Ecological Questions 19/2014: 9 – 24 http://dx.doi.org/10.12775/EQ.2014.001

Lichens of larch *Larix* sp. in places of the Podlasie province (NE Poland)

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Abstract. The paper presents the results of the research on the composition of lichen species of larch in the towns of Podlasie. 29 species of lichenicolous fungi have been recorded. A synthesis of epiphytic lichen biota of larch in Poland has been made. Despite the homogeneity of the substrate, the lichen biota of larch in Poland according to our own data and literature amounts to 107 species, some of which are rare. The richest lichen biota of larch in Poland occurs in mountainous areas. Many species that inhabit the bark of that phorophyte belong to the species extinct in Poland.

Key words: diversity, epiphitic lichens, extinct species, geographical distribution, morphological forms, threat categories, Podlasie.

1. Introduction

The most important factors that influence the development of epiphytic communities include chemical and physical properties of bark, mainly its pH, mineral content and volume of water, as well as microrelief and method of peeling (Barkman 1958). Conifers (eg. *Abies, Picea*, *Pinus*, *Larix*) are characterized by low pH of bark, small water capacity and flaky bark. They are characterized by generally poor lichen biota, with the dominance of common taxa.

On the bark of *Larix* sp. in Poland many species rare and very rare in Europe have been found (Halicz & Kuziel 1965; Halicz & Cieśliński 1967; Czyżewska 1974; Bystrek & Górzyńska 1981; Cieśliński & Bystrek 1982; Łubek 2007; Janczar & Liśkiewicz 2012; Lipnicki et al. 2012; and others) and in Europe (Nascimbene et al. 2006; Otte 2012).

In Poland, genus *Larix* is represented by one native species of larch *Larix decidua* Mill., comprising the subspecies of: European larch *L. decidua* sensu stricto, within which the variety from the Sudetenland var. *sudetica* (Cies.) Domin. has been marked off, as well as the Polish larch *Larix decidua* subsp. *polonica* (Racib.) Domin. (Jagielska 2008).

European larch *Larix decidua* is a species whose natural habitat is the Alps, the Sudety Mountains and Carpathian Mts, but because of the valuable wood it is widely distributed outside its original range. In the Alps it usually occurs in the upper parts, the lower limit of occurrence does not go below 500 m above sea level, at the height of 1600-2200 m above sea level it forms extensive forests with ordinary spruce *Picea abies* and *Pinus cembra* stonepine, and single specimens can be found at an altitude of 2500 m above sea level (Isocrono et al. 2006). In Poland, it reaches the northern limit of the range and can naturally be found only in the Tatra Mountains, on the strip at the height of 800-1550 m above sea level, in the form of a dwarf even to the crag floor. It is also found in artificial forest plantings, especially in mixed mountain forests (Isocrono et al. 2006; Chylarecki 2007).

Polish larch *Larix decidua* subsp. *polonica* occurs primarily in the area of the upland part of Poland, especially in the Świętokrzyskie Mountains, and in the Beskids Mts.,

and the Pieniny Mts. Besides Poland it is reported from a few stations in Slovakia, western Ukraine and Romania. It is now becoming rarer and is protected on natural stands in nature reserves such as, for example, Chełmowa Mountain, Świnia Mountain or Modrzewina near Little Village. The vertical range varies from 600 meters above sea level in the south to 150 meters above sea level in the north.

Larch is a species associated with continental climate. It belongs to the most heliophilous trees of temperate climate zones. Larch is characterized by high tolerance of thermal conditions, it tolerates high temperatures of the summer and reaches the Alpine boundary of trees. It produces a deep root system. It is resistant to a cap of snow, less sensitive than spruce and fir. Larch is inherently a component of mixed stands. In admixture, which is almost the only form of occurrence of larch in Poland, it stands out by its clear desire to reach upper floors. Pure stands of larch are rarely encountered. Larch is a fast-growing species. At a young age it grows very rapidly: at the age of five it reaches an average height of 3 to 4.5 m. The average annual growth of European larch height between 5 and 20 years of age reaches 1 meter. It grows 30-45 m tall, lives for 200-400 years (Seneta & Dolatowski 2006).

The aim of the study was to draw up a list of epiphytic lichen species of larch *Larix* sp. in built-up areas in the Podlasie province and a list of lichen species recorded on that phorpohyte in Poland.

The following tasks served to implement the undertaken intention:

- the determination of species composition of lichens in the towns of Podlasie in Poland;
- the distinction of rare species due to the rarity of their listing on the Podlasie area and/or the conservation status and the degree of risk in the country;
- the determination of the degree of diversity of lichen species in localities characterized by different levels of anthropogenic transformation (size, degree of population);
- the characterization of the morphological groups of lichens.

2. Study area

The Podlasie province is located in the north-eastern part of Poland, in the Podlasie Lowland, Suwałki Lakeland and Mazowsze Lowland. Its capital is Białystok.

The landscape of the region is varied, formed in the north during the Baltic glaciation, the rest of the region by Middle Poland glaciation. The highest peaks are found in the north, where the hilly lake district landscape (lakelands: Zachodniosuwalskie, Wschodniosuwalskie, Ełckie) and sandur lakeland (Augustowska Plain) dominate; in the central and southern part periglacial plains prevail (plateaus:

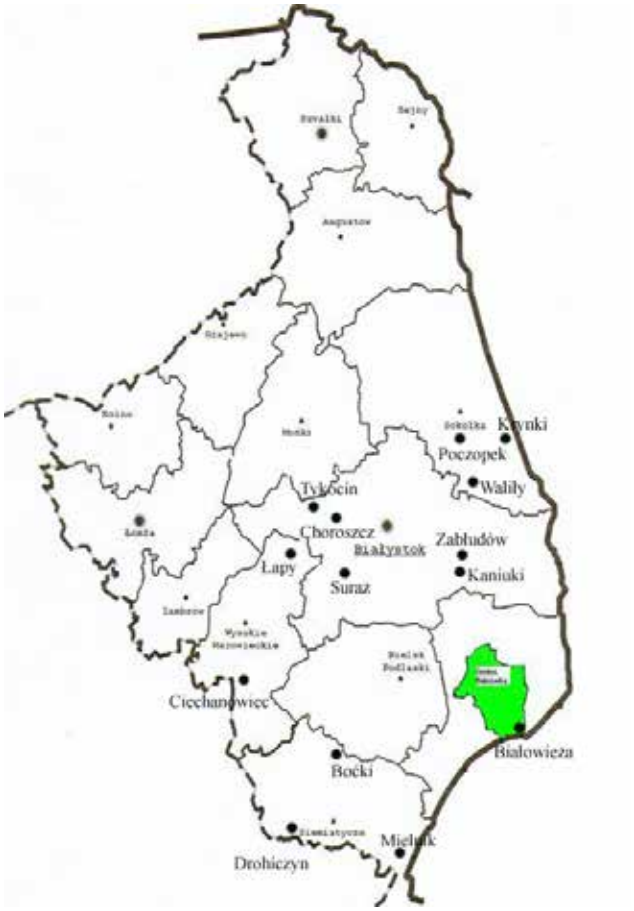

Figure. 1. Distribution of research stands. Origin: Plan rozwoju lokalnego gminy Hajnówka (2004)

