THREATENED LICHENS OF LOWER SILESIA, POLAND

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ABSTRACT

A preliminary red list of threatened lichens of Lower Silesia (SW Poland) is presented. Species have been valuated according to the Red Data Book Categories (IUCN). The list comprises 602 taxa (ca. 60% of the whole lichen flora of Lower Silesia). 52 species are considered as rare (category R), 84 - as vulnerable (V), and 63 species – as endangered (E). The Silesian lichen flora is characterized by great numbers of taxa with extinct (Ex – 140 taxa), and indeterminate (I – 263 taxa) categories.

KEY WORDS: threatened lichens, red list, Lower Silesia, Poland.

INTRODUCTION

Two subsequent editions of Polish red list of threatened lichens published recently (Cieśliński et al. 1986, 1992) drew lichenologists' attention of to a process of the extinction of lichen species and inspired them to prepare similar lists for micro- and macroregions, mountain ranges etc. (e.g., Leśniański 1998; Śliwa 1998; Kiszka and Leśniański 1999). These lists will supplement the synthetic Polish list with detailed descriptions, showing local differences in both a kind and degree of threat factors.

In 1997, at the annual meeting, Polish lichenologists passed a resolution to make red lists for all regions of Poland distinguished as physical-geographic subprovinces according to Kondracki (1988, 1998). All these lists should have been published together in a one book edition. This plan has not been executed so far, but some results have been already achieved, among others presented regional red list of threatened lichens of Lower Silesia. It should be considered as preliminary and rough one. In the future, when our knowledge about contemporary conditions of lichen flora increases, the list will be verified.

The presented list bases on a preliminary check-list of Lower Silesian lichens (Kossowska, in preparation), containing all species reported from this area and mentioned in literature. Untill now the preliminary check-list is composed of ca. 1020 species, i.e. more than 60% of the whole Polish lichen flora (see Fałtynowicz 1993). Such a great number of recorded lichen taxa is caused by the abound-

ance and diversity of potential habitats, as well as by careful investigations carried out in the past. The lichen flora of Lower Silesia is one of the better recognized in Poland. A considerable part of records dates from the 19th and the beginning of the 20th centuries and was shed by eminent German lichenologists, e.g. Flotow 1849, 1850; Koerber 1855; Stein 1879, 1889; Eitner 1896, 1901, 1911, and others. Thanks to them and subsequent works of Polish lichenologists (Tobolewski 1855; Fabiszewski 1962, 1968) we have obtained nearly complete knowledge about Lower Silesian lichen flora before the great anthropogenic extinction, started in the seventies of the 20th century.

Names of lichen species are quoted according to Santesson (1993) and Fałtynowicz (1993).

LOCATION AND BORDERS OF THE STUDIED AREA

Lower Silesia (Dolny Śląsk, Niedere Schlesien) is a historical and geographical province in the south-western part of Poland, bordered upon Germany and Czech Republic. Due to the recent administrative division of the country one big voivodship with the capital city – Wrocław was established in this region; the borders of this voivodship were accepted as conventional borders of the area taken into consideration in this work (Fig. 1).

Such a delimited study area involves following physicalgeographic subprovinces (according to Kondracki 1998):

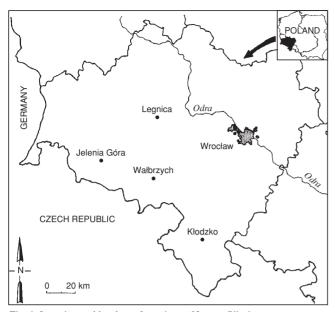


Fig. 1. Location and borders of province of Lower Silesia.

the Sudety Mts., the Śląsko-Łużyckie Lowlands and a part of the Środkowopolskie Lowlands.

CATEGORIES OF THREAT

Categories used for a valuation of a species threat degree have to be briefly explained. In December 1994, the World Conservation Union (IUCN) replaced hitherto used the Red Data Book Categories by a new system of threat categories and recommended them for use in new versions of red lists and red books. This system is composed of eight categories and three subcategories of threat, and of precise criteria of a valuation. Those new categories have been named as the Red List Categories (see IUCN Red List Categories...).

The clearly defined valuation criteria were assumed to make preparation of red lists easier and more objective. However, their strict application to lichens seems to be very difficult or even impossible, mainly because of lack of precise information about a current and historical size of populations, a number of mature individuals etc. As a result, according to the recommended criteria most of the lichen species should be considered as data deficient (category DD).

Therefore, in the presented list the authors decided to use the previous Red Data Book Categories (Cieśliński et al. 1992), as follows:

- Ex (Extinct) Species which are not confirmed after repeated searches either on known localities or in similar habitats
- E (Endangered) Taxa in danger of extinction and which survival is hardly probable if the casual factors continue operating.
- ullet V (Vulnerable) Species belived to move to the endangered category in near future if the casual factors continue operating
- **R** (Rare) Species of limited geographical range, small habitat areas or occuring on wide areas, but in considerable dispersion. At present, they are neither endangered nor vulnerable, but are at risk.

• I (Indeterminate) – Taxa known to be extinct, endangered, vulnerable or rare, but there are insufficient data to say which category is appropriate.

Advantage of such a solution is possibility of comparing our list with existing regional lists and the Polish list. However, lack of compatibility with new instructions of IUCN is its unquestionable drawback. Therefore, in the future, lichelologists who will study the lichen flora of Lower Silesia ought to pay particular attention to size and dynamics of species populations, especially of rare and endangered taxa. Consequently, in the second edition of our red list, we will be able to valuate lichen taxa according to the Red List Categories.

SHORT DISCUSSION

The red list of threatened lichens of Lower Silesia comparises 602 taxa, that is ca. 60% of the total lichen flora of this region. Among them, 52 species are considered as rare (category R), 83 – as vulnerable (V) and 63 species – as endangered (E). The characteristic trait of the Lower Silesian lichen flora are particularly numerous extinctas well as indeterminate species (140 and 264 respectively). Taxa with these two categories compose together two thirds of all species included to the red list.

