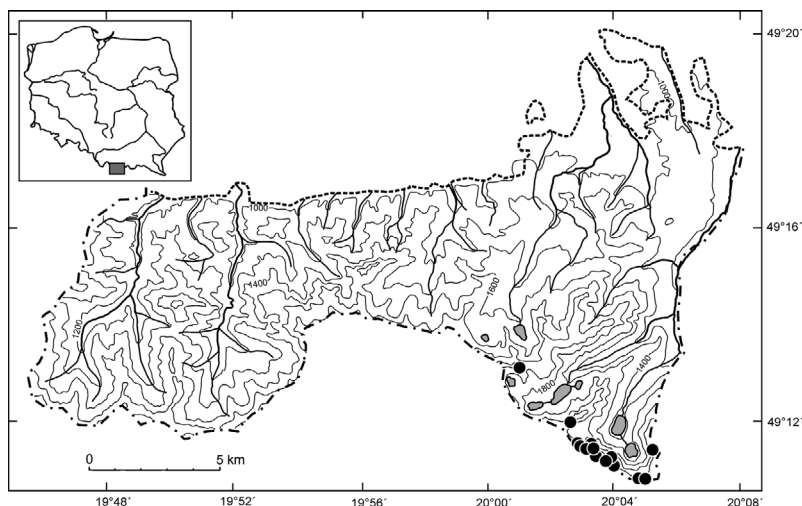


Fig. 3. Location of the collection sites in the Polish Tatra Mts.

pass, alt. 2260 m, 49°11'09"N, 20°03'55"E, 16 July 2004; 14. N wall of Mt. Mięgoszowiecki Szczyt, alt. 2100 m, 49°11'20"N, 20°03'34"E, 22 July 2004; 15. Hińczowy Żleb gully, alt. 2200 m, 49°11'10"N, 20°03'21"E, 22 July 2004; 16. Ciemnosmreczyńska Przełęczka pass, alt. 2105 m, 49°11'21"N, 20°02'59"E, 24 July 2004; 17. Ciemnosmreczyńska Przełęczka pass, alt. 2115 m, 49°11'21"N, 20°02'59"E, 7 August 2004; 18. Przełęczka pod Zadnim Mnichem pass, alt. 2135 m, 49°11'19"N, 20°03'06"E, 15 August 2004; 19. Zawrat pass, alt. 2150 m, 49°13'15"N, 20°01'03"E, 18 August 2004; 20. Szpiglasowa Przełęcz pass, alt. 2105 m, 49°11'53"N, 20°02'34"E, 24 August 2004; 21. Przełęczka pod Zadnim Mnichem pass, alt. 2135 m, 49°11'19"N, 20°03'06"E, 24 August 2004; 22. Wyżnia Białczańska Przełęcz pass, alt. 2085 m, 49°11'20"N, 20°05'13"E, 20 August 2005; 23. Mięgoszowiecka Przełęcz pod Chłopkiem pass, alt. 2307 m, 49°11'09"N, 20°03'55"E, 22 August 2005; 24. Wyżnia Mięgoszowiecka Przełęcz pass, alt. 2330 m, 49°11'12"N, 20°03'48"E, 30 August 2005; 25. Żabia Przełęcz pass, alt. 2225 m, 49°10'44"N, 20°04'50"E, 1 September 2005; 26. Wyżnia Żabia Przełęcz pass, alt. 2235 m, 49°10'42"N, 20°04'47"E, 1 September 2005.

The morphology and anatomy of the lichen specimens were investigated using stereo- and compound microscopes. Secondary metabolites were identified applying thin layer chromatography (TLC, *see* Orange *et al.* 2001) or using spot tests. The specimens are deposited in KRAM-L. In addition, duplicates of some specimens are kept in the herbaria UGDA, ZAMU, J. Blaha, A. Fryday, A. Guttová, L. Kivistö, T. Lumbsch, H. Sipman, E. Timdal and A. Vězda. In the text the following symbols are used: * = lichenicolous fungus, + = non-lichenized saprophytic fungus, [SK] = Slovakia, [PL] = Poland.

List of taxa

Agonimia gelatinosa (Ach.) Brand & Diederich

[SK] (Lisická & Türk 2004). [PL] on humus, terricolous bryophytes and plant debris — 19 (3224); 20 (3371). This species is new to the Polish Tatra Mts.

Agonimia tristicula (Nyl.) Zahlbr.

[SK] (Vězda 1961, Pačlová & Lisická 1998). [PL] on plant debris, terricolous bryophytes and mylonite eluvium — 4 (930); 6 (1269); 11 (2444 & 2469/1); 16 (2900 & 2903); 19 (3254 & 3257); 20 (3359, 3406 & 3433); 21 (3501 & 3514).

Alectoria nigricans (Ach.) Nyl.

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] (Tobolewski 1957); on humus, mylonite eluvium, terricolous bryophytes and plant debris — 3 (857); 4 (985); 5 (1095 & 1099); 8 (1747 & 1825); 22 (5433).

Alectoria ochroleuca (Hoffm.) A. Massal.

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] on humus, mylonite eluvium, terricolous bryophytes and plant debris — 1 (561); 3 (833); 5 (1094); 6 (1287); 8 (1743); 19 (3237); 22 (5434); 24 (5547/1).

Allantoparmelia alpicola (Th. Fr.) Essl.

[PL] on granite and mylonite rock — 1 (502 & 563); 8 (1822 & 1834); 24 (5540 & 5541/4).

Anaptychia bryorum Poelt

[PL] on terricolous bryophytes — 1 (571).

Anaptychia ciliaris (L.) Körb.

[SK] (Kyselová 1995). [PL] on mylonite rock — 8 (1738).

Arthonia lapidicola (Taylor) Branth & Rostr.

[PL] on mylonite rock — 4 (979). This species is new to the Tatra Mts.

Arthonia muscigena Th. Fr.[PL] on twigs of *Salix reticulata* — 20 (3377/2 & 3383/1). This species is new to the Western Carpathians.***Arthrorhaphis alpina*** (Schaer.) R. Sant.

[SK] (Pačlová & Lisická 1998). [PL] (Tobolewski 1959, Flakus 2004a, 2005); on humus, humous soil, mylonite eluvium and terricolous bryophytes — 4 (886, 910 & 987); 8 (1765); 12 (2503, 2535 & 2587/1); 16 (2944); 20 (3333); 23 (5505).

Arthrorhaphis citrinella (Ach.) Poelt

[PL] (Flakus 2004a); on humus and terricolous bryophytes — 6 (1292); 12 (2541).

Aspicilia aquatica Körb.

[PL] on mylonite rock in stream — 21 (3452).

Aspicilia caesiocinerea (Nyl. ex Malbr.) Arnold

[PL] on mylonite rock — 9 (1916); 21 (3454).

Aspicilia polychroma var. ***rubrireagens*** Asta & Roux

[PL] on mylonite rock — 4 (971). This variety is new to the Carpathians and this species is recorded from Poland and the High Tatra Mts. for the first time.

Aspicilia simoënsis Räsänen

[PL] on mylonite rock — 15 (2805).

Aspilidea myrinii (Fr.) Hafellner

[PL] on granite and mylonite rock — 12 (2596).

Bacidia bagliettoana (A. Massal. & De Not.) Jatta

[SK] (Vězda 1961). [PL] on plant debris and terricolous bryophytes — 11 (2287, 2290/1 & 2464); 20 (3327).

Bacidia herbarum (Stizenb.) Arnold[SK] (Lisická & Türk 2004). [PL] on plant debris and twigs of *Salix reticulata* — 16 (B. Cykowska 2900); 20 (3383).***Bacidia trachona*** (Ach.) Lettau

[PL] (Flakus 2004a).

Bacidina egenula (Nyl.) Vězda

[PL] on plant debris — 20 (3349 & 3349/1). This species is new to the High Tatra Mts. and the Polish Tatra Mts.

Bacidina inundata (Fr.) Vězda[PL] on inundate mylonite rock and thallus of *Dermatocarpon rivulorum* — 10 (2035, 2035/1 & 2038).***Baeomyces rufus*** (Huds.) Rebent.

[PL] on humus and mylonite rock — 10 (2025 & 2034); 12 (2578 & 2579); 15 (2785); 22 (5432); 23 (5506).

Bellemeria alpina (Sommerf.) Clauzade & Cl. Roux

[PL] on granite and mylonite rock — 5 (1141, 1152 & 1153); 6 (1260 & 1262); 9 (1882, 1894 & 1909); 10 (2039 & 2062); 12 (2599); 15 (2793 & 2811); 18 (3165, 3169 & 3176); 23 (5519).

Bellemeria diamarta (Ach.) Hafellner & Cl. Roux

[PL] on mylonite rock — 18 (3178). This species is recorded from Poland for the first time.

Bellemeria subsorediza (Lynge) R. Sant.

[PL] on mylonite rock — 5 (1144); 6 (1261/1); 15 (2812). The species is recorded from Poland for the first time.

Belonia incarnata Th. Fr. & Graewe ex Th. Fr.

[PL] on humous soil and mylonite eluvium — 16 (2852).

Biatora vernalis (L.) Fr.[PL] (Flakus 2005); on humus, plant debris, terricolous bryophytes and twigs of *Salix reticulata* — 4 (885, 928 & 932); 11 (2306/1, 2325 & 2339).***Bilimbia accedens*** Arnold[PL] (Flakus 2005); on plant debris, terricolous bryophytes and *Saxifraga oppositifolia* — 1 (504); 4 (900, 938 & 994/1); 8 (1849); 11 (2462/1 & 2468/2); 20 (3382 & 3399).***Bilimbia lobulata*** (Sommerf.) Hafellner & Cop-pins

[SK] (Vězda 1960, 1961, Pišút 1968a). [PL] (Flakus 2005); on humus soil, mylonite eluvium, plant debris and terricolous bryophytes — 3 (866); 4 (941, 949 & 959); 9 (1865); 11

(2314); 12 (2552, 2561 & 2594); 16 (2885/1 & 2929); 18 (3102); 19 (3229); 20 (3366, 3385 & 3434); 26 (5643).