Kolneńska, Białystok, Wysokomazowiecka, Drohiczyńska, Sokólskie Hills, Łomża Interfluve, Bielska Plain), varied by basins and river valleys cutting into them, to the west lies the edge of the standur Kurpiowska Plain (Kondracki 2011). On the surface there prevail sand, gravel, moraine clay, and in the valleys and basins of rivers there are silt, sand and river peat. The climate is more severe in comparison with other Polish regions, and Suwalki is called "Polish pole of cold". This area is heavily influenced by continental air masses, the average annual air temperature is below 7°C, in the north-east less than 6.5°C. It is one of the coldest areas of the country (the coldest winters in Poland, apart from the mountains, at a temperature below 5.5°C); temperature amplitude above 23°C, higher than the average in the country. Precipitation averages 550 mm in the south of the province, to 700 in the north. Climatic conditions result in a long period of snow cover (over 3 months) and a short growing season of plants of 190-205 days (Górniak 2000). Very low population density 61 pers./ km², the largest population (outside the cities) in the western and central part of the region of Podlasie, Białystok

and the area around is populated by one third of the inhabitants, lower than the national average level of urbanization 57.8%; higher birthrate 1.2, a negative migration balance (0.6) (Nowak 2012).

Studies on the diversity of lichen biota of larch were carried out in 19 localities of Podlasie (Fig. 1).

3. Material and methods

The material of research were data obtained from three sources: 1 – the present studies, 2 – the herbarium collections deposited in the Herbarium of Lichens of the Institute of Biology, University of Białystok, 3 – the review of the national lichenological literature from years 1935-2010.

Field studies were carried out in 2005-2010, at 12 sites in Podlasie: Augustów, Bielsk Podlaski, Choroszcz, Kaniuki, Krynki, Łapy, Poczopek, Siemiatycze, Suraż, Tykocin, Waliły and Zabłudów. The search of lichens was carried out by point and route method. The species have been named according to Santessona et al. (2004) and genus *Bryoria* and *Usnea* to Bystrek (1986, 1994), species *Arthothelium spectabile* (Sundin & Tehler 1998), *Melanohalea exasperatula* (Blanco et al. 2004), *Melanelixia fuliginosa* (Arup & Sandler Berlin 2011) and *Polycauliona polycarpa* (Arup et al. 2013). Species of genus *Lepraria* were determined by thin layer chromatography TLC (Orange et al. 2001). The categories of threat for lichens in Poland are given after Cieśliński et al. (2006), while the protected species are given according to the Decree of the Minister of Environment of 9 July 2004 on the wild species of fungi under protection (Rozporządzenie Ministra Środowiska, 2004). The morphological forms of thalli (crustose, squamulose, wide foliose type *Parmelia*, narrow foliose type *Physcia*, fruticose) are adopted after Nimis and Martellosa (2008).

The herbarium material and floristic documentation can be found at the Herbarium of the Institute of Biology, University of Białystok.

4. Results and discussion

4.1. The lichen biota of larch in the Podlasie province

In the localities of the Podlasie province the bark of larch is characterized by poor and poorly differentiated species of lichen biota. As a result of the study, revision of herbal material and literature data a total of 29 species of epiphytic lichens was recorded. In Augustów, Ciechanowiec, Krynki and Narew the lichen biota of larch comprises 13 species for each site, in Bielsk Podlaski and Poczopek – 11 for each site, in Białowieża, Łapy and Zabłudów – 10 for each site, in Choroszcz, Kaniuki and Siemiatycze – 9 for each site, in Tykocin – 8, in Białystok – 6, in Suraż – 5, in Drohiczyn, Mielnik and Waliły – 4 for each site, in Boćki – 3 (Table 1). The degree of species richness did not considerably diversify statistically depending on the size and number of inhabitants of a given site (Table 1).

One of the most important factors influencing the occurrence of epiphytic lichens is the pH of the bark of a phorophyte (Barkman 1958). The highly acidic nature of the larch bark and unfavorable habitat conditions for lichens (low humidity, nutrient deficiency) contributes to the poverty of lichen biota growing on those trees. In the surveyed localities taxa with foliose thalli (14 species) dominate on the bark of larch. Lichens with fruticose thalli are represented by 8 species, crustose by 6 and squamulose by 1 (Fig. 2). A higher share of narrow foliose lichens is probably connected with the fact that the composition of this group is mainly by nitrophilous, coniophilous, heliophilous and xerophilic lichens of the genus *Physcia, Physconia, Phaeophyscia* and some *Xanthoria* particularly associated with urban areas. A higher share of foliose lichens on the bark of larch growing in open areas is due to the favorable impact of higher intensity of light reaching the lower parts of tree trunks compared with phorophytes from forest communities (Zarabska 2011).

On most larch trees there grows the most widespread in Poland, acidophilic crustose lichen *Lecanora conizaeoides*. On some positions it is also accompanied by common species: *Hypocenomyce scalaris*, *Hypogymnia physodes*, *Lepraria incana* and *Scoliciosporum chlorococcum*. The thalli of lichens, mainly *Lecanora conizaeoides* are often infected by a parasitic fungus (*Athelia arachnoidea*, *Lichenoconium erodens* and *L. lecanorae*). The colonization of larch bark by acidophilic species is characteristic of trees with acid bark. In many places the bark of a phorophyte is inhabited by nitrophilous lichens of the genus *Physcia*, *Phaeophyscia*, *Xanthoria*. The presence of nitrophilous taxa is caused by various factors, such as air pollution, dust and microclimate. At the base of trunks, in places where humus accumulates in the cracks of bark, there grows *Cladonia* (*C. coniocraea*, *C. fimbriata*), often visible only in the form of scales of primary fronds and barren fronds of *Lepraria incana*.

Rare species inhabiting larch bark include: *Candelariella xanthostigma* (in Suraż), *Evernia prunastri* (in Augustów, Narew, Poczopek), *Hypogymnia tubulosa* (Narew, Poczopek), *Melanelixia fuliginosa* (Krynki), *Melanohalea exasperatula* (Ciechanowiec), *Pertusaria coccodes* (Poczopek), *Platismatia glauca* (Poczopek), *Pseudevernia furfuracea* (Augustów, Białowieża, Narew, Poczopek).

In the forests surrounding the localities the bark of *Larix decidua* is inhabited by several species of the association *Pseudevernietum furfuraceae*, such as *Hypogymnia physodes*, single fronds of *Pseudevernia furfuracea*.