A group of extinct taxa is mainly constituted of lichens especially sensitive to air pollution, e.g. macrolichens from the genera Alectoria, Bryoria, Evernia, Lobaria, Nephroma, Ramalina, Sticta and Usnea. These species are particularly endangered everywhere within their geographical ranges; some of them have no present locality in Poland (category Ex in the Polish red list – Cieśliński et al. 1992). The other group of taxa considered as extinct is composed of lichens known only from single localitites and occupying very specific habitats, e.g., aquatic species or lichens – relicts of a primeval forest (acc. to Cieśliński et al. 1996). The remaining species, that have not been recorded for a long time were considered as "lost" but still possible to be recovered and have got a category I. A great number of indeterminate species is resulted from, mentioned above, careful lichenological investigations carried out in Lower Silesia in the past. Many inconspiciouus species, easy to overlook were then recorded in single sites. Some of them could die out, but it is possible that the other still persist at the same or similar localities. Thus, the category I should be considered as a temporary one. In the future, the species included here shall be either moved to another category, or, what seems to be less probable, excluded from the list as not endangered.

When one compare the presented list with the Polish one, the lichen flora of Lower Silesia seems to be much more endangered (Fig. 2). It is probably caused by synanthropization of the environment, which has started earlier and has been more intensive than in other parts of Poland. Anthropogenic transformations in this region include mainly urbanization and industrialization processes, resulted in air and water pollution, forest felling, exploitation of natural rock outcrops and many others. In the seventies of the 20th century the local air pollution caused by emission of gases such as SO₂, NH_x and HF and dust contamination were intensified by a large-scale air pollution come from above the territories of former Czechoslovakia and German

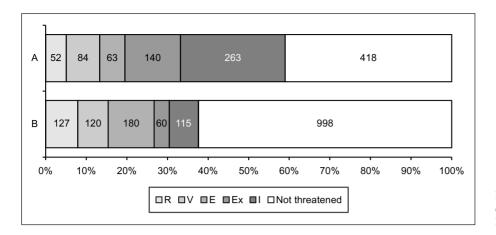


Fig. 2. Number of species and percentage of each category of threat in lichen flora of Lower Silesia (A) and Poland (B).

Democratic Republic. It was the main reason of the ecological disaster of mountain forests in the Sudetes.

All those factors exerted a strong harmful impact on the Lower Silesian lichens, resulted in a considerable decline of a number of species. A relatively reach lichen flora could persist only in small refuges, characterised by a peculiar combination of habitat factors and usually protected from air pollution by specific topographic features.

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RED LIST OF THREATENED LICHENS OF LOWER SILESIA

Species]	Lower Si	lesia	Poland
Acarospora complanata H. Magn				I
A. gallica H. Magn.				I I
A. impressula Th. Fr			Ex	R
A. macrospora (Hepp) Massal. ex Bagl.	'	V		
A. nitrophila H. Magn.			1 1	I
A. oligospora (Nyl.) Arnold	R			I D
A. peliscypha Th. Fr A. sinopica (Wahlenb.) Körb.	R			R R
A. versicolor Bagl. & Car.	K			ı
Acrocordia conoidea (Fr.) Körb.			1 1	II
Adelolecia pilati (Hepp) Hertel & Hafellner	R			
Alectoria nigricans (Ach.) Nyl.	'	V		
A. ochroleuca (Hoffm.) Massal.	R			
A. sarmentosa (Ach.) Ach.			Ex	E
Anaptychia ciliaris (L.) Körb.		E		E
Anisomeridium biforme (Borr.) R. C. Harris			Ex	
A. macrocarpum (Körb.) Wirth			Ex	1 I
Arctoparmelia centrifuga (L.) Hale Arthonia arthonioides (Ach.) A. L. Sm.	,	v	'	I I V
Armonia armoniolaes (Acn.) A. L. Sm. A.byssacea (Weigel) Almq.		'	Ex	E E
A. caesia (Flot.) Arnold			Ex	E
A. cinnabarina (DC.) Wallr.				I E
A. didyma Körb.				I V
A. dispersa (Schrad.) Nyl.				I V
A. elegans (Ach.) Almq.			Ex	E
A. endlicheri (Garov.) Oxner			Ex	Ex
A. exilis (Flk.) Anzi			Ex	E
A. fuliginosa (Turn. & Borr.) Flot.			Ex	Ex
A. lapidicola (Taylor) Branth & Rostrup	'	V		
A. mediella Nyl.			Ex	V
A. pruinata (Pers.) Sm.		E	Ex	Ex V
A. radiata (Pers.) Ach.		l E	Ex	· •
Arthopyrenia cerasi (Schrad.) Massal.			1 1	ı
A. cinereopruinosa (Schaer.) Körb.			Ex	•
A. glabra (Massal.) Nowak & Tobol.			1 1	ı
A. grisea (Schleich.) Koerb.				ı v
A. inconspicua Lahm in Körb.	R			
A. punctiformis Massal.				I E
Arthothelium spectabile Flotow ex Massal.			Ex	E
Arthrorhaphis citrinella (Ach.) Poelt			1 1	I
A. grisea Th. Fr.				I I
Arthrosporum populorum Massal.			Ex	, ,
Aspicilia aquatica Körb. A. coronata (Massal) Anzi	R		'	I I
A. faginea Eitner	K		Ex	
A. gottweigensis Zahlbr.				ı
A. pelobotryoides Eitner			1 1	Ī
A. recedens (Taylor) Arnold	,	v		v
Bacidia arceutina (Ach.) Arnold				I V
B. arnoldiana Körb.				I
B. assulata (Körb.) Vězda				I V
B. auerswaldii (Hepp) Migula			Ex	I
B. baggei (Metzler) DT. & Sarnth.			1 1	I V
B. beckhausii Körb.				I V
B. circumspecta (Nyl. ex Vainio) Malme			Ex	ı
B. coniangioides (Eitner) Zahlbr. B. egenula (Nyl.) Arnold			1 1	I I R
B. igniarii (Nyl.) Oxner			1 1	I
B. incompta (Borr.) Anzi			1 1	i v
B. laurocerasi (Delise ex Duby) Zahlbr.			Ex	R
B. polychroa (Th. Fr.) Körb.			Ex	E
<i>B. rosella</i> (Pers.) de Not			1 1	ı v
B. rubella (Hoffm.) Massal.			1 1	ı v
B. silesiaca Zahlbr.			Ex	Ex
B. subincompta (Nyl.) Arn.			Ex	E
B. trachona (Ach.) Lettau			Ex	E
			1 1	