Bilimbia microcarpa (Th. Fr.) Th. Fr.

[PL] (Flakus 2004a); on plant debris and terricolous bryophytes — 20 (3340).

Bilimbia sabuletorum (Schreb.) Arnold

[SK] (Vězda 1961). [PL] (Flakus 2005); on terricolous bryophytes, plant debris and seldom on saxicolous bryophytes and mylonite rock — 4 (931, 956 & 958); 6 (1294); 8 (1848); 11 (2305 & 2450); 16 (2914 & 2934); 17 (3017); 20 (3414).

Brodoa atrofusca (Schaer.) Goward

[SK] (Pačlová & Lisická 1998). [PL] on granite rock — 8 (1763).

Brodoa intestiniformis (Vill.) Goward

[PL] on granite and mylonite rock — 9 (1903); 11 (2337); 12 (2584); 18 (3103); 21 (3456 & 3461); 22 (5427); 24 (5576).

Bryonora castanea (Hepp) Poelt

[SK] (Vězda 1961, Kyselová 1995).

Bryoria bicolor (Ehrh.) Brodo & D. Hawksw.

[PL] (Tobolewski 1957); on humus and terricolous bryophytes — 4 (989); 8 (1742, 1823 & 1837); 12 (2515/1).

Buellia* cf. *aethalea (Ach.) Th. Fr.

[SK] (Pačlová & Lisická 1998).

Buellia alboatra (Hoffm.) Th. Fr.

[PL] on mylonite rock and thallus of *Xanthoria elegans* — 8 (1738/1 & 1764); 17 (3009/2); 20 (3336).

Buellia insignis (Nägeli ex Hepp) Th. Fr.

[SK] (Vězda 1961).

Buellia leptocline (Flot.) A. Massal.

[PL] on mylonite rock — 12 (2530).

Buellia papillata (Sommerf.) Tuck.

[PL] (Flakus 2004a).

Caloplaca ammiospila (Wahlenb.) H. Olivier

[SK] (Vězda 1960, 1961, Pačlová & Lisická 1998). [PL] (Tobolewski 1957, Flakus 2005); on terricolous bryophytes, plant debris, *Saxifraga oppositifolia* and *S. retusa* — 1 (482,

516 & 569); 4 (891, 994 & 997); 8 (1748, 1847 & 1861); 11 (2291); 14 (2772); 16 (2865/1 & 2946/1); 23 (5515).

Caloplaca bryochryson Poelt

[SK] (Vězda 1960).

Caloplaca cerina* var. *chloroleuca (Sm.) Th. Fr.

[SK] (Pačlová & Lisická 1998). [PL] (Tobolewski 1957, Flakus 2005); on terricolous bryophytes, plant debris, *Saxifraga oppositifolia* and twigs of *Salix reticulata* — 1 (505); 4 (907, 970 & 995/1); 8 (1826/1 & 1827/1); 11 (2290 & 2295); 14 (2754, 2765 & 2777); 20 (3383/1).

Caloplaca cerina* var. *muscorum (A. Massal.) Jatta

[PL] on terricolous bryophytes — 11 (2459).

Caloplaca citrina (Hoffm.) Th. Fr.

[PL] on dead twigs of *Saxifraga oppositifolia* — 4 (960/1). This species is new to the High Tatra Mts.

Caloplaca conciliascens (Nyl.) Zahlbr.

[PL] (Wilk & Flakus 2006).

Caloplaca crenularia (With.) J.R. Laundon

[PL] on mylonite rock — 9 (1889); 20 (3417). This species is new to the High Tatra Mts.

Caloplaca sinapisperma (Lam. & DC.) Maheu & Gillet

[PL] on terricolous bryophytes — 20 (3442).

Caloplaca tiroliensis Zahlbr.

[SK] (Vězda 1960). [PL] (Tobolewski 1957); on plant debris, *Saxifraga oppositifolia* and twigs of *Salix reticulata* — 4 (892, 918 & 952); 14 (2763).

Calvitimela armeniaca (DC.) Hafellner

[PL] on mylonite and granite rock — 3 (840); 5 (1116); 10 (2015); 12 (2607/3).

Candelariella vitellina (Hoffm.) Müll. Arg.

[SK] (Pačlová & Lisická 1998). [PL] on mylonite and granite rock — 9 (1875 & 1914); 11 (2482); 12 (2498); 23 (5499).

Carbonea vorticosa (Flörke) Hertel

[PL] on granite and mylonite rock — 4 (972, 975); 10 (2061).

Catapyrenium cinereum (Pers.) Körb.

[SK] (Vězda 1961, Kyselová 1995). [PL] on humus, mylonite eluvium and terricolous bryophytes — 8 (1854); 18 (3103/1, 3108 & 3111); 20 (3381); 21 (3496); 26 (5640).

Catapyrenium daedaleum (Kremp.) Stein

[SK] (Vězda 1960, 1961, Kyselová 1995). [PL] (Tobolewski 1957); on humus, mylonite eluvium and terricolous bryophytes — 4 (924/2 & 984); 5 (1135); 8 (1850); 10 (2018 & 2028).

Catillaria chalybeia (Borrer) A. Massal.

[PL] on granite rock — 24 (3532).

Catolechia wahlenbergii (Ach.) Körb.

[PL] on humus — 24 (5553).

****Cecidonia umbonella*** (Nyl.) Triebel & Rambold

[PL] on thallus of *Lecidea swartzioidea* — 6 (1281). This species is new to the Tatra Mts. and is recorded from Poland for the first time.

****Cercidospora epipolytropa*** (Mudd) Arnold

[PL] on thallus and apothecial discs of *Lecanora polytropa* — 5 (1101). This species is new to the High Tatra Mts.

Cetraria aculeata (Schreb.) Fr.

[SK] (Lisická & Türk 2004). [PL] (Flakus 2005); on soil, humus, terricolous bryophytes and in rock cracks — 2 (648); 3 (828); 4 (882 & 1002); 5 (1092); 12 (2544); 23 (5512).

Cetraria ericetorum Opiz

[SK] (Pačlová & Lisická 1998, Lisická & Türk 2004). [PL] on humus and mylonite eluvium — 22 (5457).

Cetraria islandica (L.) Ach.

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] on soil, humus, mylonite eluvium and terricolous bryophytes — 1 (492); 3 (829 & 830/2); 5 (1093 & 1098/1); 8 (1821); 10 (2024); 11 (2457); 19 (3239); 22 (5434/1 & 5441); 24 (5550).

Cetraria muricata (Ach.) Eckfeldt

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] on soil and moribund bryophytes — 3 (855).

Cetrariella delisei (Bory *ex* Schaer.) Kärnefelt & Thell

[SK] (Aptroot *et al.* 2003).

Cladonia arbuscula (Wallr.) Flot. em. Ruoss subsp. ***arbuscula***

[SK] (Krajina 1933, as *C. arbuscula s.l.*). [PL] on humus and mylonite eluvium — 6 (1286).

Cladonia arbuscula subsp. ***mitis*** (Sandst.) Ruoss

[SK] (Aptroot *et al.* 2003). [PL] on mylonite eluvium, humus, plant debris and terricolous bryophytes — 1 (541); 8 (1841); 11 (2483); 16 (2877 & 2925).

Cladonia bellidiflora (Ach.) Schaer.

[SK] (Aptroot *et al.* 2003). [PL] on humus, mylonite eluvium and terricolous bryophytes — 14 (2784); 18 (3182); 22 (5426).

Cladonia borealis S. Stenroos

[SK] (Aptroot *et al.* 2003). [PL] (Osyczka 2006).

Cladonia cervicornis (Ach.) Flot.

[PL] on humus and mylonite eluvium — 19 (3246/2 & 3249/1).

Cladonia chlorophaea (Flörke *ex* Sommerf.) Spreng.

[SK] (Lisická & Türk 2004). [PL] on humus, plant debris, mylonite eluvium and terricolous bryophytes — 6 (1285); 10 (2020); 11 (2332); 14 (2474); 19 (3264).

Cladonia coccifera (L.) Willd.

[SK] (Aptroot *et al.* 2003). [PL] on humus, plant debris, mylonite eluvium and terricolous bryophytes — 1 (560); 3 (838); 5 (1088); 8 (1795); 16 (2893); 19 (3247, 3250/1 & 3263/1).

Cladonia coniocraea (Flörke) Spreng.

[SK] (Lisická & Türk 2004).

Cladonia crispata var. ***cetrariiformis*** (Delise) Vain.

[PL] on humus, plant debris and mylonite eluvium — 19 (3228); 22 (5437); 24 (5548).

Cladonia cyanipes (Sommerf.) Nyl.

[SK] (Pišút 1962).

Cladonia ecmocyna Leight.

[SK] (Lisická & Türk 2004).

Cladonia furcata (Huds.) Schrad.

[PL] on humus and mylonite eluvium — 9 (1874); 11 (2302).

Cladonia gracilis (L.) Willd.

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] [subsp. *turbinata* (Ach.) Ahti] on humus — 16 (2894).

Cladonia macilenta subsp. ***floerkeana*** (Fr.) V. Wirth

[SK] (Lisická & Türk 2004). [PL] on humus, terricolous bryophytes and mylonite eluvium — 12 (2522/1); 22 (5436).