Of the 29 lichen species of the bark of larch 3 species have been put on the Red List of lichens in Poland

Table 1. The number of lichen species of larch in different localities in Podlasie

No.	Places	Location	Surface [km²]	Population	Numer of lichen species
1	Augustów	53°51′0″N 22°58′0″E	80.93	30 799	13
2	Ciechanowiec	52°41′0″N 22°30′0″E	19.53	4 891	13
3	Krynki	53°15′55″N 23°46′19″E	3.85	2 531	13
4	Narew	52°54′46″N 23°31′15″E	33.95	1 547	13
5	Bielsk Podlaski	52°46′06″N 23°11′11″E	26.88	26 545	11
6	Białowieża	52°42′04″N 23°52′10″E	26.88	2 698	10
7	Łapy	52°59′0″N 22°53′0″E	12.14	16 153	10
8	Zabłudów	53°01′0″N 23°20′0″E	14.30	2 500	10
9	Choroszcz	53°08′35″N 22°59′08″E	16.79	5 716	9
10	Kaniuki	52°53′43″N 23°18′27″E	0.1	140	9
11	Siemiatycze	52°25′38″N 22°51′45″E	36.25	14 920	9
12	Tykocin	53°12′11″N 22°46′15″E	28.97	2 002	8
13	Poczopek	53°15′37″N 23°38′26″E	0.3	20	8
14	Białystok	53°07′0″N 23°10′0″E	102.12	294 298	6
15	Suraż	52°57′0″N 22°57′0″E	33.86	1 012	5
16	Drohiczyn	52°24′0″N 22°39′0″E	15.69	2 129	4
17	Mielnik	52°19′38″N 23°02′55″E	24.97	980	4
18	Waliły	53°08′29″N 23°35′25″E	0.5	290	4
18	Boćki	52°39′0″N 23°02′0″E	23.02	1 446	3

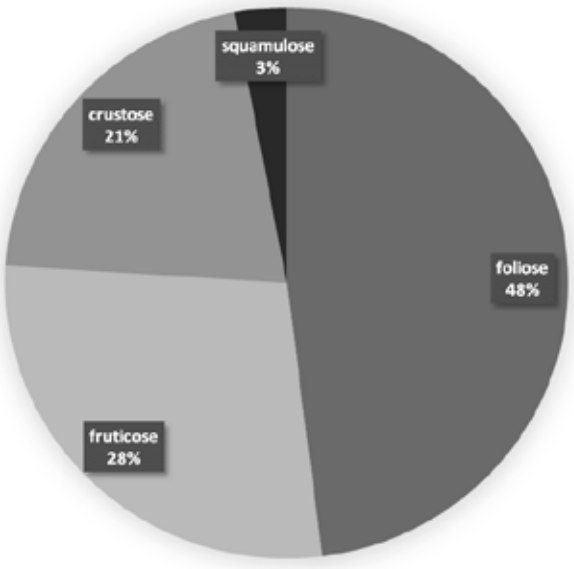

Figure 2. The contribution of morphological forms of lichens on the bark of larch (*Larix* sp.) in the villages in Podlasie

Table 2. Lichens of larch (*Larix* sp.) in the cities of the Podlasie province according to literature and own data

No.	Species	Legal protection	Threat category in Poland	City and type of data	
				own data	literature data*
1	*Amandinea punctata* (Hoffm.) Coppins & Scheid.			Bielsk Podlaski, Łapy, Zabudów	Białystok (Matwiejuk 2007) Ciechanowiec (Matwiejuk & Kolanko 2007)
2	*Candelariella xanthostigma* (Ach.) Lettau			Suraż	
3	*Cladonia coniocraea* auct.			Augustów, Krynki	
4	*Cladonia fimbriata* (L.) Fr.			Augustów, Bielsk Podlaski, Choroszcz, Krynki	
5	*Evernia prunastri* (L.) Ach.	partial	NT	Augustów, Narew, Poczopek	Białowieża (Rydzak 1957a)
6	*Hypocenomyce scalaris* (Ach.) M. Choisy			Augustów, Bielsk Podlaski, Choroszcz, Łapy, Kaniuki, Krynki, Narew, Poczopek, Siematycze, Suraż, Tykocin, Waliły, Zabudów	Białystok (Matwiejuk 2007) Ciechanowiec (Matwiejuk & Kolanko 2007), Mielnik (Matwiejuk 2008), Boćki (Matwiejuk 2009a), Drohiczyn (Matwiejuk 2009b)
7	*Hypogymnia physodes* (L.) Nyl.			Augustów, Bielsk Podlaski, Choroszcz, Łapy, Kaniuki, Krynki, Narew, Poczopek, Siematycze, Suraż, Tykocin, Waliły, Zabudów	Białowieża (Rydzak 1957a), Białystok (Matwiejuk 2007) Ciechanowiec (Matwiejuk & Kolanko 2007)
8	*Hypogymnia tubulosa* (Schaer.) Hav.	strict		Narew, Poczopek	
9	*Lecanora conizaeoides* Nyl. ex Cromb.			Augustów, Bielsk Podlaski, Choroszcz, Łapy, Kaniuki, Krynki, Narew, Poczopek, Siematycze, Tykocin, Waliły, Zabudów	Białystok (Matwiejuk 2007) Ciechanowiec (Matwiejuk & Kolanko 2007), Mielnik (Matwiejuk 2008), Boćki (Matwiejuk 2009a), Drohiczyn (Matwiejuk 2009b)
10	*Lepraria incana* (L.) Ach.			Augustów, Bielsk Podlaski, Choroszcz, Łapy, Kaniuki, Krynki, Narew, Siematycze, Suraż, Tykocin, Waliły, Zabudów	Białystok (Matwiejuk 2007) Ciechanowiec (Matwiejuk & Kolanko 2007), Mielnik (Matwiejuk 2008), Boćki (Matwiejuk 2009a), Drohiczyn (Matwiejuk 2009b)
11	*Melanelixia fuliginosa* (Duby) O. Blanco et al.	strict		Krynki	Białowieża (Rydzak 1957a)
12	*Melanohalea exasperatula* (Nyl.) O. Blanco et al.	strict			Ciechanowiec (Matwiejuk & Kolanko 2007)
13	*Parmelia sulcata* Taylor			Bielsk Podlaski, Kaniuki, Krynki, Łapy, Narew, Poczopek, Zabłudów	Białowieża (Rydzak 1957a), Ciechanowiec (Matwiejuk & Kolanko 2007)
14	*Pertusaria coccodes* (Ach.) Nyl.		NT	Poczopek	
15	*Phaeophyscia orbicularis* (Neck.) Moberg.			Augustów, Bielsk Podlaski, Choroszcz, Krynki, Łapy, Narew, Siemiatycze, Suraż, Tykocin, Zabłudów	Ciechanowiec (Matwiejuk & Kolanko 2007)
16	*Physcia adscendens* H. Olivier nom. Cons.			Augustów, Bielsk Podlaski, Choroszcz, Krynki, Łapy, Narew, Kaniuki, Łapy, Poczopek, Siemiatycze, Tykocin, Zabudów	Ciechanowiec (Matwiejuk & Kolanko 2007)