Species	Lo	ower Sile	Poland	
Bactrospora dryina (Ach.) Massal.			Ex	E
Baeomyces carneus Flk.			I	E
B. speciosus (Körb.) Lindau			I	E
Belonia incarnata Th. Fr. & Graeve			I	R
B. russula Körb.			I	R
Biatora efflorescens (Hedl.) Erichsen	V			V
B. helveola Körb.ex Hellbom	V			X 7
B. sphaeroides (Dicks.) Körb.			Ex	V Ex
Biatorella conspurcans Norm. Bryoria bicolor (Ehrh.) Brodo & Hawskw.			EX	Ex
B. chalybeiformis (L.) Brodo & Hawksw.			Ex	I
B. fuscescens (Gyelnik) Brodo & Hawksw.		E	LA	E
B. implexa (Nyl.) Bystrek		E		v
<i>B. jubata</i> (L.) Bystrek		E		R
B. mirabilis (Mot.) Bystrek			Ex	E
B. nadvornikiana (Gyel.) Brodo & Hawksw.		E		E
B. setacea (Ach.) Brodo & Hawksw.			Ex	E
B. subcana (Nyl. ex Stiz.) Bystrek		E		E
Buellia alboatra (Hoffm.) Th. Fr.			I	
B. badia (Fr.) Mudd	V			I
B. chloroleuca Körb.			Ex	I
B. disciformis (Fr.) Mudd.			I	E
B. erubescens Arnold			I	E
B. leptocline (Flot.) Massal.			I	
B. ocellata (Flot.) Körb.			I	I
B. pharcidia (Ach.)Malme			I	
B. populorum (Massal.) Clauz. & Roux			I	
B. schaereri De Not.			I	V
B. stellulata (Tayl.) Mudd	R			
Calicium abietinum Pers			_r I	V
C. adspersum Pers.			Ex	E
C. corynellum (Ach.) Ach.		_E	Ex	Ex V
C. lichenoides (L.) Schum		E E		E
C. trabinellum (Ach.) Ach.		E		E
C. viride Pers		E		V
Caloplaca alociza (Massal.) Migula			I	'
C. cerina (Ehrh.) Th. Fr.		E	1	E
C. chlorina (Flot.) Sandst.		E		E
C. coronata (Krempelh.) Steiner	R			~
C. crenularia (With.) Laundon			I	R
<i>C. ferruginea</i> (Huds.) Th. Fr			I	E
C. lactea (Massal.) Zahlbr.	R			
C. nivalis (Körb.) Th. Fr.			I	
C. obscurella (Körb.) Th. Fr.			I	R
C. rubelliana (Ach.) Lojka			Ex	I
C. saxifragarum Poelt			I	I
C. stillicidiorum (Vahl.) Lynge		E		V
C. vitellinula (Nyl.) Olivier			I	I
Candelaria concolor (Dicks.) Stein	V			
Catapyrenium deadaleum (Krempelh.) Stein			Ex	V
C. michelii (Massal.) R. Sant.			I	
C. nufescens (Ach.) Breuss	V			
C. squamulosum (Ach.) Breuss				
Catillaria atomarioides (Hoffm.) Müll. Arg.	R			
C. subnigratula (Eitner) Zahlbr.			Ex	_
Catinaria atropurpurea (Schaerer) Vězda & Poelt			_E I	E
C. dispersa (Arnold) Lettau			Ex	I
C. laureri (Hepp) Degel.			Ex	E
Catagiria oklasophylla (Willd.) Voinio			I	R
Cetraria chlorophylla (Willd.) Vainio	W7	E		V
C. commixta (Nyl.) Th. Fr.	V			
C. cucullata (Bell.) Ach.				
C. nivalis (L.) Ach.				¥7
C. sepincola (Ehrh.) Ach.		E		V
Cetrelia olivetorum (Nyl.) Culb. & Culb. [C. cetrarioides (Duby) Culb. & Culb.]			I	E
Chaenotheca brachypoda (Ach.) Tibell			I	E
Ch. brunneola (Ach.) Müll. Arg.		E	I	V
Ch. chrysocephala (Turn.) Th. Fr	$ _{\mathbf{v}}$			
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Species	Lo	wer Sile	esia	Pola
<i>Ch. furfuracea</i> (L.) Tibell			I	
Ch. phaeocephala (Turn.) Th. Fr.			I	E
Ch. stemonea (ach.) Müll. Arg.			I	
Ch. trichialis (Ach.) Th. Fr.	V			V
Ch. xyloxena Nadv.			I	
Chrysotrix candelaris (L.) Laundon			I	
Cladonia botrytes (Hagen) Willd			Ex	E
C. cariosa (Ach.) Spreng.			I	
C. carneola (Fr.) Fr.			l	
<i>C. cyanipes</i> (Sommerf.) Nyl			I	
C. decorticata (Flk.) Spreng.			Ex	E
C. macroceras (Delise) Hav.	V			
C. macrophylla (Schaer.) Stenham.	R			R
C. parasitica (Hoffm.) Hoffm.			I	
C. ramulosa (With.) Laundon			I	
C. sulphurina (Michx.) Fr.	V			
C. turgida Hoffm.	v		I	V
Clauzadeana macula (Taylor) Coppins & Rambold [Aspicilia morioides Blomb.]	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Ex	l _E
C. griffithii (Sm.) Coppins			EX I	
Collema auriforme (With.) Coppins & Laundon	\mathbf{v}		1	E
C. callopismum Massal.	v			R
C. coccophorum Tuck.	v			R
C. conglomeratum Hoffm.			Ex	
C. crispum (Huds.) Weber	V			I
C. cristatum (L.) Weber			I	
C. dichotomum (With.) Coppins & Laundon			Ex	E
C. flaccidum (Ach.) Ach.			I	-
C. fragrans (Sm.) Ach.			Ex	E
C. glebulentum (Nyl. ex Crombie) Degel.			Ex	E
C. limosum (Ach.) Ach.	R			R
C. nigrescens (Huds.) DC.			Ex Ex	I E
C. occultatum Bagl.			EX	1 -
Cornicularia normoerica (Gunn.) Du Rietz			li	
Cresporhaphis muellerii (Duby) Aguirre			Ex	
C. weinkampii (Lahm) Aguirre			I	
Cyphelium notarisii (Tul.) Blomb. & Forssell			Ex	E
C. tigillare (Ach.) Ach.			I	E
Dermatocarpon luridum (With.) Laundon	V			l F
Dimelaena oreina (Ach.) Norm.			I	
Dimerella lutea (Dicks.) Trevisian			I	
Diploicia canescens (Dicks.) Massal.			_ I	
Diploschistes euganeus (Massal.) Stnr			Ex	E
D. gypsaceus (Ach.) Zahlbr.	R			
Endocarpon adscendens (Anzi) Müll. Arg.	V			١,
E. pusillum Hedw	*		I	
Eopyrenula leucoplaca (Wallr.) R. C. Harris			l	- 1
Ephebe lanata (L.) Vainio	R		1	ı,
Evernia divaricata (L.) Ach.			Ex	l i
E mesomorpha Nyl.			Ex	F
E. prunastri (L.) Ach.		E		1
Farnoldia hypocrita (Massal.) Fröberg	V			
F. jurana (Schaer,) Hertel			I	
Flavoparmelia caperata (L.) Hale			I	
Fritzea lamprophora (Körb.) Stein			I	
Fulgensia fulgens (Swartz) Elenkin		E		I
Fuscidea austera (Nyl.) P. James	V		_	1
F. kochiana (Hepp) Wirth & Vězda	₩7		I	
F. lightfootii (Sm.) Koppins & James	V		,	
F. recensa (Stirton) Hertel, Wirth & Vězda		E	I	I
Graphis scripta (L.) Ach		E	Ex	'
			Ex	1
	1	1		
G. ulmi (Sw.) Zahlbr.		1 1		
G. ulmi (Sw.) Zahlbr			I	- 1
G. ulmi (Sw.) Zahlbr.		E	I	