Cladonia macroceras (Delise) Hav.

[SK] (Lisická & Türk 2004). [PL] on humus and mylonite eluvium — 1 (538/2 & 542); 3 (837); 5 (1096 & 1100); 9 (1873); 10 (2021); 16 (2895/1); 19 (3238); 22 (5447).

Cladonia cf. ***macrophyllodes*** Nyl.

[PL] on mylonite eluvium and humus — 11 (2447).

Cladonia monomorpha Aptroot, Sipman & van Herk

[SK] (Aptroot *et al.* 2003).

Cladonia pleurota (Flörke) Schaer.

[PL] on plant debris, humus and mylonite eluvium — 22 (5429).

Cladonia pocillum (Ach.) Grognot

[SK] (Lisická & Türk 2004). [PL] on mylonite eluvium, humus and terricolous bryophytes — 12 (2591); 18 (3155).

Cladonia pyxidata (L.) Hoffm.

[SK] (Pačlová & Lisická 1998, Lisická & Türk 2004). [PL] on humus, terricolous bryophytes and plant debris — 11 (2303 & 2336); 19 (3249).

Cladonia rangiferina (L.) F.H. Wigg.

[SK] (Pačlová & Lisická 1998). [PL] on humus and mylonite eluvium — 19 (3243).

Cladonia squamosa Hoffm.

[PL] on humus, mylonite eluvium and terricolous bryophytes — 3 (830/3); 8 (1761); 16 (2939); 22 (5438).

Cladonia stellaris (Opiz) Pouzar & Vězda

[SK] (Pačlová & Lisická 1998).

Cladonia sulphurina (Michx.) Fr.

[SK] (Pišút 1961).

Cladonia trassii Ahti

[PL] on humus and mylonite eluvium — 6 (1288); 10 (2022); 12 (2497); 16 (2895); 22 (5442).

Cladonia uncialis (L.) Weber *ex* F.H. Wigg.

[SK] (Aptroot *et al.* 2003). [PL] on humus and mylonite eluvium — 1 (513); 3 (830/1 & 831); 8 (1746); 10 (2019); 11 (2486); 19 (3242); 20 (5439); 22 (5446); 24 (5578).

Collema crispum (Huds.) Weber *ex* F.H. Wigg.

[PL] on terricolous bryophytes and mylonite eluvium — 11 (2331); 20 (3347). This species is new to the High Tatra Mts.

Collema cristatum (L.) Weber *ex* F.H. Wigg. var. ***cristatum***

[SK] (Pišút 1968b).

Collema polycarpon Hoffm.

[SK] (Pišút 1968b).

Collema tenax (Sw.) Ach. *em.* Degel.

[SK] (Pačlová & Lisická 1998). [PL] on terricolous bryophytes and humus — 12 (2572 & 2588); 16 (2943); 18 (3094/1).

Cornicularia normoerica (Gunnerus) Du Rietz

[PL] on granite rock — 1 (531); 4 (986); 5 (1113 & 1115); 24 (5539).

Cystocoleus ebeneus (Dillwyn) Thwaites

[PL] on terricolous bryophytes, plant debris, humus and mylonite eluvium — 8 (1759 & 1810); 14 (2753 & 2769); 16 (2948); 17 (3011).

****Dacampia engeliana*** (Saut.) A. Massal.

[PL] on thallus of *Solorina saccata* and *Solorina* sp. — 8 (1853); 16 (2909). This species is new to the High Tatra Mts.

****Dacampia hookeri*** (Borrer) A. Massal.

[PL] on thallus of terricolous crustose lichen — 12 (2592).

Dermatocarpon miniatum (L.) W. Mann

[PL] on humus, mylonite eluvium and in mylonite crack — 9 (1866); 20 (3368); 23 (3525); 26 (5650).

Dermatocarpon rivulorum (Arnold) Dalla Torre & Sarnth.

[PL] on inundate mylonite rock — 10 (2035/2). This species is recorded from Poland for the first time.

Diploschistes gypsaceus (Ach.) Zahlbr.

[PL] on mylonite rock and mylonite eluvium with humus — 11 (2313, 2445 & 3437).

Diploschistes scruposus (Schreb.) Norman

[PL] on mylonite rock and uniquely on saxicolous and terricolous bryophytes — 1 (490 & 506); 6 (1266); 9 (1919); 10 (2033); 12 (2585); 19 (3261 & 3275); 20 (3334).

Eiglera flavida (Hepp) Hafellner

[PL] on mylonite rock — 11 (2318); 12 (2502, 2534/1 & 2607/1); 20 (3439 & 3440); 21 (3536). This species is new to the High Tatra Mts.

Epilichen scabrosus (Ach.) Clem.

[PL] (Flakus 2004a); on thallus of *Baeomyces rufus* — 12 (2587).

Evernia divaricata (L.) Ach.

[PL] on overhanging mylonite rock among *Ramalina carpatica* and on terricolous bryophytes — 8 (1740); 11 (2324).

Farnoldia micropis (A. Massal.) Hertel

[PL] on mylonite rock — 18 (3137, 3148 & 3149); 21 (3512).

Flavocetraria cucullata (Bellardi) Kärnefelt & Thell

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] on humus, mylonite eluvium and terricolous bryophytes — 1 (537); 3 (830); 8 (1745); 19 (3235); 23 (5481); 24 (5560).

Flavocetraria nivalis (L.) Kärnefelt & Thell

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] (Krzewicka 2004b); on humus, mylonite eluvium and terricolous bryophytes — 1 (538); 3 (834); 5 (1098); 8 (1741); 14 (2748); 16 (2895/2); 19 (3236 & 3246/1); 22 (5433/1); 24 (5547).

Frutidella caesioatra (Schaer.) Kalb

[PL] on terricolous bryophytes — 20 (3443).

Fuscidea kochiana (Hepp) V. Wirth & Vězda

[PL] on granite rock — 1 (525, 556/1 & 564); 17 (3009/1).

Gyalecta foveolaris (Ach.) Schaer.

[SK] (Vězda 1961). [PL] (Tobolewski 1959); on humus and mylonite eluvium — 11 (2471); 20 (3402 & 3405).

Gyalecta jenensis (Batsch) Zahlbr.

[SK] (Vězda 1960). [PL] on mylonite rock — 20 (3384 & 3394/1).

Gyalecta peziza (Mont.) Anzi

[PL] (Flakus 2005).

Gyalecta sudetica Vězda

[PL] (Flakus & Bielczyk 2006).

Gyalidea lecideopsis (A. Massal.) Lettau

[PL] on mylonite rock — 9 (1878); 11 (2301); 20 (3392). This species is new to the High Tatra Mts.

Gyalidea subscutellaris (Vězda) Vězda

[PL] on terricolous bryophytes — 20 (3377). This species is recorded from Poland for the first time.

Helocarpon crassipes Th. Fr.

[SK] (Vězda 1961). [PL] on terricolous bryophytes and plant debris — 11 (2289 & 2485); 12 (2543, 2549 & 2576); 16 (2856, 2906 & 2912); 20 (3427); 22 (5444 & 5448); 23 (5492); 24 (5551, 5555 & 5580).

Hypogymnia physodes (L.) Nyl.

[SK] (Lisická & Türk 2004). [PL] on humus, mylonite rubble, plant debris and terricolous bryophytes — 1 (494); 3 (869); 4 (913, 991 & 996); 16 (2869); 19 (3244).

Hypogymnia vittata (Ach.) Parrique

[SK] (Pačlová & Lisická 1998). [PL] (Flakus 2005); on humus, plant debris, mylonite rubble, terricolous bryophytes, *Saxifraga oppositifolia* and *S. retusa* — 1 (538/1, 540 & 566); 8 (1836); 12 (2559); 16 (2876); 19 (3244/1).

Involucropyrenium waltheri (Kremp.) Breuss

[PL] (Tobolewski 1959).

Ionaspis odora (Ach.) Stein

[PL] on inundate or moist mylonite and granite rock — 15 (2803); 22 (5464).

Lecanactis dilleniana (Ach.) Körb.

[PL] (Flakus 2004a).

Lecanographa abscondita (Th. Fr.) Egea & Torrente

[PL] (Flakus 2004a); on mylonite rock — 17 (3052).

Lecanora bicincta Ramond

[PL] on granite and mylonite rock — 4 (998); 5 (1108, 1109 & 1119); 17 (3043). This species is new to the Polish Tatra Mts. and is recorded from the Polish part of the Carpathians for the first time.

Lecanora bicinctoidea Blaha & Grube

[PL] on granite rock — 5 (1129). This recently described species by Blaha and Grube (2007) is new to the Carpathians and is recorded from Poland for the first time.

Lecanora cavicola Creveld

[PL] on mylonite and granite rock — 5 (1104 & 1124); 8 (1797); 12 (2505); 24 (5538, 5541 & 5572). This species is new to the Carpathians and is recorded from Poland for the first time.

Lecanora cenisia Ach.

[PL] (Wilk & Flakus 2006); on mylonite and granite rock — 3 (846 & 851); 6 (1282); 8 (1777, 1781 & 1829); 9 (1884, 1907 & 1915); 10 (2040, 2058 & 2061/1); 12 (2508 & 2529); 14 (2767); 17 (3045); 19 (3274); 21 (3451); 22 (5459); 23 (5489 & 5521); 24 (5565).

Lecanora dispersa (Pers.) Sommerf.

[PL] on mylonite rock — 8 (1772/1 & 1773); 21 (3534/1).

Lecanora dispersoareolata (Schaer.) Lamy

[SK] (Pišút 1970). [PL] on mylonite rock — 4 (968).