17	*Physcia dubia* (Hoffm.) Lettau			Augustów, Bielsk Podlaski, Choroszcz, Kaniuki, Krynki, Łapy, Narew, Siemiatycze, Tykocin, Zabłudów	Ciechanowiec (Matwiejuk & Kolanko 2007)
18	*Physcia stellaris* (L.) Nyl.			Poczopek	
19	*Physconia enteroxantha* (Nyl.) Poelt				Ciechanowiec (Matwiejuk & Kolanko 2007)
20	*Platismatia glauca* (L.) W.L. Culb. & C.F. Culb.	strict		Poczopek	
21	*Polycauliona polycarpa* (Hoffm.) Frödén, Arup & Søchting			Kaniuki, Krynki, Narew	Ciechanowiec (Matwiejuk & Kolanko 2007)
22	*Pseudevernia furfuracea* (L.) Zopf	strict		Augustów, Narew, Poczopek	Białowieża (Rydzak 1957a)
23	*Ramalina farinacea* (L.) Ach.	strict			Białowieża (Rydzak 1957a)
24	*Ramalina pollinaria* (Westr.) Ach.	strict			Białowieża (Rydzak 1957a)
25	*Scoliciosporum chlorococcum* (Graeve ex Stenh.) Vězda			Augustów, Krynki, Siemiatycze, Suraż	Białystok (Matwiejuk 2007), Mielnik (Matwiejuk 2008), Boćki (Matwiejuk 2009a), Drohiczyn (Matwiejuk 2009b)
26	*Tuckermanopsis chlorophylla* (Willd.) Hale	strict			Białowieża (Rydzak 1957a)
27	*Usnea hirta* (L.) Weber ex F.H. Wigg.	strict, zonal			Białowieża (Rydzak1957a)
28	*Usnea subfloridana* Stirt.	strict, zonal	EN		Białowieża (Rydzak 1957a)
29	*Xanthoria parietina* (L.) Th. Fr.			Augustów, Bielsk Podlaski, Choroszcz, Łapy, Kaniuki, Krynki, Narew, Siemiatycze, Tykocin, Zabłudów	Białystok (Matwiejuk 2007) Ciechanowiec (Matwiejuk & Kolanko 2007)

Explanation: EN – species in the endangered category, NT – species in the category of near threatened; *source of the data in brackets.

(Cieśliński et al. 2006) and 10 species have been put under legal protection, 9 of which are totally, including 2 requiring the setting of the protection zones of refuge or posts and 1 of which is partially protected (Table 2).

Small villages in the Podlasie region may create optimal conditions for lichen growth. The biota of lichens of larch is similar to the biota of other conifers, like pine *Pinus sylvestris* and spruce *Picea abies*. It is, however, much poorer than their biota, mainly due to the lack of that phorophyte in the woods. Larch usually occurs as an admixture or in single specimens.

In the surveyed localities the presence of many nitrophilous species on the bark of larch, preferring neutral or slightly alkaline nature of the substrate, may confirm the hypothesis put forward by Spier et al. (2010), that the decrease in air pollution, mainly the decrease of sulfur dioxide and ammonia in the last two decades and the simultaneous increase in the pH of the bark, caused the epiphytic lichens to have become less sensitive to the pH of the bark.

4.2. The lichen biota of larch in Poland

The lichen biota of larch in Poland, according to historical and contemporary data amounts to 107 species (Table 3), of which 20 species are regionally extinct today, mainly represented by macrolichens of the genera *Bryoria* and *Usnea* (Table 4).

The impoverishment of epiphytic biota of larch was observed in many regions of Poland (Kościelniak 2004; Łubek 2007). Łubek (2007) found that in the Świętokrzyskie Mountains Polish larch lost the largest number of epiphytes among phorophytes. Currently 62% of the species occurring in the past on the bark of this tree species has not been confirmed. The natural positions of the Polish larch

are found in the reserve Chełmowa Mountain, founded in 1920. This reserve became the nucleus of the Świętokrzyski National Park. The biota of this phorophyte is very poor and contemporarily limited to about 20 species.

In the reserve Trębaczew, which is the largest concentration of Polish larch in Mazowsze, on the bark of this phorophyte 23 lichen species were recorded, and in the reserve Modrzewiny – 10 (Czyżewska 1974).

In other areas of Poland the lichen biota of larch is also poor, for example, in Przemyskie Foothills (Kiszka & Piórecki 1991) it consists of 16 species, in Beskid Wyspowy (Nowak 1998) – 14, Wigry National Park (Bystrek & Matwiejuk 1999) – 14, in Bieszczady Low Mountains (Kościelniak 2004) – 25, in Śnieżnik Massif and Bialskie Mountains (Szczepańska 2008) – 15, in the central part of the Western Poland (Lipnicki et al. 2012) – 35.

In the cities of Poland the lichen biota of this phorophyte is also poor, for example in Kielce (Toborowicz 1976) it consists of 13 species, in Karpacz (Jurwin et al. 2012) – 9, in Lesko (Rydzak 1956b) – 8, in Zakopane – 6 (Rydzak 1957b).

The lichen biota of larch and other coniferous trees, such as *Pinus sylvestris*, *Picea abies*, *Abies alba* is very close to one aother. There grow primarily ubiquistic taxa and those enduring strongly acidic medium of the substrate (pH 3.5–4), such as *Hypogymnia physodes*, *Lecanora conizaeoides*, *Lepraria incana*, *Pseudevernia furfuracea*, *Scoliciosporum chlorococcum*.

In many lichenological studies the biota of that phorophyte is ignored.

On the bark of larch several species very sensitive and often rare in Poland were recorded, e.g: *Bryoria capillaris* (Świętokrzyskie Mountains, Bialskie Mountains), *Flavoparmelia caperata* (Świętokrzyskie Mountains, Przemyskie Foothills), *Hypogymnia farinacea* (Beskid Sądecki Mts.), *Usnea florida* (Bieszczady Niskie Mts.) (Table 3).

Of the lichen species of larch in Poland identified 52 species have been put on the Red List of lichens in Poland (Cieślinski et al. 2006), including in category RE – 7 species, CR – 18, EN – 11, VU – 10, NT – 4, DD – 2 (Table 3).

The reason for the ongoing process of extinction of lichens is constantly increasing anthropopressure, which causes adverse changes in the environment, as a result of which the most sensitive species disappear. The causes of this negative phenomenon are: influx of phytotoxic compounds from industrial and municipal centers, excessive communication traffic and air pollution associated with the automotive industry, the destruction of individual old trees and roadside avenues, reducing the number of old trees in stands, replacing uneven stands with monocultures, changes in water relations.

Table. 3. Lichens found on larch (*Larix* sp.) in Poland according to the selected literature data

No.	Species	Area	Source: of literature data	Threat category
1	*Amandinea punctata* (Hoffm.) Coppins & Scheid.	Kielce, Gorce Mountains, central part of the western Poland, reserve "Trębaczew", Karpacz	Czyżewska (1974), Toborowicz (1976), Czarnota and Wojnarowicz (2008), Lipnicki et al. (2012), Jurwin et al. (2012)	
2	*Arthothelium spectabile* Flot. ex A. Massal.	Świętokrzyski NP	Halicz and Kuziel (1965), Łubek (2007)	CR
3	*Bacidia fresiana* (Hepp) Körb.	Chełmowa Mountain, Świętokrzyski NP	Halicz and Kuziel (1965), Łubek (2007)	DD
4	*Bacidina chloroticula* (Nyl.) Vezda & Poelt	Olsztyn	Kubiak (2005)	
5	*Biatora pallens* (Kullhem.) Zahlbr.	Świętokrzyskie Mountains, Chęciński area	Toborowicz (1983)	
6	*Bryoria crispa* (Motyka) Bystrek	central part of the western Poland	Lipnicki et al. (2012)	EN
7	*Bryoria capillaris* (Ach.) Brodo & D. Hawksw.	Świętokrzyskie Mountains, Śnieżnik Massif and Bialskie Mountains	Toborowicz (1983), Szczepańska (2008)	CR
8	*Bryoria fuscescens* (Gyeln.) Brodo D. Hawksw.	reserve "Trębaczew", central part of the western Poland	Czyżewska (1974), Lipnicki et al. (2012)	VU
9	*Bryoria implexa* (Hoffm.) Brodo & D. Hawksw.	Chełmowa Mountain, Biebrzański NP, Wkrzańska Forest	Halicz & Kuziel (1965), Bystrek & Cieśliński (1976), Kolanko (2005), Łubek (2007), Janczar & Liśkiewicz (2012)	CR
10	*Bryoria jubata* (L.) Bystr.	Lesko, Bieszczady Niskie Mountains	Rydzak (1956b), Kościelniak (2004)	RE
11	*Bryoria mirabilis* (Motyka) Bystr.	Chełmowa Mountain, Świętokrzyski NP	Halicz and Kuziel (1965), Bystrek and Cieśliński (1976), Łubek (2007)	CR