Helocarpon crassipes Th. Fr. Heppia lutosa (Ach.) Nyl. Hymenelia lacustris (With.) Choisy Hyperphyscia adglutinata (Flk.) Mayrh. & Poelt Hypogymnia farinacea Zopf H. tubulosa (Schaer.) Hav. H. vittata (Ach.) Parr. Hypotrachyna revoluta (Flk.) Hale H. sinuosa (Sm.) Hale Cmadophila ericetorum (L.) Zahlbr. mshaugia aleurites (Ach.) S. L. F. Meyer Onaspis chrysophana (Körb.) Stein Lepulotica (Ach.) Arnold Lodora (Ach.) Stein Cörberiella wimmeriana (Körb.) Stein Lecanactis abietina (Ach.) Körb.	R V V V R V V R	E	Ex Ex	E I V V I E E E X
Iymenelia lacustris (With.) Choisy Iyperphyscia adglutinata (Flk.) Mayrh. & Poelt Iypogymnia farinacea Zopf I. tubulosa (Schaer.) Hav. I. vittata (Ach.) Parr. Iypotrachyna revoluta (Flk.) Hale I. sinuosa (Sm.) Hale I. sinuosa (Sm.) Hale I. mshaugia aleurites (Ach.) S. L. F. Meyer Ionaspis chrysophana (Körb.) Stein I. epulotica (Ach.) Arnold I. odora (Ach.) Stein I. odora (Ach.) Stein I. ecanactis abietina (Ach.) Körb.	v v R V	E	Ex Ex Ex	I V V E E E E E E E E E E E E E E E E E
Isperphyscia adglutinata (Flk.) Mayrh. & Poelt Ispogymnia farinacea Zopf It tubulosa (Schaer.) Hav. It vittata (Ach.) Parr. Ispotrachyna revoluta (Flk.) Hale It sinuosa (Sm.) Hale It sinuosa (Sm.) Hale Is sinuosa (Sm.) Hale Is sinuosa (Sm.) Experimental (L.) Zahlbr. Imshaugia aleurites (Ach.) S. L. F. Meyer Ispotrachyna (Körb.) Stein Ispotrachyna (Körb.) Stein Ispotrachyna (Ach.) Arnold Ispotrachyna (Körb.) Stein Ispotrachyna (Körb.) Stein Ispotrachyna (Körb.) Stein Ispotrachyna (Körb.) Stein Ispotrachyna (Ach.) Körb.	v v R V	E	Ex Ex	I E Ex
Il pogymnia farinacea Zopf Il tubulosa (Schaer.) Hav. Il vittata (Ach.) Parr. Il pyotrachyna revoluta (Flk.) Hale Il sinuosa (Sm.) Hale Il sinuosa (Sm.) Hale Il madophila ericetorum (L.) Zahlbr. In shaugia aleurites (Ach.) S. L. F. Meyer In onaspis chrysophana (Körb.) Stein Il epulotica (Ach.) Arnold Il odora (Ach.) Stein Il odora (Ach.) Stein Il odora (Ach.) Stein Il odora (Ach.) Stein Il odora (Ach.) Körb.	R V	,	Ex Ex	I E Ex
I. tubulosa (Schaer.) Hav. I. vittata (Ach.) Parr. I. ypotrachyna revoluta (Flk.) Hale I. sinuosa (Sm.) Hale I. sinuosa (Sm.) Hale I. mshaugia aleurites (Ach.) S. L. F. Meyer I. sinuosa (Körb.) Stein I. epulotica (Ach.) Arnold I. odora (Ach.) Stein I. correction (Körb.) Stein I. ecanactis abietina (Ach.) Körb.	R V	,	Ex Ex	I E Ex
I. vittata (Ach.) Parr. I. ypotrachyna revoluta (Flk.) Hale I. sinuosa (Sm.) Hale I. sinuosa (Sm.) Hale I. mshaugia aleurites (Ach.) S. L. F. Meyer I. onaspis chrysophana (Körb.) Stein I. epulotica (Ach.) Arnold I. odora (Ach.) Stein I. ofora (Ach.) Stein I. ofora (Ach.) Stein I. odora (Ach.) Stein I. odora (Ach.) Stein I. odora (Ach.) Körb.	R V	,	Ex Ex	I E Ex
Ispotrachyna revoluta (Flk.) Hale I. sinuosa (Sm.) Hale I. sinuosa (Sm.) Hale I. madophila ericetorum (L.) Zahlbr. Inshaugia aleurites (Ach.) S. L. F. Meyer Instance (Ach.) S. L. F. Meyer Instance (Ach.) Arnold I. epulotica (Ach.) Arnold I. odora (Ach.) Stein I. cörberiella wimmeriana (Körb.) Stein I. ecanactis abietina (Ach.) Körb.	R		Ex Ex	E Ex
I. sinuosa (Sm.) Hale cmadophila ericetorum (L.) Zahlbr. mshaugia aleurites (Ach.) S. L. F. Meyer onaspis chrysophana (Körb.) Stein . epulotica (Ach.) Arnold . odora (Ach.) Stein (örberiella wimmeriana (Körb.) Stein .ecanactis abietina (Ach.) Körb.	R		Ex	Ex
cmadophila ericetorum (L.) Zahlbr. mshaugia aleurites (Ach.) S. L. F. Meyer onaspis chrysophana (Körb.) Stein . epulotica (Ach.) Arnold . odora (Ach.) Stein . cörberiella wimmeriana (Körb.) Stein .ecanactis abietina (Ach.) Körb.	R			I .
mshaugia aleurites (Ach.) S. L. F. Meyer onaspis chrysophana (Körb.) Stein . epulotica (Ach.) Arnold . odora (Ach.) Stein . " Körberiella wimmeriana (Körb.) Stein .ecanactis abietina (Ach.) Körb.	R			I E
onaspis chrysophana (Körb.) Stein . epulotica (Ach.) Arnold . odora (Ach.) Stein . «örberiella wimmeriana (Körb.) Stein . ecanactis abietina (Ach.) Körb.	R			
epulotica (Ach.) Arnold odora (Ach.) Stein öffberiella wimmeriana (Körb.) Stein ecanactis abietina (Ach.) Körb.	V	,		_
. odora (Ach.) Stein	V	,		I
Körberiella wimmeriana (Körb.) Stein				
ecanactis abietina (Ach.) Körb.	R		.	, D
	R	E		I R
	K	I.E.		"
. plocina Massal.				_I
ecania dubitans (Nyl.) A. L. Sm.			1 1	i
. fuscella (Schaer.) Körb.			1 1	i E
nylanderiana Massal.			Ex	. .
. guercicola Eitner			Ex	
ecanora achariana A. L. Sm.				$_{\rm I}$
. albella (Pers.) Ach.				i E
. allophana (Ach.) Nyl.				ī
. argopholis (Ach.) Ach.				ī
. cateilea (Ach.) Massal.			Ex	_ I
. demissa (Flot.) Zahlbr.			1 1	I
. eitneriana Zahlbr.			Ex	_ I
epibryon (Ach.) Ach.				I
. glabrata (Ach.) Malme			1 1	I
gypsodes Körb.				I R
. intumescens (Rebent.) Rabenh				ı l v
persimilis (Th. Fr.) Nyl.			Ex	I
subcarnea (Liljeblad) Ach.				I R
subrugosa Nyl		E		V
sulphurea (Hoffm.) Ach	V	r		V
tephraea Körb. ex Stein				I I
torquata (Fr.) Nyl.				I
umbrosa Degel				I I
ecidea alboflava (Körb.) Arnold				I
atomaria Th. Fr.			1 1	I
caesioatra Schaer			1 1	I
decussata (Ach.) Th. Fr				I R
ecrustacea (Anzi ex Arnold) Arnold	R			
exilis (Körb.) Rabenh.	_		Ex	I
. fallax (Hepp) Linds	R	.		
limosa Ach.	V			.
lurida (Ach.) DC.				I
luteoatra Nyl				I
nodulosa (Körb.) Olivier				I
ochrocarpa (Körb.) Lettau			Ex	,
phaeops Nyl.				I
planorbis (Körb.) Lett			Ex	
. pontifica (Körb. ex Stein) Zahlbr.			Ex	$\begin{bmatrix} & \mathbf{I} \\ \mathbf{I} \end{bmatrix}$
. pycnocarpa (Körb.) Ohlert			1 1	I R
. ramulosa Th. Fr			1 1	I
. squalescens Nyl.				I
. squatescens Nyi.				I
turgidula Fr.	l v	,		1 V
ecidella bullata Körb.	V			"
scabra (Taylor) Hertel & Leuckert	V			E
emmopsis arnoldiana (Hepp) Zahlbr.	•	E		I
pelodes (Körb. ex Stein) L. T. Ellis		E	Ex	I
.empholemma botryosum (Massal.) Zahlbr.			Ex	E
chalazanum (Ach.) B. de Lesd.	R		EA	V
myriococcum (Ach.) Th. Fr.	R			R
eprocaulon microscopicum (Vill.) Gams	~		Ex	E
eptogium byssinum (Hoffm.) Zwackh ex Nyl.			Ex	E