Lecanora epibryon (Ach.) Ach.

[PL] (Tobolewski 1957, Flakus 2005); on *Saxifraga oppositifolia*, plant debris and terricolous bryophytes — 4 (894, 946 & 951); 11 (2466).

Lecanora flotoviana Spreng.

[PL] on mylonite rock — 8 (1737/1 & 1772/2); 26 (5644).

Lecanora intricata (Ach.) Ach.

[SK] (Lisická & Türk 2004). [PL] on mylonite and granite rock — 5 (1154/1); 9 (1898); 15 (2816); 17 (3044/1); 24 (5575).

Lecanora marginata (Schaer.) Hertel & Rambold

[SK] (Pišút 1968a).

Lecanora polytropia (Ehrh. ex Hoffm.) Rabenh.

[SK] (Paclová & Lisická 1998, Lisická & Türk 2004). [PL] (Krzewicka 2004b); on mylonite and granite rock and uniquely on saxicolous bryophytes and twigs of *Salix reticulata* — 1 (487 & 550); 3 (847 & 852); 4 (924/1 & 930/1); 5 (1145, B. Cykowska 669/1 & 672/1); 6 (1251 & 1291); 8 (1784 & 1830); 9 (1904); 15 (2827); 17 (3044/2); 22 (5460); 23 (5496 & 5522).

Lecanora pulicaris (Pers.) Ach.

[PL] on wood of small twigs — 4 (888).

Lecanora rupicola subsp. *subplanata* (Nyl.) Leuckert & Poelt

[PL] on granite and mylonite rock — 8 (1769); 9 (1891/1).

Lecanora saligna (Schrad.) Zahlbr.

[SK] (Lisická & Türk 2004).

Lecanora soralifera (Suza) Räsänen

[PL] on mylonite rock — 12 (2532).

Lecanora stenotropa Nyl.

[PL] on mylonite rock — 9 (1896/1); 12 (2532/1). This species is new to the Western Carpathians and is recorded from Poland for the first time.

Lecanora swartzii (Ach.) Ach. subsp. *swartzii*

[PL] on mylonite rock — 5 (1105).

Lecanora swartzii subsp. *nylanderi* (Räsänen) Leuckert & Poelt

[PL] on mylonite rock — 8 (1752 & 1768). This variety is new to the Polish Tatra Mts.

Lecidea atrobrunnea (Ramond ex Lam. & DC.) Schaer.

[PL] on mylonite and granite rock — 5 (1149); 6 (1261); 10 (2032, 2065 & 2067); 12 (2597); 21 (3450); 23 (5497 & 5516). This species is new to the Polish part of the Carpathians.

Lecidea confluens (Weber) Ach.

[PL] on mylonite rock — 9 (1877).

Lecidea lapicida (Ach.) Ach. var. *lapicida*

[PL] on mylonite rock — 9 (1910).

***Lecidea lapicida* var. *pantherina* Ach.**

[PL] on mylonite and granite rock — 1 (548); 9 (1895 & 1911); 12 (2595); 23 (5525); 24 (5570).

***Lecidea lithophila* (Ach.) Ach.**

[PL] on mylonite rock — 5 (1126); 10 (2057); 22 (5458).

***Lecidea plana* (J. Lahm) Nyl.**

[PL] on mylonite rock — 22 (5463).

***Lecidea swartzioidea* Nyl.**

[PL] on mylonite and granite rock — 1 (485, 549 & 564/1); 3 (845); 5 (1127); 6 (1249 & 1258); 9 (1879); 10 (2042); 17 (3037, 3040 & 3047); 20 (3391); 23 (5490).

***Lecidella stigmatea* (Ach.) Hertel & Leuckert**

[PL] on mylonite rock — 20 (3337).

***Lecidella wulfeni* (Hepp) Körb.**

[SK] (Vězda 1961).

***Lecidoma demissum* (Rutstr.) Gotth. Schneid. & Hertel**

[SK] (Pačlová & Lisická 1998). [PL] on humus, mylonite eluvium and rarely on terricolous bryophytes — 5 (1089); 22 (5430); 26 (5649).

***Lepraria borealis* Lohtander & Tønsberg**

[PL] on mylonite rock — 12 (2546).

***Lepraria caesioalba* (de Lesd.) J.R. Laundon (chemotype I)**

[PL] on mylonite rock — 21 (3497).

***Lepraria diffusa* (J.R. Laundon) Kukwa**

[PL] on moribund terricolous bryophytes — 21 (3514/1). This species is new to the Polish Tatra Mts.

***Lepraria* cf. *jackii* Tønsberg**

[PL] on terricolous bryophytes — 16 (2930).

***Lepraria lobificans* Nyl.**

[PL] on plant debris, terricolous bryophytes and *Cystocoleus ebeneus* — 17 (3013 & 3018).

***Lepraria neglecta* (Nyl.) Erichsen**

[PL] on plant debris, terricolous bryophytes, humus, mylo-

nite eluvium and mylonite rock — 11 (2323); 12 (2568); 14 (2746, 2778 & 2783); 16 (2904 & 2930); 18 (3096); 19 (3255); 20 (3396, 3438/1 & 3445/1); 21 (3499); 23 (3503).

***Lepraria rigidula* (de Lesd.) Tønsberg**

[PL] on plant debris — 8 (1749/1).

***Lepraria vouauxii* (Hue) R.C. Harris**

[PL] on terricolous bryophytes and plant debris — 4 (957/1); 8 (1753/1); 11 (2308, 2311 & 2317); 16 (2926).

***Leptogium gelatinosum* (With.) J.R. Laundon**

[SK] (Pačlová & Lisická 1998). [PL] on terricolous bryophytes — 26 (5636 & 5638).

***Leptogium imbricatum* P.M. Jørg.**

[PL] on terricolous bryophytes, plant debris, humus and mylonite eluvium — 4 (924); 5 (1138/1); 11 (2316); 12 (2550, 2562 & 2577); 16 (2931); 17 (3025); 20 (3350 & 3435). This species is recorded from Poland for the first time.

***Leptogium lichenoides* (L.) Zahlbr.**

[PL] on terricolous bryophytes, plant debris, humus and mylonite eluvium — 4 (895); 9 (1865/1 & 1867/1); 11 (2454); 17 (3016); 20 (3387, 3403 & 3404); 21 (3515/1 & 3526); 26 (5634).

***Leucocarpia biatorella* (Arnold) Vězda**

[PL] on mylonite rock and plant debris — 20 (3377/1); 21 (3477).

***Lichenomphalia alpina* (Britzelm.) Redhead, Lutzoni, Moncalvo & Vilgalys**

[PL] (Flakus & Bielczyk 2006).

***Lichenomphalia hudsoniana* (H.S. Jenn.) Redhead, Lutzoni, Moncalvo & Vilgalys**

[PL] on humus, mylonite eluvium, plant debris and terricolous bryophytes — 16 (2942); 22 (5453); 23 (5500); 24 (5585).

***Lichenomphalia umbellifera* (L. : Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys**

[PL] (Flakus 2004a); on humus, mylonite eluvium, plant debris and terricolous bryophytes — 16 (2853 & 2921); 17 (3022); 19 (3226); 22 (5451); 23 (5484).

***Megaspora verrucosa* (Ach.) Hafellner & V. Wirth**

[PL] (Tobolewski 1957); on moribund terricolous bryophytes and plant debris — 20 (3432).

Melanelia commixta (Nyl.) Thell

[SK] (Aptroot *et al.* 2003). [PL] [chemotype III] on mylonite rock — 3 (870); 5 (1102).

Melanelia hepaticon (Ach.) Thell

[PL] on granite rock — 10 (2031).

+Melaspilea gibberulosa (Ach.) Zwackh

[PL] (Flakus 2004a).

Micarea cinerea f. tenuispora (D. Hawksw. & Poelt) Fryday

[PL] on terricolous bryophytes, plant debris and humus — 4 (906); 11 (2307); 12 (2553); 19 (3253 & 3256); 20 (3351).

Micarea incrassata Hedl.

[PL] (Tobolewski 1959, as *Lecidea assimilata*, Czarnota 2004); on mylonite eluvium, plant debris and terricolous bryophytes — 16 (2887).

Micarea lignaria (Ach.) Hedl.

[SK] (Pačlová & Lisická 1998). [PL] (Tobolewski 1957); on plant debris and terricolous bryophytes — 1 (483, 517 & 567); 4 (884, 919 & 1003); 5 (1087); 6 (1295); 8 (1753, 1815 & 1862); 11 (2321, 2328 & 2343); 12 (2511, 2558 & 2571); 16 (2865, 2880 & 2913); 17 (3049); 18 (3168); 19 (3246, 3273 & 3276); 20 (3328); 22 (5450); 23 (5514).

Micarea lithinella (Nyl.) Hedl.

[PL] on mylonite rock — 19 (3251). This species is new to the Tatra Mts.

Micarea submilliaria (Nyl.) Coppins

[PL] on plant debris and terricolous bryophytes — 19 (3262).

Micarea sylvicola (Flot.) Vězda & V. Wirth

[PL] on granite rock — 4 (1000).

Miriquidica garovaglii (Schaer.) Hertel & Rambold

[PL] on granite and mylonite rock — 1 (511, 554 & 555); 3 (839); 4 (967 & 973); 6 (1255); 8 (1775 & 1802); 9 (1880); 10 (2060/1); 18 (3162); 23 (5517); 24 (5568).

Miriquidica leucophaea (Flörke *ex* Rabenh.) Hertel & Rambold

[PL] on granite rock — 17 (3048).

***Muellerella pygmaea** (Körb.) D. Hawksw.

[PL] on thallus of *Rhizocarpon lavatum* — 10 (2048).