12	*Bryoria positiva* (Gyel.) Bystr.	Beskid Wyspowy Mountains	Nowak J. (1998)	
13	*Bryoria subcana* (Nyl. ex Stizenb.) Brodo et D. Hawksw.	Chełmowa Mountain, Świętokrzyski NP, central part of the western Poland	Halicz and Kuziel (1965), Łubek (2007), Lipnicki et al. (2012)	CR
14	*Bryoria vrangiana* (Gyeln.) Brodo et D. Hawksw.	Chełmowa Mountain, Świętokrzyski NP, central part of the western Poland	Halicz and Kuziel (1965), Łubek (2007), Lipnicki et al. (2012)	CR
15	*Buellia griseovirens* (Sm.) Almb.	Śnieżnik Massif and Bialskie Mountains	Szczepańska (2008)	
16	*Calicium abietinum* Pers.	Chełmowa Mountain, Świętokrzyski NP	Halicz & Kuziel (1965), Łubek (2007)	VU
17	*Calicium salicinum* Pers.	Chełmowa Mountain, Świętokrzyskie Mountains	Halicz & Kuziel (1965)	VU
18	*Calicium viride* Pers.	Chełmowa Mountain	Halicz and Kuziel (1965)	VU
19	*Caloplaca holocarpa* (Ach.) A. E. Wade	reserve "Trębaczew", central part of the western Poland	Czyżewska (1974), Lipnicki et al. (2012)	
20	*Cetraria sepincola* (Ehrh.) Ach.	Chełmowa Mountain, Świętokrzyskie Mountains, Wigry NP, Bieszczady Niskie Mountains, Bieszczady NP	Halicz and Kuziel (1965), Halicz and Cieśliński (1967), Fałtynowicz (1994), Kościelniak (2004, 2008)	EN
21	*Chaenotheca chrysocephala* (Turner ex Ach.) Th. Fr.	Lublin Region, Beskid Wyspowy Mountains, Elbląg Upland	Sulma (1935), Nowak J. (1998), Szymczyk and Zalewska (2008)	
22	*Chaenotheca ferruginea* (Turner ex Sm.) Mig.	Poland NE, reserve "Trębaczew", Przemyskie Foothills, Beskid Wyspowy Mountains, Bieszczady Niskie Mountains, Śnieżnik Massif and Bialskie Mountains	Czyżewska (1974), Cieśliński and Tobolewski (1989), Kiszka and Piórecki (1991), Nowak J. (1998), Kościelniak (2007), Szczepańska (2008)	
23	*Chaenotheca phaeocephala* (Tuner) Th. Fr.	Łysa Góra, reserve "Trębaczew"	Halicz and Kuziel (1965), Czyżewska (1974), Łubek (2007)	EN
24	*Chaenotheca trichialis* (Ach.) Th. Fr.	Knyszyńska Forest	Bystrek and Kolanko (2000)	NT
25	*Chrysothrix candelaris* (L.) J.R. Laundon	Chełmowa Mountain, Świętokrzyski NP	Halicz and Kuziel (1965), Łubek (2007)	CR
26	*Cladonia coniocraea* auct.	Poland NE, Przemyskie Foothills, Romincka Forest, Świętokrzyski NP, central part of the western Poland	Cieśliński and Tobolewski (1989), Kiszka and Piórecki (1991), Zalewska et al. (2004), Łubek (2007), Lipnicki et al. (2012)	
27	*Cladonia digitata* (L.) Hoffm.	reserve "Trębaczew", Beskid Wyspowy Mountains, Bieszczady Niskie Mountains, Świętokrzyski NP, Karpacz	Czyżewska (1974), Nowak J. (1998), Kościelniak (2004), Łubek (2007), Jurwin et al. (2012)	
28	*Cladonia fimbriata* (L.) Fr.	Zakopane, Wigry NP, Bieszczady Niskie Mountains	Rydzak (1957b), Bystrek and Matwiejuk (1999), Kościelniak (2004)	
29	*Cladonia macilenta* Hoffm.	Bieszczady Niskie Mountains, Karpacz	Kościelniak (2004), Jurwin et al. (2012)	
30	*Cladonia ochrochlora* Flörke	Śnieżnik Massif and Bialskie Mountains	Fałtynowicz (2003), Szczepańska (2008)	
31	*Cyphellium tigillare* (Ach.) Ach.	Gubałówka	Kiszka (1967)	EN
32	*Evernia prunastri* (L.) Ach.	Lublin region, reserve "Trębaczew", Wiry NP, Bieszczady Niskie Mountains, Knyszyńska Forest, central part of the western Poland	Sulma (1935), Czyżewska (1974), Fałtynowicz (1994), Bystrek and Kolanko (2000), Kościelniak (2004), Lipnicki et al. (2012)	
33	*Flavoparmelia caperata* (L.) Hale	Chełmowa Mountain, Przemyskie Foothills	Halicz and Kuziel (1965), Halicz and Cieśliński (1967), Kiszka and Piórecki (1991)	EN