Species		Lower Sile	esia	Poland
L. corniculatum (Hoffm.) Minks.			I	E
L. cyanescens (Rabenh.) Körb.			Ex	
L. intermedium (Arnold) Arnold	R			
L. saturninum (Dicks.) Nyl			Ex	E
L. schraderi (Bernh.) Nyl.	R			
L. subtile (Swchrad.) Torss.			I	
L. tenuissimum (Dickson) Körb.		V		
Leptorhaphis quercus (Beltr.) Körb.			I	
Letharia vulpina (L.) Hue			Ex	Ex
Lobaria linita (Ach.) Rabenh.			Ex	Ex
L. pulmonaria (L.) Hoffm.			Ex	E
L. scorbiculata (Scop.) DC.			Ex	E
Lobothalia radiosa (Hoffm.) Hafellner			, I	
Lopadium disciforme (Flot.) Kullhem			Ex	
L. pezizoideum (Ach.) Körb.			F I	E E
Loxospora elatina (Ach.) Massal.			Ex Ex	
Maronea constans (Nyl.) Hepp	,	$\mathbf{v} \mid \cdot \mid$	EX	Ex
Massalongia carnosa (Dicks.) Körb		v	Ex	I
M. pulverea (Borr.) Hafellner & E. Schreiner			EX	1
M. puiverea (Bott.) Hatelinet & E. Schreinet Megaspora verrucosa (Ach.) Hafellner & Wirth			I	
Melanelia elegantula (Zahlbr.) Essl.			Ex	E
M. exasperata (de Not.) Essl.			EX	E
M. glabra (Schaer.) Essl		E	1	I
M. panniformis (Nyl.) Essl.			I	I
M. sorediata (Ach.) Goward & Ahti			I	1
M. stygia (L.) Essl	R		1	
M. subargentifera (Nyl.) Essl.	K	E		v
M. subaurifera (Nyl.) Essl		E		'
Menegazzia terebrata (Hoffm.) Massal.			I	E
Micarea adnata Coppins	,	$\mathbf{v} \mid \cdot \mid$	1	
M. incrassata Hedl.		$\dot{\mathbf{v}}$		
M. lignaria (Ach.) Hedl	R	`		
<i>M. meleana</i> (Nyl.) Hedl	1	\mathbf{v}		v
M. meleanida (Nyl.) Coppins			Ex	I
M. nitschkeana (Lahm. ex Rabenh.) Harm.			I	v
M. peliocarpa (Anzi) Coppins & R. Sant.	,	\mathbf{v}		
M. turfosa (Massal.) Du Rietz			I	R
Miriquidica complanata (Körb.) Hertel & Rambold	R			R
M. lîljenstroemi Du Rietz			I	
M. lulensis (Hellb.) Hertel & Rambold	R			
Moelleropsis nebulosa (Hoffm.) Gyeln.			I	I
Mycobilimbia lobulata (Sommerf.) Hafellner		E		
M. microcarpa (Th. Fr.) Wirth			I	E
Mycoblastus sanguinarius (L.) Norm.			I	E
Nephroma bellum (Spreng.) Tuck.			Ex	E
N. laevigatum Ach.			Ex	
N. parile (Ach.) Ach.			Ex	E
N. resupinatum (L.) Ach.			Ex	E
Normandina pulchella (Borrer) Nyl.			Ex	E
Ochrolechia pallescens (L.) Massal.			I	E
O. parella (L.) Massal.			I	I
O. subviridis (Hoeg.) Erichs.		V		V
O. tartarea (L.) Massal.		I		I
O. turneri (Sm.) Hasselrot			Ex	
Opegrapha atra Pers.			I	V
O. calcarea Sm			Ex	
O. dolomitica (Ach.) Koerb.			_ I	
O. illecebrosa Dufour [L. amylacea (Ehrh.) Arnold]			Ex	E
O. ochrocheila Nyl.			I	R
O. rufescens Pers.		E		V
O. varia Pers		E	_	V
O. vermicillifera (Kunze) Laundon			Ex	E
O. viridis (Pers.) Nyl.		E		V
O. vulgata Ach. var. vulgata [O. lithryga Ach.]		_	I	
O. vulgata Ach. var. subsiderella Nyl. [O. niveoatra (Borr.) Laundon]		V		V
Pachyphiale carneola (Ach.) Arnold			I	I
Pannaria conoplea (Ach.) Bory		_	I	E
P. leucophaea (Vahl.) Jorg.	,	, E		V
P. pezizoides (Web.) Trevisian		V		V