Mycobilimbia berengeriana (A. Massal.) Hafellner & V. Wirth

[SK] (Pačlová & Lisická 1998).

Mycobilimbia hypnorum (Lib.) Kalb & Hafellner

[SK] (Vězda 1961). [PL] on plant debris and terricolous bryophytes — 1 (498); 4 (896); 8 (1857); 11 (2326); 12 (2589); 16 (2897, 2937 & 2949); 18 (3091, 3106 & 3114); 20 (3344, 3360 & 3367); 23 (5503).

Ochrolechia androgyna (Hoffm.) Arnold *s. lato*

[PL] on plant debris, terricolous bryophytes and *Saxifraga* sp. — 11 (2329 & 2335); 14 (2770); 20 (3425/1 & 3431).

Ochrolechia frigida (Sw.) Lynge

[SK] (Vězda 1961). [PL] on plant debris, terricolous bryophytes and *Saxifraga oppositifolia* — 11 (2299, 2446 & 2469); 16 (2932).

Ochrolechia inaequatula (Nyl.) Zahlbr.

[SK] (Lisická 1993, Pačlová & Lisická 1998, Lisická 2005).

Ochrolechia cf. upsaliensis (L.) A. Massal.

[PL] on *Saxifraga oppositifolia* and terricolous bryophytes — 20 (3430).

Opegrapha gyrocarpa Flot.

[PL] (Flakus 2004a).

Ophioparma ventosa (L.) Norman

[SK] (Lisická 2005). [PL] on mylonite and granite rock — 1 (503); 3 (853); 4 (1001); 5 (1114); 12 (2507); 22 (5454).

Parmelia omphalodes (L.) Ach.

[SK] (Vězda 1960, Aptroot *et al.* 2003). [PL] (Tobolewski 1959); on humus, mylonite eluvium, mylonite rock, terricolous and saxicolous bryophytes — 1 (495, 497 & 539); 8 (1819); 17 (3042).

Parmelia saxatilis (L.) Ach.

[SK] (Lisická 2005). [PL] on mylonite rock, terricolous bryophytes, mylonite eluvium, humus and *Saxifraga retusa* — 4 (921); 5 (1090); 19 (3234); 23 (5485); 24 (5536).

Peltigera didactyla (With.) J.R. Laundon[SK] (Aptroot *et al.* 2003).***Peltigera lepidophora*** (Nyl. *ex* Vain.) Bitter

[PL] (Flakus 2004a).

Peltigera leucophlebia (Nyl.) Gyeln.

[SK] (Pačlová & Lisická 1998). [PL] (Flakus 2005); on mylonite eluvium, humus and terricolous bryophytes — 2 (647 & 649); 4 (887); 5 (1137/1); 8 (1842 & 1855); 9 (1871/1); 10 (2017); 11 (2333); 14 (2757); 16 (2855); 17 (3014); 18 (3093 & 3183); 20 (3324 & 3339).

Peltigera neckeri Hepp. *ex* Müll. Arg.

[PL] on terricolous bryophytes, mylonite eluvium, humus and plant debris — 5 (1137/2); 9 (1870); 20 (3346).

Peltigera polydactylon (Neck.) Hoffm.

[SK] (Krajina 1933). [PL] on mylonite eluvium, humus and terricolous bryophytes — 3 (827); 4 (999); 6 (1289); 8 (1852); 9 (1871); 11 (2453); 14 (2758); 21 (3535).

Peltigera ponojensis Gyeln.

[PL] (Flakus & Bielczyk 2006).

Peltigera praetextata (Flörke *ex* Sommerf.) Zopf

[PL] on terricolous bryophytes and plant debris — 16 (2923); 21 (3486).

Peltigera rufescens (Weiss) Humb.[SK] (Aptroot *et al.* 2003). [PL] on mylonite eluvium, humus and terricolous bryophytes — 4 (920/1); 5 (1137); 9 (1869); 10 (2029); 18 (3157 & 3166).***Peltigera venosa*** (L.) Hoffm.

[PL] on mylonite eluvium, humus and terricolous bryophytes — 2 (649/1); 3 (872); 5 (1137/3); 8 (1856 & 1858); 14 (2743 & 2777/2); 19 (3231).

Pertusaria amara (Ach.) Nyl.

[PL] on mylonite rock — 16 (2868).

Pertusaria bryontha (Ach.) Nyl.

[SK] (Lisická & Türk 2004).

Pertusaria corallina (L.) Arnold

[SK] (Pačlová & Lisická 1998). [PL] on mylonite rock — 1 (486); 16 (2866); 17 (3034); 23 (5513 & 5523).

Pertusaria coriacea (Th. Fr.) Th. Fr.

[SK] (Vězda 1961).

Pertusaria geminipara (Th. Fr.) C. Knight *ex* Brodo

[SK] (Vězda 1961, Lisická & Türk 2004).

Pertusaria glomerata (Ach.) Schaer.[SK] (Pačlová & Lisická 1998). [PL] (Tobolewski 1957, Flakus 2005); on plant debris, humus, terricolous bryophytes, *Saxifraga oppositifolia* and *S. retusa* — 1 (573); 4 (893, 912 & 990); 8 (1844 & 1859); 20 (3353).***Pertusaria lactea*** (L.) Arnold

[SK] (Pačlová & Lisická 1998). [PL] on mylonite and granite rock — 12 (2506 & 2513); 24 (5566/1).

Pertusaria melanochlora (DC.) Nyl.

[PL] (Flakus 2004a).

Pertusaria oculata (Dicks.) Th. Fr.

[SK] (Vězda 1961). [PL] (Flakus 2004a); on terricolous bryophytes — 11 (2487); 12 (2539); 16 (2857); 17 (3024); 19 (3271).

Pertusaria schaeereri Hafellner

[SK] (Pačlová & Lisická 1998). [PL] (Flakus 2004a); on mylonite rock — 12 (2500, 2531 & 2569); 17 (3032); 20 (3422); 23 (5524).

Physcia dimidiata (Arnold) Nyl.

[PL] on granite rock — 8 (1805).

Physconia muscigena (Ach.) Poelt

[SK] (Pačlová & Lisická 1998).

Placidium lachneum (Ach.) de Lesd.

[SK] (Vězda 1961). [PL] on mylonite eluvium, humus and terricolous bryophytes — 20 (3329).

Placidium squamulosum (Ach.) Breuss

[SK] (Vězda 1961). [PL] (Tobolewski 1959); on humus and mylonite eluvium — 3 (863 & 865); 6 (1265); 12 (2575 & 2592/1); 18 (3089 & 3110); 19 (3229/1); 21 (3498); 23 (5510).

Placynthiella icmalea (Ach.) Coppins & P. James

[SK] (Lisická & Türk 2004).

Placynthiella oligotropha (J.R. Laundon) Coppins & P. James

[PL] on humus and mylonite eluvium — 12 (2540).

Placynthium dolichoterum (Nyl.) Trevis.[PL] (Flakus 2006); on mylonite rock, humus and moribund thallus of *Placidium* sp. — 20 (3372); 21 (3509).***Placynthium pannariellum*** (Nyl.) H. Magn.

[SK] (Kyselová 1995).

Platismatia glauca (L.) W.L. Culb. & C.F. Culb.[SK] (Aptroot *et al.* 2003).***Polyblastia albida*** Arnold

[PL] on mylonite rock — 15 (2790).

Polyblastia bryophila Lönnr.

[SK] (Vězda 1961).

Polyblastia cupularis A. Massal. [including *P. microcarpa* (Arnold) Lettau]

[PL] on mylonite rock — 11 (2300); 12 (2557, 2583 & 2607/2); 15 (2792, 2813 & 2834); 17 (3027 & 3053); 18 (3130 & 3151); 20 (3393, 3411 & 3441/1); 21 (3457, 3539 & 3540).

Polyblastia fuscoargillacea Anzi

[PL] (Flakus & Bielczyk 2006).

Polyblastia gothica Th. Fr.

[PL] on plant debris and terricolous bryophytes — 12 (2560); 16 (2888 & 2945). This species is new to the High Tatra Mts.

Polyblastia muscorum (Servít) Clauzade & Poelt

[PL] on terricolous bryophytes and plant debris — 11 (2296, 2341 & 2469/2); 12 (2594/1); 18 (3099 & 3100); 20 (3331, 3398 & 3444). This species is new to the High Tatra Mts.

Polyblastia sendtneri Kremp.[PL] on terricolous bryophytes and *Saxifraga oppositifolia* — 20 (3418 & 3420).***Polyblastia terrestris*** Th. Fr.

[SK] (Vězda 1960). [PL] (Tobolewski 1959, Flakus 2004a, 2005); on mylonite eluvium, humus, plant debris, terricolous bryophytes and mylonite rock — 4 (924/4 & 940); 11 (2448,

2452 & 2463); 12 (2537 & 2564); 14 (2742, 2773 & 2781); 15 (2826 & 2843); 16 (2867, 2935 & 2946/2); 17 (3020 & 3021); 18 (3186); 19 (3262/1); 20 (3325 & 3436/1); 21 (3502 & 3504).

Polyblastia theleodes (Sommerf.) Th. Fr.

[PL] on mylonite rock — 4 (965/1); 11 (2320); 12 (2565); 16 (2950); 17 (3029); 19 (3230 & 3258); 20 (3338, 3357 & 3389).

Polyblastia verrucosa (Ach.) Lönnr.

[PL] on mylonite rock — 9 (1893/2); 20 (3438).

Polysporina simplex (Davies) Vězda

[SK] (Paclová & Lisická 1998). [PL] on mylonite rock — 4 (976); 17 (3054).