34	*Hypocenomyce anhtracophila* (Nyl.) P. James & Gotth. Schneid.	Świętokrzyski NP	Łubek (2007)	
35	*Hypocenomyce caradocensis* (Leight. ex Nyl.) P. James & Gotth. Schneid.	Bieszczady Niskie Mountains, Świętokrzyski NP, Śnieżnik Massif and Bialskie Mountains	Kościelniak (2004), Łubek (2007), Szczepańska (2008)	
36	*Hypocenomyce scalaris* (Ach.) M. Choisy	Wołczyn, Kielce, Limanowa, Przemyskie Foothills, Słonne Mountains, Beskid Sądecki Mountains, Beskid Wyspowy Mountains, Wigry NP, Knyszyńska Forest, Gorce NP, Bieszczady Niskie Mountains, Świętokrzyski NP, Śnieżnik Massif and Bialskie Mountains, central part of the western Poland, Karpacz	Rydzak (1956a), Toborowicz (1976), Jagiełło (1983), Kiszka and Piórecki (1991, 1992), Nowak J. (1998), Śliwa (1998), Bystrek & Matwiejuk (1999), Bystrek and Kolanko (2000), Czarnota (2001), Kościelniak (2004), Łubek (2007), Szczepańska (2008), Lipnicki et al. (2012), Jurwin et al. (2012)	
37	*Hypogymnia farinacea* Zopf	Chełmowa Mountain, Beskid Sądecki	Halicz & Kuziel (1965), Śliwa (1998)	VU
38	*Hypogymnia physodes* (L.) Nyl.	Lublin region, Wołczyn, Muszyna, Lesko, Zakopane, Kielce, Poland NE, Przemyskie Foothills, Słonne Mountains, Wigry NP, Knyszyńska Forest, Beskid Wyspowy Mountains, Gorce NP, Bieszczady Niskie, Biebrza NP, Świętokrzyski NP, Śnieżnik Massif and Bialskie Mountains, Elbląg Upland, central part of the western Poland, Karpacz	Sulma (1935), Rydzak (1956a, b, 1957b), Tobrowicz (1976), Cieśliński and Tobolewski (1989), Kiszka & Piórecki (1991, 1992), Fałtynowicz (1994), Nowak J. (1998), Bystrek & Matwiejuk (1999), Bystrek & Kolanko (2000), Czarnota (2001), Kościelniak (2004), Kolanko (2005), Łubek (2007), Szczepańska (2008), Szymczyk and Zalewska (2008), Lipnicki et al. (2012), Jurwin et al. (2012)	
39	*Hypogymnia tubulosa* (Schaer.) Hav.	Lesko, Wigiry NP, Beskid Sądecki Mountains, Beskid Wyspowy Mountains, Biebrza NP, central part of the western Poland, Karpacz	Rydzak (1956b), Fałtynowicz (1994), Śliwa (1998), Nowak J. (1998), Bystrek and Matwiejuk (1999), Kolanko (2005), Lipnicki et al. (2012), Jurwin et al. (2012)	NT
40	*Imshaugia aleurites* (Ach.) S.L.F. Meyer	Beskid Wyspowy Mountains, central part of the western Poland	Nowak J. (1998), Lipnicki et al. (2012)	
41	*Lecanora albella* (Pers.) Ach.	Roztocze	Bystrek and Górzyńska (1981)	EN
42	*Lecanora albellula* (Nyl.) Th. Fr.	Beskid Wyspowy Mountains	Nowak J. (1998)	
43	*Lecanora carpinea* (L.) Vain.	reserve Trębaczew, Śnieżnik Massif and Bialskie Mountains	Czyżewska (1974), Fałtynowicz (2003), Szczepańska (2008)	
44	*Lecanora chlarotera* Nyl.	Bieszczady Niskie Mountains	Kościelniak (2004)	
45	*Lecanora conizaeoides* Nyl. ex Cromb.	reserve "Trębaczew", Słupsk, reserve "Las Piwnicki", Limanowa, Rzeszów, Słonne Mountains, Wigry NP, Region Bełchatów, Beskid Wyspowy Mountains, Beskid Sądecki Mountains, Knyszyńska Forest, Bieszczady Niskie Mountains, Świętokrzyski NP, Śnieżnik Massif and Bialskie Mountains, Elbląg Upland, central part of the western Poland, Karpacz	Czyżewska (1974), Śpiewakowski and Izydorek (1981), Wilkoń-Michalska and Glazik (1983), Jagiełło (1983), Putelniak (1991), Kiszka and Piórecki (1992), Fałtynowicz (1994), Czyżewska (1998), Nowak J. (1998), Śliwa (1998), Bystrek and Kolanko (2000), Kościelniak (2004), Łubek (2007), Szczepańska (2008), Szymczyk and Zalewska (2008), Lipnicki et al. (2012), Jurwin et al. (2012)	
46	*Lecanora expallens* Ach.	Elbląg Upland	Szymczyk & Zalewska (2008)	
47	*Lecanora pulicaris* (Pers.) Ach.	Kielce, Wigry NP, Beskid Wyspowy Mountains	Toborowicz (1976), Fałtynowicz (1994), Nowak J. (1998)	
48	*Lecanora saligna* (Schrad.) Zahlbr.	Kielce, Bieszczady Niskie Mountains	Toborowicz (1976), Kościelniak (2004)	
49	*Lecanora sarcopidoides* (A. Massal.) A.L. Sm.	Beskid Wyspowy Mountains	Nowak J. (1998)	NT

50	*Lecanora strobilina* (Spreng.) Kieff.	Przemyskie Foothills	Kiszka & Piórecki (1991)	
51	*Lecanora symmicta* (Ach.) Ach.	Wigry NP	Fałtynowicz (1994)	
52	*Lecanora varia* (Hoffm.) Ach.	Kielce, Przemyskie Foothills	Toborowicz (1976), Kiszka and Piórecki (1991)	
53	*Lecidella elaeochroma* (Ach.) M. Choisy (sic)	Zakopane	Rydzak (1957b)	
54	*Lepraria incana* (L.) Ach.	Słonne Mountains, Beskid Wyspowy Mountains, Bieszczady Niskie Mountains, central part of the western Poland	Kiszka and Piórecki (1992), Nowak J. (1998), Kościelniak (2004), Lipnicki et al. (2012)	
55	*Lepraria jackii* Tønsberg	Śnieżnik Massif and Bialskie Mountains	Szczepańska (2008)	
56	*Letharia vulpina* (L.) Hue	Sudety, Karpaty Western Mountains, Środkowopolskie Lowland	Fałtynowicz (2003)	RE
57	*Melanelixia exasperatula* (Nyl.) O. Blanco et al.	central part of the western Poland	Lipnicki et al. (2012)	
58	*Melanelixia fuliginosa* (Duby) O. Blanco et al. ssp. *glabratula* (Lamy) J. R. Laundon	Lublin Region, reserve "Trębaczew", Wigry NP, central part of the western Poland	Sulma (1935), Czyżewska (1974), Fałtynowicz et al. (1994), Lipnicki et al. (2012)	
59	*Melanelixia subaurifera* (Nyl.) O. Blanco et al.	Lublin region, Lesko, Kielce	Sulma (1935), Rydzak (1956b), Toborowicz (1976)	
60	*Menegazzia terebrata* (Hoffm.) A. Massal.	Chełmowa Mountain, Świętokrzyski NP	Halicz and Kuziel (1965), Łubek (2007)	CR
61	*Micarea prasina* Fr.	Świętokrzyski NP	Łubek (2007)	
62	*Opegrapha atra* Pers.	Chełmowa Mountain, Świętokrzyski NP	Halicz and Kuziel (1965), Łubek (2007)	EN
63	*Parmelia sulcata* Taylor	Zakopane, reserve "Trębaczew", Kielce, Bieszczady Niskie Mountains, central part of the western Poland	Rydzak (1957b), Czyżewska (1974), Toborowicz (1976), Kościelniak (2004), Lipnicki et al. (2012)	
64	*Parmeliopsis ambigua* (Wulfen) Nyl.	Lublin region, Beskid Wyspowy Mountains, central part of the western Poland, Karpacz	Sulma (1935), Nowak J. (1998), Lipnicki et al. (2012), Jurwin et al. (2012)	
65	*Pertusaria albescens* (Huds.) M. Choisy & Werner in Werner	Chełmowa Mountain, reserve "Trębaczew"	Halicz and Kuziel (1965), Czyżewska (1974),	
66	*Phaeophyscia orbicularis* (Neck.) Boberg	Kielce, central part of the western Poland	Toborowicz (1976), Lipnicki et al. (2012)	
67	*Phlyctis argena* (Spreng.) Flot.	reserve "Trębaczew", central part of the western Poland	Czyżewska (1974), Lipnicki et al. (2012)	
68	*Physcia adscendens* H. Olivier	reserve "Trębaczew", Kielce, central part of the western Poland	Czyżewska (1974), Toborowicz (1976), Kiszka and Piórecki (1992), Lipnicki et al. (2012)	
69	*Physcia stellaris* (L.) Nyl.	reserve "Trębaczew", Kielce	Czyżewska (1974), Toborowicz (1976)	
70	*Physcia tenella* (Scop.) DC.	central part of the western Poland	Lipnicki et al. (2012)	
71	*Physconia distorta* (With.) J. R. Laundon	Przemyskie Foothills	Kiszka & Piórecki (1991)	EN
72	*Physconia grisea* (Lam.) Poelt	Zakopane	Rydzak (1957b)	
73	*Placynthiella dasaea* (Stirt.) Tønsberg	Świętokrzyski NP	Łubek (2007)	
74	*Placynthiella icmalea* (Ach.) Coppins & P. James	Świętokrzyski NP	Łubek (2007)	