Species	Lo	ower Siles	sia	Pola
P. praetermissa Nyl. in Chyd. & Furuhj.			I	
Parmelia omphalodes (L.) Ach	V			V
. submontana Nadv. ex Hale			I	E
Parmeliella triptophylla (Ach.) Mül. Arg.			I	E
Parmelina quercina (Willd.) Hale		E		E
tiliacea (Hoffm.) Hale		E		E
armeliopsis hyperopta (Ach.) Arn	V			
armotrema chinense (Osbeck) Hale & Ahti			I	E
eccania coralloides Massal			Ex	
eltigera aphtosa (L.) Willd.			I	E
canina (L.) Willd.		E		1
collina (Ach.) Schrad.			I	1
horizontalis (Huds.) Baumg.		E	-	l E
leucophlebia (Nyl.) Gyeln.			I	-
malacea (Ach.) Funck.			I	1
polydactyla (Necker) Hoffm.		E	1	'
venosa (L.) Hoffm.			I	l I
				1 1
eltula euploca (Ach.) Poelt	$ _{\mathbf{v}}$		Ex	'
ertusaria albescens (Huds.) Choisy & Werner	V			.
alpina Hepp		E		1
amara (Ach.) Nyl.	V			
aspergilla (Ach.) Laundon			_ I	
caesioumbrina Eitner			Ex	E
chiodectonoides Bagl. ex Massal			I	I
coccodes (Ach.) Nyl.	V			
constricta Erichs			Ex	
coronata (Ach.) Th. Fr.		E]
creatomma (Norm.) Zahlbr.			Ex	
eitneriana Zahlbr.			I	
geminipara (Th. Fr.) Knight. ex Brodo	l v			
glomerata (Ach.) Schaer.			I	
hemisphaerica (Flk.) Erichs.			I	,
hymenea (Ach.) Schaer.			Ex	1
leioplaca DC.		E	LX	,
<u> </u>	R			
ocellata (Wallr.) Körb.	K V			
oculata (Dicks.) Th. Fr.	•			,
pertusa (Weigel) Tuck.		E		'
rupestris (DC.) Schaer.			I	Ι.
naeophyscia ciliata (Hoffm.) Moberg			I	1
n. endococcina (Körb.) Moberg		E		
alyctis agelaea (Ach.) Flot.		E		1
nylliscum demangeonii (Moug. & Mont.) Nyl.			I	
ayscia aipolia (Ehrh.) Fürnr.		E		'
n. stellaris (L.) Nyl.	V			
aysconia distorta (With.) Laundon		E		1
. perisidiosa (Erihsen) Moberg		E		1
acocarpus schaereri (Fr.) O. Breuss			Ex]
acopsis gelida (L.) Linds.			I	
atismatia glauca (L.) W. Culb. & C. Culb.	l v		-	1
cospidium chlorophanum (Wahlenb.) Zopf.		E		
flavum (Bellardi) Körb.		E		
gurosticta acetabulum (Neck.) Ellis & Lumbsch		E		1
		l E		
lyblastia abscondita (Nyl.) Arnold	_		I]]
cruenta (Körb.) James & Swinscow	R			
gelatinosa (Ach.) Th. Fr	R			
gothica Th. Fr			I	
melaspora (Taylor) Zahlbr			_ I	
sendtneri Krempelh			Ex	
sepulta Massal.			I	
theleodes (Sommerf.) Th. Fr	R			
lychidium muscicola (Sw.) Gray			I]
rina byssophila (Körb. ex Hepp) Zahlbr.			I	1
grandis (Körb.) Zahlbr.			I	1
lectissima (Fr.) Zahlbr.			I	
mammilosa (Th. Fr.) Vainio			I	
procyphus coccodes (Flot.) Körb.			I	
	$ _{\mathbf{v}}$		1	;
prpidia cinereoatra (Ach.) Hertel & Knoph	*		I	
musiva (Körb.) Krempel & Knoph	D		1]
in amortana (DC) Stainan	R		I	1
. incrustans (DC.) Steiner			1 -	1