Porina mammillosa (Th. Fr.) Vain.

[SK] (Vězda 1961). [PL] on terricolous bryophytes and plant debris — 16 (2881/1 & 2928); 23 (5502).

Porina sudetica (Körb.) Lettau

[PL] (Flakus 2004a); on terricolous bryophytes and plant debris — 1 (490/1); 11 (2294, 2461 & 2465); 12 (2563); 16 (2864 & 2885); 17 (3019). This species is new to the High Tatra Mts.

Porpidia albocaerulescens (Wulfen) Hertel & Knoph

[PL] on granite rock — 5 (1121).

Porpidia crustulata (Ach.) Hertel & Knoph

[PL] (Krzewicka 2004b); on mylonite rock — 6 (1267); 12 (2501, 2566/1); 20 (3436).

Porpidia macrocarpa (DC.) Hertel & A.J. Schwab

[SK] (Paclová & Lisická 1998). [PL] on mylonite rock — 8 (1828); 23 (5504).

Porpidia speirea (Ach.) Kremp. var. *speirea*

[SK] (Paclová & Lisická 1998). [PL] on mylonite rock — 4 (933 & 964); 10 (2036); 20 (3388 & 3423).

Porpidia speirea var. *alpina* (Hepp *ex* Arnold) Clauzade & Cl. Roux

[PL] on mylonite rock — 6 (1268); 8 (1845). This variety is new to the High Tatra Mts.

Porpidia speirea* var. *prochsthallina (A. Massal.) Clauzade & Cl. Roux

[PL] on mylonite rock — 4 (982); 6 (1257); 8 (1790, 1803 & 1813); 17 (3030); 23 (5509). This variety is new to the Carpathians.

Porpidia superba (Körb.) Hertel & Knoph f. *superba*

[PL] on mylonite rock — 3 (849); 5 (1140); 6 (1256 & 1283); 9 (1899, 1899/1 & 1900); 10 (2043, 2055 & 2066); 11 (2292); 15 (2828); 18 (3138).

Porpidia tuberculosa (Sm.) Hertel & Knoph

[PL] on mylonite rock — 8 (1789).

Porpidia zeoroides (Anzi) Knoph & Hertel

[PL] on mylonite rock — 4 (966, 978 & 980); 21 (3519).

Protoblastenia siebenhaariana (Körb.) J. Steiner

[PL] (Flakus 2004a); on mylonite rock — 12 (2502/1); 18 (3121, 3129 & 3131); 20 (3369).

Protoblastenia terricola (Anzi) Lyngø

[PL] on terricolous bryophytes — 11 (2306).

Protopannaria pezizoides (Weber) P.M. Jørg. & S. Ekman

[SK] (Pačlová & Lisická 1998). [PL] (Tobolewski 1959, Flakus 2005); on mylonite eluvium, humus, plant debris and terricolous bryophytes — 2 (645); 3 (861); 4 (927); 7 (1735); 8 (1839 & 1843); 9 (1863); 10 (2026); 14 (2744/1); 16 (2859, 2929/1 & 2931/1); 18 (3185); 20 (3342); 21 (5537).

Protoparmelia badia (Hoffm.) Hafellner

[SK] (Pačlová & Lisická 1998). [PL] on mylonite and granite rock — 1 (533); 3 (844 & 850); 5 (1120); 6 (1253 & 1263); 8 (1793, 1806 & 1818); 9 (1881, 1901 & 1906); 10 (2041 & 2046); 12 (2516); 23 (5518).

Protothelenella corrosa (Körb.) H. Mayrhofer & Poelt

[PL] on mylonite rock — 12 (2556); 17 (3015).

Protothelenella sphinctrinoidella (Nyl.) H. Mayrhofer & Poelt

[PL] on terricolous bryophytes and plant debris — 12 (2567/1 & 2593/1); 16 (2889, 2921 & 2922); 17 (3012); 18 (3088, 3109 & 3159); 20 (3374); 22 (5455); 24 (5532).

Protothelenella sphinctrinoides (Nyl.) H. Mayrhofer & Poelt

[PL] on terricolous bryophytes and plant debris — 15 (2788); 16 (2854, 2907 & 2940).

Pseudephebe minuscula (Nyl. ex Arnold) Brodo & D. Hawksw.

[SK] (Lisická 2005).

Pseudephebe pubescens (L.) M. Choisy

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] on mylonite rock and terricolous and saxicolous bryophytes — 3 (835); 5 (1091).

Pseudevernia furfuracea (L.) Zopf

[PL] on mylonite eluvium, humus, plant debris and terricolous bryophytes — 4 (903 & 988); 12 (2521); 19 (3225).

Pseudosagedia chlorotica (Ach.) Hafellner & Kalb

[PL] (Flakus 2004a); on granite rock — 1 (510).

Psora decipiens (Hedw.) Hoffm.

[SK] (Vězda 1961).

Psorinia conglomerata (Ach.) Gotth. Schneid.

[PL] on overhanging and sparsely on vertical granite rock — 5 (1106 & 1112); 8 (1774); 17 (3010).

Pycnothelia papillaria (Ehrh.) Dufour

[SK] (Lisická 2005).

Racodium rupestre Pers.

[PL] on plant debris and terricolous bryophytes — 14 (2762).

Ramalina carpatica Körb.

[PL] on overhanging and sparsely horizontal mylonite and granite rock in covered place — 5 (1110); 8 (1739 & 1776); 9 (1872); 24 (5558).

Rhexophiale rhexoblephara (Nyl.) Hellb.

[SK] (Vězda 1960, 1961). [PL] (Flakus 2004a); on plant debris, mylonite eluvium and terricolous bryophytes — 1 (520 & 558); 12 (2548 & 2554); 16 (2899, 2941 & 2944/1); 23 (5511).

Rhizocarpon alpicola (Anzi) Rabenh.

[PL] on granite rock — 22 (5461); 24 (5556).

Rhizocarpon atroflavescens Lyngé

[SK] (Vězda 1960). [PL] on mylonite rock — 3 (848); 4 (983). This species is new to the Polish part of the Carpathians.

Rhizocarpon badioatrum (Flörke *ex* Spreng.) Th. Fr.

[PL] on mylonite rock — 5 (1150).

Rhizocarpon carpaticum Runemark

[PL] on granite rock — 1 (501, 529 & 535); 5 (1123); 8 (1751, 1791 & 1799).

Rhizocarpon distinctum Th. Fr.

[PL] on granite rock — 9 (1905).

Rhizocarpon geographicum (L.) DC.

[SK] (Pačlová & Lisická 1998). [PL] on mylonite and granite rock — 1 (488, 527 & 552); 3 (842); 5 (1125, 1134 & 1154); 6 (1259, 1270 & 1284); 8 (1796); 9 (1896, 1902 & 1913); 15 (2817).

Rhizocarpon glaucescens (Th. Fr.) Zahlbr.

[PL] on granite and mylonite rock — 5 (1131); 8 (1798); 24 (5561). This species is new to Poland and is recorded from central Europe for the first time.

Rhizocarpon grande (Flörke) Arnold

[PL] on granite rock — 8 (1804/1). This species is new to the Tatra Mts.

Rhizocarpon lavatum (Fr.) Hazsl.

[PL] on mylonite and granite rock — 1 (543, 544 & 547); 6 (1252); 7 (1734); 9 (1908); 10 (2037); 18 (3153 & 3180); 19 (3280); 22 (5462).

Rhizocarpon petraeum (Wulfen) A. Massal.

[PL] on mylonite rock — 8 (1794); 11 (2478); 20 (3390).

Rhizocarpon polycarpum (Hepp) Th. Fr.

[PL] on mylonite rock — 8 (1780); 9 (1890); 17 (3051); 18 (3163).

Rinodina olivaceobrunnea C.W. Dodge & G.E. Baker

[SK] (Vězda 1960). [PL] on twigs of *Salix reticulata* — 11 (2309); 20 (3425). This species is new to the Polish Tatra Mts.

Rinodina roscida (Sommerf.) Arnold

[PL] on *Saxifraga oppositifolia* — 4 (960 & 961); 11 (2319).

Rinodina turfacea (Wahlenb.) Körb.

[SK] (Vězda 1962, Lisická 2005).

Sarcogyne regularis Körb.

[PL] on mylonite rock — 21 (3528).

Schadonia fecunda (Th. Fr.) Vězda & Poelt

[PL] (Flakus 2006); on terricolous bryophytes and plant debris — 19 (3233); 20 (3345).

Schaereria fuscocinerea (Nyl.) Clauzade & Cl. Roux

[PL] on mylonite and granite rock — 1 (499, 521 & 534); 5 (1103, 1130 & 1133); 8 (1778); 17 (3039 & 3050); 24 (5569).

Scoliciosporum umbrinum (Ach.) Arnold.

[PL] (Flakus & Bielczyk 2006).

Solorina bispora Nyl. var. *bispora*

[SK] (Vězda 1960, 1961; Pačlová & Lisická 1998). [PL] (Flakus 2004b); on mylonite eluvium, humus and terricolous bryophytes — 15 (2787); 20 (3354); 23 (5483 & 5501).

Solorina bispora var. *macrospora* (Harm.) H. Olivier

[PL] (Flakus 2004b); on mylonite eluvium, humus and terricolous bryophytes — 12 (2563/1); 14 (2572); 16 (2860); 17 (3023); 18 (3095, 3101/1 & 3184); 19 (3223).

Solorina crocea (L.) Ach.

[SK] (Lisická 2005). [PL] (Nowak 1974); on mylonite eluvium, humus and terricolous bryophytes — 1 (557); 2 (646); 3 (856); 4 (999/1); 5 (1136); 6 (1293); 8 (1762, 1808 & 1864); 10 (2030); 14 (2744); 16 (2892); 19 (3265); 24 (5542).