75	*Platismatia glauca* (L.) W.L. Culb. & C.F. Culb.	Beskid Wyspowy Mountains, Wigierski NP, Knyszyńska Forest, Śnieżnik Massif and Bialskie Mountains	Nowak J. (1998), Bystrek & Matwiejuk (1999), Bystrek and Kolanko (2000), Kolanko (2005), Szczepańska (2008)	
76	*Pleurosticta acetabulum* (Neck.) Elix & Lumbsch	central part of the western Poland	Lipnicki et al. (2012)	EN
77	*Polycauliona polycarpa* (Hoffm.) Frödén, Arup & Søchting	reserve "Trębaczew", Kielce, Słonne Mountains, Wigry NP, Gorce Mountains, central part of the western Poland	Czyżewska (1974), Toborowicz (1976), Kiszka and Piórecki (1992), Fałtynowicz (1994), Czarnota and Wojnarowicz (2008), Lipnicki et al. (2012)	
78	*Pseudevernia furfuracea* (L.) Zopf.	Lublin region, Zakopane, Beskid Wyspowy, Beskid Sądecki, Wigierski NP, Knyszyńska Forest, Bieszczady Niskie Mountains, Świętokrzyski NP, Śnieżnik Massif and Bialskie Mountains, central part of the western Poland, Karpacz	Sulma (1935), Rydzak (1957b), Nowak J. (1998), Śliwa (1998), Bystrek and Matwiejuk (1999), Bystrek & Kolanko (2000), Kościelniak (2004), Łubek (2007), Szczepańska (2008), Lipnicki et al. (2012), Jurwin et al. (2012)	
79	*Ramalina farinacea* (L.) Ach.	Lublin region, reserve "Trębaczew", central part of the western Poland	Sulma (1935), Czyżewska (1974), Lipnicki et al. (2012)	VU
80	*Scoliciosporum chlorococcum* (Graeve ex Stenh.) Vězda	reserve "Trębaczew", Przemyskie Foothills, Słonne Mountains, Beskid Wyspowy Mountains, Beskid Sądecki Mountains, Bieszczady Niskie Mountains, Świętokrzyski NP, Śnieżnik Massif and Bialskie Mountains	Czyżewska (1974), Kiszka and Piórecki (1991, 1992), Nowak J. (1998), Śliwa (1998), Kościelniak (2004), Łubek (2007), Szczepańska (2008)	
81	*Trapeliopsis flexuosa* (Fr.) Coppins & P. James	Przemyskie Foothills, Beskid Wyspowy Mountains, Bieszczady Niskie Mountains, Świętokrzyski NP, Śnieżnik Massif and Bialskie Mountains	Kiszka and Piórecki (1991), Nowak J. (1998), Kościelniak (2004), Łubek (2007), Szczepańska (2008)	
82	*Tuckermanopsis chlorophylla* (Willd.) Hale	Chełmowa Mountain, Świętokrzyskie Mountains, Przemyskie Foothills, Wigierski NP, Beskid Wyspowy, Knyszyńska Forest, Bieszczady Niskie Mountains, Śnieżnik Massif and Bialskie Mountains, central part of the western Poland, Trębaczew	Halicz and Kuziel (1965), Halicz and Cieśliński (1967), Czyżewska (1974), Kiszka and Piórecki (1991), Fałtynowicz (1994), Nowak J. (1998), Bystrek and Kolanko (2000), Kościelniak (2004), Szczepańska (2008), Lipnicki et al. (2012)	VU
83	*Usnea arnoldii* Motyka	Roztocze	Bystrek & Górzyńska (1981)	
84	*Usnea barbata* (L.) Wigg.	Lublin Upland	Bystrek et al. (1981)	RE
85	*Usnea carpatica* Motyka	Tatry Mountains	Fałtynowicz (2003)	RE
86	*Usnea caucasica* Vain.	Roztocze	Bystrek et al. (1981)	RE
87	*Usnea extensa* Vain.	Roztocze	Bystrek and Górzyńska (1981)	RE
88	*Usnea faginea* Motyka	Lesko, Chełmowa Mountain, Świętokrzyskie Mountains, Bieszczady Niskie Mountains, Świętokrzyski NP	Rydzak (1956b), Halicz and Kuziel (1965), Cieśliński and Bystrek (1982), Kościelniak (2004), Łubek (2007)	CR
89	*Usnea filipendula* Stirt.	Lesko, Chełmowa Mountain, Świętokrzyskie Mountains, Roztocze, Knyszyńska Forest, Bieszczady Niskie Mountains, central part of the western Poland, Wkrzańska Forest	Rydzak (1956b), Halicz and Kuziel (1965), Halicz and Cieśliński (1967), Cieśliński and Bystrek (1982), Bystrek and Górzyńska (1981), Bystrek and Kolanko (2000), Kościelniak (2004), Lipnicki et al. (2012), Janczar and Liśkiewicz (2012)	VU
90	*Usnea florida* (L.) Weber ex F.H. Wigg.	Lesko, Bieszczady Niskie Mountains	Rydzak (1956b), Kościelniak (2004)	CR