pecies	Lo	ower Sil	esia	Po
Protoparmelia atriseda (Fr.) R. Sant. & Wirth				I
rotothelenella leucothelia (Nyl.) Mayrh. & Poelt				I
. sphinctrinoides (Nyl.) Mayr. & Poelt	V			
Seudephebe pubescens (L.) Choisy	R			
Sora vallesiaca (Schaer.) Timdal [P. albilabra (Dufour) Körb. ssp. deceptoria (Nyl.) Clauz. & Roux]	R			
C. decipiens (Hedw.) Hoffm.				I
Soroma hypnorum (Vahl) Gray				I
Osorotichia schaereri (Massal.) Arnold	R			
Punctelia subrudecta (Nyl.) Krog				I
Cycnothelia papillaria (Ehrh.) Dufour				I
yrenocarpon flotowianum (Hepp) Trevisian			Ex	
yrenula laevigata (Pers.) Arnold		n		I
P. nitida (Weigel) Ach.		E		
2. nitidella (Flk.) Müll. Arg.		E		
Ayrrhospora quernea (Dicks.) Körb.			Ex	
Ramalina baltica Lettau			Ex Ex	
2. calicaris (L.) Fr.			EX	ı
. capitata (Ach.) Nyl			Ex	1
. farinacera (L.) Ach.		E	LA	
. fastigiata (Pers.) Ach.		E		
. fraxinea (L.) Ach.		E		
. pollinaria (Westr.) Ach.		E		
. polymorpha (Liljeblad) Ach.			Ex	
. thrausta (Ach.) Nyl.			Ex	
hizocarpon disporum (Näg.) Müll. Arg.				ı
eupetraeum (Nyl.) Arnold				Ī
grande (Flk. ex Flotow) Arnold				Ī
oederi (Weber) Körb.				Ī
petraeum (Wulf.) Massal.	R			-
. simillinum (Anzi) Lettau				I
sorediosum Runem.	v			
. subgeminatum Eitner				I
. saanaënse Räs. [R. sublucidum Räs.]				I
. umbilicatum (Ramond) Flagey			Ex	
. viridiatrum (Wulf.) Körb.				I
<i>'imularia impavida</i> (Th. Fr.) Hertel				I
inodina adspersa (Borr.) Laundon				I
. archaea (Ach.) Arnold				I
. atropallidula (Nyl.) Arnold				I
. colobina (Ach.) Th. Fr.			Ex	
. conradii Körb.				I
. exigua (Ach.) Gray	V			
. fimbriata Körb.			Ex	
. milvina (Wahlenb. in Ach.) Th. Fr.	_			I
. oxydata (Massal.) Massal.	R			
. polyspora Th. Fr			Ex	
. sophodes (Ach.) Massal.				I
. teichophila (Nyl.) Arnold	R			
. tephraspis (Tuck.) Herre				I
. trevisani (Hepp) Körb.			Ex	
. turfacea (Wahlenb.) Körb.				I
arcogyne clavus (DC.) Krempelh.	R			
arcopyrenia gibba (Nyl.) Nyl	V			
arcosagium campestre (Fr.) Poetsch. & Schied.				I
chaereria cinereorufa (Schaer.) Th. Fr.			E	I
chismatomma abietinum (Ehrh.) Massal.			Ex	I
celleiosporum parayeillum Körb			F.	1
coliciosporum perpusillum Körb.			Ex	
saccata (L.) Ach	R			I
saccata (L.) Ach.	K V			
phaerophorus fragilis (L.) Pers.	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			, l
globosus (Huds.) Vainio			Ex	I
melanocarpus (Sw.) DC.			EX	I
porastatia polyspora (Nyl.) Grum.	v			1
. testudinea (Ach.) Massal	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Ex	
			Ex Ex	
Initiagra (Web.) Poelt		1	ISA	
. lentigera (Web.) Poelt	\mathbf{v}			- 1