Solorina octospora (Arnold) Arnold

[PL] (Flakus 2006).

Solorina saccata (L.) Ach.

[PL] (Flakus 2006); on mylonite eluvium, humus and terricolous bryophytes — 18 (3092, 3101 & 3104); 20 (3363/1 & 3401).

Sphaerophorus fragilis (L.) Pers.

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] on humus in rock crack and mylonite rubble — 1 (496 & 528); 3 (858); 4 (992 & 993); 8 (1783); 10 (2016); 22 (5428 & 5435).

Sphaerophorus globosus (Huds.) Vain.

[PL] (Tobolewski 1957); on humus, mylonite eluvium and terricolous bryophytes — 1 (491); 3 (836); 11 (2484); 16 (2875); 23 (5481/1 & 5486).

Sporastatia polyspora (Nyl.) Grunmann

[PL] on granite and mylonite rock — 3 (841); 6 (1250); 10 (2068); 15 (2822); 23 (5487).

Staurothele bacilligera (Arnold) Arnold

[PL] (Flakus & Bielczyk 2006).

Staurothele clopimoides (Arnold) J. Steiner

[PL] on inundate granite and mylonite rock — 10 (2047); 15 (2841).

Staurothele rupifraga (A. Massal.) Arnold

[PL] (Flakus & Bielczyk 2006).

Staurothele succedens (Rehm. *ex* Arnold) Arnold

[PL] (Flakus & Bielczyk 2006).

Stereocaulon alpinum Laurer

[SK] (Pačlová & Lisická 1998). [PL] on mylonite eluvium, humus and terricolous bryophytes — 3 (859); 11 (2408, 2479 & 2480); 12 (2542); 14 (2755, 2756 & 2786); 18 (3181); 23 (5465 & 5498).

Stereocaulon dactylophyllum Flörke

[PL] (Tobolewski 1969).

Stereocaulon evolutum Graewe

[PL] on humus in mylonite rock crack — 5 (1111). This species is new to the Polish part of the Carpathians.

Stereocaulon nanodes Tuck.

[PL] on mylonite and granite rock — 12 (2592); 21 (3513).

****Stigmidium mycobilimbiae*** Cl. Roux, Triebel & Etayo

[PL] on thallus of *Bilimbia sabuletorum* — 20 (3445/2).

This species is recorded from the High Tatra Mts. for the first time.

Strigula stigmatella (Ach.) R.C. Harris

[PL] on terricolous bryophytes and plant debris — 11 (2456, 2462 & 2470); 16 (2919 & 2946); 18 (3107 & 3111/1); 20 (3361, 3364 & 3428).

Tephromela atra (Huds.) Hafellner

[SK] (Vězda 1960, Pačlová & Lisická 1998). [PL] on mylonite and granite rock — 1 (508, 522 & 553); 8 (1771).

Thamnolia vermicularis (Sw.) Schaer. var. ***vermicularis***

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] (Bielczyk 2004).

Thamnolia vermicularis var. ***subuliformis*** (Ehrh.) Schaer.

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] (Bielczyk 2004, Krzewicka 2004b as *T. vermicularis*; Flakus 2005); on mylonite eluvium, humus and terricolous bryophytes — 19 (3240); 24 (5546 & 5549).

Thelidium aeneovinosum (Anzi) Arnold

[PL] on mylonite rock — 7 (1729); 9 (1892, 1893/1 & 1894/1); 18 (3145).

Thelidium olivaceum (Fr.) Körb.

[PL] on mylonite rock — 21 (3528/1). This species is recorded from Poland for the first time.

Thelidium papulare (Fr.) Arnold

[SK] (Pišút 1968a). [PL] on mylonite rock — 12 (2580); 17 (3028, 3031 & 3055); 18 (3118); 19 (3259); 20 (3412); 21 (3458 & 3479).

Thelidium pyrenophorum (Ach.) Mudd

[PL] on mylonite rock — 10 (2051, 2059 & 2060); 11 (2475, 2476 & 2477); 12 (2581 & 2582); 15 (2797, 2799 & 2830); 18 (3120, 3128 & 3144); 20 (3358 & 3386); 21 (3488, 3500 & 3538); 24 (3533).

Thelidium zwackhii (Hepp) A. Massal.

[PL] on mylonite rock — 13 (2611); 21 (3460, 3505 & 3507). This species is new to the High Tatra Mts.

****Thelocarpon epibolum*** Nyl.

[PL] on thallus of *Lichenomphalia hudsoniana*, *Solorina bispora* and *Peltigera venosa* — 16 (2861); 22 (2776, 5456).

Thelocarpon sphaerosporum H. Magn.

[PL] on humus, moribund terricolous bryophytes and thallus of crustose lichens — 12 (2567); 18 (3105). This species is new to the Carpathians and is recorded from Poland for the first time.

Thelopsis melathelia Nyl.

[SK] (Vězda 1960). [PL] (Tobolewski 1959); on plant debris and terricolous bryophytes — 3 (862); 11 (2467, 2469/3 & 2472); 12 (2536 & 2560/1); 20 (3326, 3365 & 3429).

Toninia aromatica (Sm.) A. Massal.

[PL] on mylonite rock — 12 (2606); 18 (3132, 3133 & 3136); 20 (3415 & 3487); 21 (3491 & 3513/1).

Toninia coelestina (Anzi) Vězda

[PL] on bryophytes, plant debris and mylonite eluvium — 19 (3222). This species is new to the High Tatra Mts. and is recorded from Poland for the first time.

Trapelia coarctata (Sm.) M. Choisy

[PL] on granite and mylonite rock — 12 (2519); 16 (2863, 2882 & 2947); 20 (3355); 23 (5520).

Trapelia involuta (Taylor) Hertel

[PL] (Flakus 2004a); on mylonite rock — 16 (2851); 20 (3446).

Trapeliopsis flexuosa (Fr.) Coppins & P. James

[SK] (Lisická & Türk 2004).

Trapeliopsis gelatinosa (Flörke) Coppins & P. James

[PL] on humus and plant debris — 1 (517/1); 24 (5552).

Trapeliopsis granulosa (Hoffm.) Lumbsch

[SK] (Lisická & Türk 2004).

Tremolecia atrata (Ach.) Hertel

[PL] on mylonite rock — 15 (2823).

Umbilicaria aprina Nyl.

[PL] (Krzewicka 2004a).

Umbilicaria crustulosa (Ach.) Frey

[PL] (Krzewicka 2004a, b); on mylonite and granite rock — 14 (2761 & 2777/1); 24 (5541/1).

Umbilicaria cylindrica (L.) Delise *ex* Duby

[SK] (Paclová & Lisická 1998). [PL] (Krzewicka 2004a) on granite and mylonite rock — 1 (565); 3 (854); 22 (5452); 24 (5541/2).

Umbilicaria deusta (L.) Baumg.

[PL] (Krzewicka 2004a, b); on granite and mylonite rock — 8 (1801); 24 (5541/3).

Umbilicaria hirsuta (Sw. *ex* Westr.) Hoffm.

[PL] (Krzewicka 2004a); on granite rock — 22 (5465/1); 24 (5557).

Umbilicaria hyperborea (Ach.) Hoffm.

[PL] (Krzewicka 2004a).

Umbilicaria laevis (Schaer.) Frey

[PL] (Krzewicka 2004a).

Umbilicaria nylanderiana (Zahlbr.) H. Magn.

[PL] (Krzewicka 2004a).

Umbilicaria polyphylla (L.) Baumg.

[PL] (Krzewicka 2004b).

Umbilicaria vellea (L.) Hoffm.

[PL] (Krzewicka 2004a).

Verrucaria aethiobola Wahlenb.

[PL] on mylonite rock — 10 (2049/2).

Verrucaria andesiatica Servít

[PL] on mylonite rock — 18 (3179). This species is new to the Tatra Mts.

Verrucaria funckii (Spreng.) Zahlbr.

[PL] on inundate mylonite rock — 15 (2835).

Verrucaria guestphalica Servít

[PL] on inundate mylonite rock — 21 (3462 & 3466). This species is new to the High Tatra Mts.

Verrucaria hydrela Ach.

[PL] on inundate mylonite rock — 13 (2610).

Verrucaria latebrosa Körb.

[PL] on mylonite rock — 10 (2049/1).

Verrucaria tectorum (A. Massal.) Körb.

[PL] on mylonite rock — 21 (3523). This species is new to the Tatra Mts.

Vulpicida tubulosus (Schaer.) J.-E. Mattsson & M.J. Lai

[SK] (Vězda 1960, Pačlová & Lisická 1998). [PL] on mylonite eluvium, humus and terricolous bryophytes — 4 (881); 8 (1838); 11 (2288); 12 (2573); 16 (2900/2); 20 (3325/3).

Xanthoparmelia felkaensis (Gyeln.) Hale

[SK] (Pačlová & Lisická 1998).

Xanthoria candelaria (L.) Th. Fr.

[PL] on overhanging mylonite rock — 8 (1738/2 & 1750).

Xanthoria elegans (Link) Th. Fr.

[SK] (Pačlová & Lisická 1998, Aptroot *et al.* 2003). [PL] on mylonite and granite rock — 8 (1737 & 1804); 17 (3009 & 3041); 21 (3534).

Xanthoria nowakii S.Ya. Kondr. & U. Bielczyk

[PL] on mylonite rock — 20 (3410). This species is new to the High Tatra Mts.

Xanthoria soredata (Vain.) Poelt

[PL] on granite rock — 17 (3041/1).