91	*Usnea fulvoreagens* (Räsänen) Räsänen	central part of the western Poland	Lipnicki et al. (2012)	CR
92	*Usnea glabrata* Mot.	Roztocze	Bystrek and Górzyńska (1981)	CR
93	*Usnea glabrescens* (Nyl. ex Vain.) Vain.	Lesko, Roztocze	Rydzak (1956b), Bystrek and Górzyńska (1981)	CR
94	*Usnea glauca* Motyka	Roztocze, Świętokrzyskie Mountains	Bystrek and Górzyńska (1981), Cieśliński and Bystrek (1982)	CR
95	*Usnea hirta* (L.) Weber ex F.H. Wigg.	Chełmowa Mountain, Świętokrzyskie Mountains, Poland NE, Wigry NP, central part of the western Poland	Halicz and Kuziel (1965), Halicz and Cieśliński (1967), Halicz and Cieśliński (1967), Cieśliński and Bystrek (1982), Cieśliński and Tobolewski (1989), Fałtynowicz (1994), Lipnicki et al. (2012)	VU
96	*Usnea hirtella* (Arnold) Motyka	central part of the western Poland	Lipnicki et al. (2012)	CR
97	*Usnea laricina* Vain.	Sandomierska Dale	Bystrek et al. (1981)	EN
98	*Usnea longissima* Vain.	Roztocze	Bystrek and Górzyńska (1981)	RE
99	*Usnea perplectans* Stirt.	Roztocze	Bystrek et al. (1981)	DD
100	*Usnea prostrata* Vain.	Roztocze	Bystrek and Górzyńska (1981)	CR
101	*Usnea rigida* (Ach.) Motyka	Chełmowa Mountain, Świętokrzyski NP	Halicz and Kuziel (1965), Cieśliński and Bystrek (1982), Łubek (2007)	CR
102	*Usnea subfloridana* Stirt.	Chełmowa Mountain, Świętokrzyskie Mountains, Knyszyńska Forest, Świętokrzyski NP, central part of the western Poland, Wkrzańska Forest	Halicz and Kuziel (1965), Cieśliński and Bystrek (1982), Bystrek and Kolanko (2000), Łubek (2007), Łubek (2012), Janczar and Liśkiewicz (2012)	EN
103	*Usnea wasmuthii* Räsänen	Mazowsze Region: Czermierki	Krawiec (1938)	CR
104	*Vulpicida pinastri* (Scop.) J.-E. Mattsson & M.J. Lai	Roztocze, Beskid Wyspowy Mountains, Przemyskie Foothills, Biebrza NP, central part of the western Poland	Sulma (1935), Nowak J. (1998), Kiszka and Piórecki (1991), Kolanko (2005), Lipnicki et al. (2012)	NT
105	*Xanthoria candelaria* (L.) Th. Fr.	Kielce, Wigry NP, central part of the western Poland	Toborowicz (1976), Fałtynowicz (1994), Lipnicki et al. (2012)	
106	*Xanthoria fallax* (Hepp) Arnold	Przemyskie Foothills	Kiszka and Piórecki (1991)	VU
107	*Xanthoria parietina* (L.) Th. Fr.	reserve "Trębaczew", Kielce, central part of the western Poland	Czyżewska (1974), Toborowicz (1976), Lipnicki et al. (2012)	

Explanation: RE – regionally extinct, CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern, DD – data deficient.

The negative effect of anthropopressure in Poland has been, among others, the extinction of many of the most vulnerable components of lichen biota of larch (Table 4), on the other hand, it has been enriched with synanthropic species. The biota of lichens of that phorophyte in Poland has remained diversified to a small extent. On the bark of larch in the towns of Podlasie there grow mostly common and ubiquistic species.

The biota of lichens of deciduous trees is much more diverse than that of conifers. In north-eastern Poland (at 23 positions) on the bark of oak (*Quercus robur* and *Q. petraea*) 88 taxa were recorded and on beech (*Fagus sylvatica*) – 77 (Rutkowski & Kukwa 2000), including 40 taxa common to both trees. Many deciduous trees are phorophytes and as such are characterized by a broad ecological scale and potentially rich biota of lichens and can play an important role in maintaining species diversity in forest ecosystems. Coniferous trees are characterized by poorer biota of lichens, for example, in the Low Bieszczady Mountains (Kościelniak 2004) numbering a total of 58 species in the agricultural landscape of Nowotomyski Sandr (Zarabska 2011) – 16 taxa on *Pinus sylvestris* in Śnieżnik Masssif and Bialskie Mountains (Szczepańska 2008) – 48 species on the bark of *Picea bies* and 11 on the bark of *Abies alba*.

Lichens of larch have been the subject of research in Europe and the world, mainly in mountain areas. In Canada Kalgutkar and Bird (2011) reported the occurrence of 52 species of lichens on the bark of *Larix lyallii* and *Pinus albicaulis* in the subalpine zone of mountains of south-western province of Alberta in Canada. The authors described four stages of succession on the bark of larch:

Table 4. Lichens of larch (*Larix* sp.) extinct in various regions in Poland – based on the published data

Species	Region	Literature
Arthothelium spectabile Flot. ex A. Massal.	St. Catharine, Świętokrzyski NP	Łubek (2007)
Bacidia fiesiana (Hepp) Körb.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Bryoria implexa (Hoffm.) Brodo & D. Hawksw.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Bryoria jubata (L.) Bystr.	Lesko, Bieszczady Niskie	Kościelniak (2004)
Bryoria mirabilis (Motyka) Bystr.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Bryoria subcana (Nyl. ex Stizenb.) Brodo et D. Hawksw.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Bryoria vrangiana (Gyeln.) Brodo et D. Hawksw.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Calicium abietinum Pers.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Chaenotheca phaeocephala (Tuner) Th. Fr.	Łysa Mountain	Łubek (2007)
Chrysothrix candelaris (L.) J.R. Laundon	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Letharia vulpina (L.) Hue	Sudety, Western Carpathian Mountains, Lowland Środkowopolskie	Fałtynowicz (2003)
Menegazzia terebrata (Hoffm.) A. Massal.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Opegrapha atra Pers.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Usnea barbata (L.) Wigg.	Lubelska Upland	Bystrek et al. (1981)
Usnea caucasica Vain.	Roztocze	Bystrek et al. (1981)
Usnea extensa Vain.	Roztocze	Bystrek and Górzyńska (1981)
Usnea rigida Motyka s.l.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)
Usnea longissima Ach.	Roztocze	Bystrek and Górzyńska (1981)
Usnea subfloridana Stirt.	Chełmowa Mountain, Świętokrzyski NP	Łubek (2007)

1 – populating the bases of trees by foliose lichens, 2 – the colonization of the lower parts of tree trunks by lichens of crustose thalli, 3 – the emergence of species with foliose thalli on the trunk and branches, and 4 – the emergence of species with fruticose thalli. This relationship characteristic of lichen occurrence of different morphological types (vertical differentiation) was observed on the bark of larch in Poczopek, a village in the Knyszyńska Forest, where you can see a clear large share of lichens with fruticose thalli on the trunks and branches.

Epiphytic lichen diversity of Siberian larch (*Larix sibirica*) was studied in the forest-steppe ecotone of the Mongolian Altai (Hauck et al. 2012). A total of 64 lichen species was reported on the 240 studied larch trees. They noted that biodiversity of lichen biota is highly influenced by land use associated with traditional pastoral livestock husbandry. They found that bark of larch on the edge of the forest was less acidic and contained more nitrogen and calcium, and was colonized by numerous nitrophilous species.

Otte (2012) pointed out that larch plantations in the southern regions of Eastern Germany are home to many protected and endangered species of lichens (e.g. *Bryoria capillaris, Evernia mesomorpha*, *Usnea barbata*, *U. glabrata*, *U. glabrescens*, *U. lapponica*). On the bark of larch there were also recorded fronds of species rare in Europe, such as *Usnea flavocardia*, *Parmotrema reticulatum*, *Nephromopsis laureri*, *Bryoria subcana*.

5. Conclusion

1. A number of 27 lichen species inventoried in the localities of Podlasie allows the classification of larch into a group of phorophytes with poorly diversified lichen biota.

2. The bark of larch trees in the surveyed towns in the Podlasie province is dominated by ubiquistic taxa and those enduring strongly acidic medium.

Acknowledgements

I offer warm thanks Reviewers for their valuable and substantive comments.

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