Species		Lower Sil	lesia	Po
S. fuscocuprea (Nyl.) Zsch.			1 1	I
S. guestphalica (Lahm ex Körb.) Arnold			1	I
. hymenogonia (Nyl.) Th. Fr	R			
. succedens (Rehm) Arnold		E	_	
teinia geophana (Nyl.) Stein			1 1	I
tereocaulon condensatum Hoffm.	l I.		1	I
. dactylophyllum Flk		V		
. incrustatum Flk		V		
. paschale (L.) Hoffm.	l I.		1	I
. pileatum Ach.		V		
. tomentosum Fr		V	_	
ticta fuliginosa (Hoffm.) Ach.			Ex	
. sylvatica (Huds.) Ach.			Ex	
trangospora ochrospora (Nyl.) Anderson				I
trigula affinis (Massal.) R. C. Harris			1 1	I
. stigmatella (Ach.) R. C. Harris			1	I
ynalissa symphorea (Ach.) Nyl	R			
Chamnolia vermicularis (Sw.) Schaer.		V	_	
thelenella modesta (Nyl.) Nyl			Ex	
Thelidium absconditum (Hrempelh.) Rabenh.			1 1	I
. aenovinosum (Anzi) Arnold			1 1	I
amylaceum Massal			1 1	I
aphanes Lahm	_		1	I
Cataractarum (Hepp) Lönnr	R			
. decipiens Krempelh			1	I
. gisleri (Müll. Arg.) Zsch	R			
. incavatum Mudd	R			
. saprophilum Servit			1 1	I
subabsconditum Eitner			1	I
helingya lignyota (Wahlenb.) Jorg. & Henssen			Ex	
helocarpon cinereum Eitner			1	I
impressellum Nyl	R			
. intermediellum Nyl			Ex	
. robustum Eitner				I
Thelomma ocellatum (Koerb.) Tibell				I
'helotrema lepadinum (Ach.) Ach.			1	I
<i>Thermutis velutina</i> (Ach.) Flot	R			
'oninia aromatica (Sm.) Massal.			Ex	
. athallina (Hepp) Timdal			1 1	I
C. candida (Web.) Th. Fr.			1	I
. sedifolia (Scop.) Timdal		V		
'rapelia geochroa (Körb.) Hertel				I
. mooreana (Carroll) P. James			1 1	I
'rapeliopsis gelatinosa (Flk.) Coppins & P. James			1	I
. viridescens (Schrad.) Coppins & P. James		V		
. wallrothii (Flk. in Spreng.) Hertel & G. Schneider			1	I
Imbilicaria crustulosa (Ach.) Fey		V		
I. hyperborea (Ach.) Hoffm.		V		
I. nylanderiana (Zahlbr.) H. Magn.			1	I
. polyphylla (L.) Baumg.		V		
. proboscoidea (L.) Schrad.		V		
I. propagulifera (Vainio) Llano			1	I
. spodochroa (Hoffm.) DC		V		
. <i>vellea</i> (L.) Hoffm		V		
(snea ceratina Ach			Ex	
. compacta Mot.			Ex	
. comuta Körb.			Ex	
. diplotypus Vainio			Ex	
. filipendula Stirton		E		
T. florida (L.) Web. ex Wigg.			Ex	
glauca Mot.			1	I
V. hirta (L.) Web.		E		
I. longissima Ach.			Ex	
7. neglecta Mot.			Ex	
V. rigida (Ach.) Röhl.			Ex	
J. sorediifera Mot.			Ex	
J. subfloridana Stirton			1	I
. uncinulata Mot			Ex	
'aricellaria rhodocarpa (Körb.) Th. Fr.	R			
Verrucaria acrotella Ach.			l l 1	ı

Species		Lov	ver Sil	esia	a Po	
V. alutacea Zsch.					I	
V. andesitica Servit					I	
V. annulifera Eitner				Ex		Ex
V. apomeleana (Massal.) Hepp					I	
V. aquatilis Mudd.			E			V
V. basaltica Servit					I	
V. beltraminiana (Massal.) Trevisan				Ex		
V. buellioides Servit					I	
V. caerulea DC. in Lam & DC.					I	
V. cincta Hepp					I	
V. foveolata (Flk.) Massal.	R					
V. funckii (Spreng.) Zahlbr.		v				v
V. fusconigrescens Nyl.					I	
V. guestphalica Servit					I	
V. hydrela Ach.		v			_	
V. infumata Nyl.		'			I	
V. krempelhuberi Lindau					Ī	
V. latebrosa Körb.					I	
V. longicollis (Eitner) Zahlbr.				Ex	•	
V. macrostoma Dufour ex DC.				Ex		
77 110 1 77 11				EA	I	
V. maculiformis Krempelh. V. memmonia (Körb.) Arnold	R				1	
	K				I	
V. mougeotii (Zsch.) Servit						
V. murina Leighton					I	
V. obnigrescens Nyl					I	
V. praesudetica Zsch.					I	_ n
V. praetermissa (Trvis.) Anzi	_				I	R
V. procopii Servit	R				_	
V. pulicaris Massal.				_	I	
V. pulvinata Eitner				Ex	_	
V. rheitrophila Zsch					I	V
V. sublobulata Eitner ex Servit					I	V
V. submersella Servit					I	
V. sylvatica Zsch.	R					
V. tapetica Körb.				Ex		
V. viridula (Schrad.) Ach.			E			
Vulpicida pinastri (Scop.) Ach			E			V
Xanthoparmelia mougeotii (Schaer, ex Dietr.) Hale					I	E
Xanthoria calcicola Oxner					I	
X. candelaria (L.) Th. Fr		V				V
X. fallax (Hepp) Arnold			E			V
X. polycarpa (Hoffm.) Th. Fr. ex Rieber.		V				
<i>Xylographa</i> minutula Körb				Ex		
X. paralella (Ach.) Behl. & Desb.					I	E
X. vitiligo (Ach.) Laundon				Ex		R
Total:	52	83	63	140	264	