Discussion

Phytogeographical results

The 325 species and eight infraspecific taxa of lichens and allied fungi constitute 24% of the lichen biota of the Tatra Mts., the range of the Carpathians richest in species (1337 species, *see* Lisická 2005). They represent 35% of the species known from the entire region of the High Tatra Mts., and almost 50% of the species that occur above the upper forest limit.

Mylonitized areas of the subnival belt, although small in extension, are the most species-rich habitats in the High Tatra Mts. Their importance for biodiversity preservation is further demonstrated by the fact that they are the only Carpathian localities for some taxa, e.g. *Aspicilia polychroma* var. *rubrireagens*, *Caloplaca conciliascens*, *Gyalecta sudetica*, *Lecanora*

bicinctoidea, *L. cavicola*, *Porpidia speirea* var. *prochsthallina*, *Rhizocarpon glaucescens* and *Thelocarpon sphaerosporum*.

As many as 105 species and three infraspecific taxa are reported here from the subnival belt of the Tatra Mts. for the first time. Fourteen species are new to Poland, and many others are new to various physico-geographical regions of the Carpathians, i.e. the entire Carpathians (3), the Western Carpathians (5), the Tatra Mts. (12), the High Tatra Mts. (26), the Polish part of the Carpathians (18), and the Polish part of the Tatra Mts. (28). The present records clearly show that the lichen flora of the Tatras, and particularly that of the highest vegetation belt, has been significantly neglected. However, the author's field observations are based on a small section of the Carpathian subnival belt, and detailed examinations in other subnival mylonitized areas in the mountain system, especially in its Slovak part, would be encouraged to provide a complete and up-to-date list of species. Additionally, the study mostly focuses on lichenized fungi, and only some findings of lichenicolous fungi are included. Specialized investigations on parasites as well lichens easily overlooked in field observations, sterile lichens and critical groups (e.g. *Collema*, *Lecanora*, *Porpidia*, *Rhizocarpon*, lecideoid and pyrenocarpous lichens) may provide a valuable body of information in the future.

The lichen biota of the mylonitized area of the subnival belt includes rare species and species with an interesting geographical distribution. For instance, the present record of *Rhizocarpon glaucescens* is the first one in central Europe. It differs from species of the *R. hochstetteri*-group by small ascospores (11.0–13.0 × 5.0–6.0 μm), brown epihymenium (K+ purple, Atra-red), paraphysoids with well-developed caps and the presence of norstictic acid in the thallus (Fryday 2002). *Rhizocarpon glaucescens* had previously been known only from a few localities situated in the northern part of Asia (Andreev *et al.* 1996), in Fennoscandia in the northern part of Europe (e.g. Zahlbruckner 1926, Santesson *et al.* 2004) and in the Svalbard Islands in the Arctic (e.g. Kilius 1981, Elvebakk & Hertel 1996). The present site in the Wyżnia Miękuszowiecka Przełęcz pass in the Polish Tatra Mts. is its southernmost locality. In addition, the study area provides other rare

European taxa, known from few localities. *Aspicilia polychroma* var. *rubrireagens*, recorded at a single locality in the Carpathians, had previously been known only from the Alps and the Pyrenees (e.g. Asta & Roux 1977, Clauzade & Roux 1985). *Gyalecta sudetica*, which has its only Carpathian locality in the study area (Flakus & Bielczyk 2006), was earlier described by Vězda (1965) from the Czech part of the Sudetes Mts. and is known from the Austrian Alps (Hafellner & Türk 2001). *Gyalidea subscutellaris* has been described from the Slovak Tatra Mts. by Vězda (1960) and is now considered to be extinct in Slovakia (Pišút *et al.* 1998); it is also known from the Austrian Alps (Hafellner & Türk 2001) and Great Britain (Coppins 2002). *Porpidia speirea* var. *prochsthallina*, recorded from the Carpathians for the first time, was earlier known in Europe from some localities in the Sudetes Mts. and in the Alps, in central Asia from China, and in North America from Canada (e.g. Hertel 1967, Hafellner & Türk 2001). *Staurothele bacilligera* was recorded from the mylonitized areas as new to the Western Carpathians (Flakus & Bielczyk 2006); it had previously been known from the southern part of the Carpathians in Romania (Moruzi *et al.* 1967). Beyond the subnival and alpine belts of the Polish and Slovak Tatra Mts., *Toninia coelestina* has been found only at a few localities situated in Norway, Great Britain, Italy and Austria (Vězda 1961, Timdal 1991, Hafellner & Türk 2001). *Xanthoria nowakii*, recently described by Kondratyuk and Bielczyk from the Swiss Alps, has been known only from the Polish Western Tatra Mts. and from Chile (Kondratyuk *et al.* 2001). Species interesting in Poland include *Lecidea atrobrunnea*, so far known in Poland only from one locality in the Sudetes Mts., reported in the 19th century (Körber 1855), *Rhizocarpon carpaticum*, recorded by Alstrup and Olech (1990) from only one locality in the Polish Tatra Mts. and *Stereocaulon evolutum*, known from three localities in the north of Poland (Kiszka & Lipnicki 1994, Opanowicz & Izydorek 2003).

Species conservation

Among the 294 species recorded in the Polish

part of the study area, 141 (48%) are red-listed (Cieśliński *et al.* 2006). Of these, 25 species have been classified as “critically endangered (CR)”, 32 as “endangered (EN)”, 42 as “vulnerable (VU)”, 21 as “near threatened (NT)”, 10 as “least concern (LC)” and 11 as “data deficient (DD)”. These figures show the importance of the study area for the conservation of lichen species threatened in Poland. Nevertheless, a group of species red-listed in Poland (Cieśliński *et al.* 2006) occur abundantly in the study area and their populations are in good condition. The same was observed by the author in other vegetation belts throughout the Polish Tatra Mts. (unpubl. data). These are mostly mountain species that occur in Poland only in specific habitats where they are usually in good condition. They are not threatened by extinction, but their occurrence is limited to mountain sites, covering small areas in Poland. These include “critically endangered (CR)” species: *Melanelia commixta*, *Rhizocarpon alpicola*, *Solorina crocea*, *Sporastatia polyspora*, “endangered (EN)” species: *Cladonia bellidiflora*, *Helocarpon crassipes*, *Lecidoma demissum*, *Miriquidica garovaglii*, *Pseudephebe pubescens*, *Solorina bispora*, *Sphaerophorus fragilis*, “vulnerable (VU)” species: *Brodoa intestiniiformis*, *Cladonia macroceras*, *Cornicularia normoerica*, *Flavocetraria cucullata*, and “near threatened (NT)” species: *Lichenomphalia hudsoniana*, *L. umbellifera*, and *Protoparmelia badia*. However, their conservation status should be reclassified to “least concern (LC)” in accordance with the threat criteria specified in the Polish Red List of lichens (Cieśliński *et al.* 2006) as they are still frequent and widely distributed in the main region of their occurrence in the wild in Poland. Similarly, according to the latest data available, the “endangered (E)” status of *Alectoria ochroleuca* given in the first edition of the Polish Red List (Cieśliński *et al.* 1986) was re-evaluated as “least concern (LC)” in the later editions (Cieśliński *et al.* 2003, 2006). Some of the recorded species known only from small populations occurring at few localities in Poland and rather infrequent in Central Europe, for example *Caloplaca conciliascens*, *Gyalecta peziza*, *G. sudetica*, *Gyalidea subscutellaris*, *Lichenomphalia alpina*, *Placynthium dolichoterum*, *Polyblastia fuscoargillacea*,

Rhizocarpon atroflavescens, *Solorina octospora*, *Staurothele bacilligera* and *Toninia coelestina*, should be considered for inclusion in the Red List.

Ecology

Large habitat heterogeneity allows acidophilous species, typical of the crystalline High Tatra Mts., and species requiring the calcium-rich substrate, to co-occur in mylonitized areas. It is one of the two main factors determining the high richness of lichen species in the relatively small area of the subnival belt. Calciphilous species constitute about 28% of the lichen biota reported from the study area. Those include strongly calciphilous species such as *Dermatocarpon minutum*, *Diploschistes gypsaceus*, *Gyalecta jenensis*, *Gyalidea lecideopsis*, *Lecanora flotoviana*, *Lepetogium lichenoides*, *Mycobilimbia berengeriana*, *Ochrolechia upsaliensis*, *Peltigera lepidophora*, *Placidium squamulosum*, *Polyblastia albida*, *P. sendtneri*, *Protoblastenia terricola*, *Sarcogyne regularis*, *Solorina bispora*, *S. saccata*, *Staurothele bacilligera*, *S. rupifraga*, *Thelidium papulare*, *Thelopsis melathelia* and *Verrucaria tectorum*. It is worth noticing that until quite recently calciphilous lichens were believed to be represented only by terricolous species (growing on bryophytes, soil and mylonite eluvium) in mylonitized areas whereas only acidophilous species of saxicolous lichens occurring in these places were known (see Tobolewski 1957, 1996). The present results show that this is not the case. As much as 33% of the recorded calciphilous lichens are saxicolous species, growing on mylonite rock. The high altitude is the other factor indirectly affecting the great number of lichen species in the study area. It creates specific microclimatic conditions and thereby allows for the occurrence of arctic-alpine species rare in central Europe, such as *Buellia papillata*, *Cetrariella delisei*, *Cladonia trassii*, *Farnoldia micropsis*, *Frutidella caesioatra*, *Gyalecta peziza*, *Lecanographa abscondita*, *Placynthium dolichoterum*, *Polyblastia terrestris*, *Rhexophiale rhexoblephara*, *Schadonia fecunda* and *Solorina octospora*.

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